03/21/78

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)
DISTRIBUTION FOR INCOMING MATERIAL 50-315/316

REC: CASE E G ORG: TILLINGHAST J DOCDATE: 03/14/78
NRC IN & MI PWR DATE RCVD: 03/20/78

DOCTYPE: LETTER NOTARIZED: NO COPIES RECEIVED
SUBJECT: LTR 1 ENCL 1
RESPONSE TO NRC'S LTR DTD 12/09/77...FOWARDING COMPLETED OPERATING HISTORY QUESTIONNAIRE FOR THE STEAM GENERATORS AT SUBJECT FACILITY...NOTORIZED 03/14/78.

PLANT NAME: COOK - UNIT 1 REVIEWER INITIAL: XJM
COOK - UNIT 2 DISTRIBUTER INITIAL: CLF

********** DISTRIBUTION OF THIS MATERIAL IS AS FOLLOWS **********

RESPONSES TO STEAM GENERATOR QUESTIONNARE
(DISTRIBUTION CODE A022)

FOR ACTION: BR CHIEF SCHWENCER**W/7 ENCL

INTERNAL: REG FILE**W/ENCL
I & E**W/2 ENCL
HANAUER**W/ENCL
SHAO**W/ENCL
BUTLER**W/ENCL
J COLLINS**W/ENCL
NRC PDR**W/ENCL
OELD**W/ENCL
EISENHUT**W/ENCL
BAER**W/ENCL
GRIMES**W/ENCL

EXTERNAL: LPDR'S
ST. JOSEPH, MI**W/ENCL
TIC**W/ENCL
NSIC**W/ENCL
RON GAMBLE**W/6 ENCL
KEN HERRING**W/6 ENCL
ACRS CAT B**W/16 ENCL

DISTRIBUTION. LTR 30 ENCL 30 CONTROL NBR: 780800010
SIZE: 2P+43P

********** THE END **********

INDIANA & MICHIGAN POWER COMPANY
P. O. BOX 18
BOWLING GREEN STATION
NEW YORK, N. Y. 10004

March 14, 1978

Donald C. Cook Nuclear Plant Units 1 & 2
Docket Nos. 50-315 and 50-316
DPR Nos. 58 and 74

Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Case:

This letter is in response to Mr. Karl R. Goller's letter dated December 9, 1977 which requested response to the operating history questionnaire for the steam generators by all PWR licensees.

Enclosed please find a completed questionnaire for the steam generators at the Donald C. Cook Nuclear Plant. The responses to this questionnaire are for the Unit No. 1 steam generators since we have not had any significant operating experience on the Unit 2 steam generators. The steam generators in both units of the Cook Nuclear Plant are identical.

Very truly yours,

John Tillinghast
Vice President

JT:em

Sworn and subscribed to before me
this 14th day of March, 1978 in
New York County, New York

Kathleen Barry
Notary Public

KATHLEEN BARRY
NOTARY Public, State of New York
No. 31-4506792
Qualified in Queens County
Certificate filed in New York County
Commission expires March 30, 1979

A023
S
1/1

cc: (Attached)

7803000010

cc: R. C. Callen
G. Charnoff
P. W. Sketetee
R. J. Vollen
R. Walsh
R. W. Jurgensen
D. V. Shaller-Bridgman

ENCLOSURE 1

STEAM GENERATOR OPERATING

HISTORY QUESTIONNAIRE

NOTE: All percentages should be reported to four significant figures.

I. BASIC PLANT INFORMATION

Plant: Donald C. Cook Nuclear Plant, Unit 1

Startup Date: January 1975

Utility: Indiana & Michigan Power Company

Plant Location: Bridgman, Michigan

Thermal Power Level: 3250 MWt (UNIT 1) ; 3391 MWt (UNIT 2)

Nuclear Steam Supply System (NSSS) Supplier: Westinghouse

Number of Loops: 4

Steam Generator Supplier, Model No. and Type: Westinghouse 51 Series Steam Generator

Number of Tubes Per Generator: 3384

Tube Size and Material: 7/8" Inconel 600 (Inconel ASME -SB-163)

II. STEAM GENERATOR OPERATING CONDITIONS

Normal Operation

Temperature: 512.2°

Flow Rate: 33.9 x 10^6 lb./hr.

Primary Pressure: 2250 psia

Secondary Pressure: 758 psia

Allowable Leakage Rate: As per Tec. Specs. 1GPM total primary-to-secondary leakage through all steam generators and 500 gallons per day through any-one Steam Generator.

Accidents

Design Base LOCA Max. Delta-P:

Main Steam Line Break (MSLB) Max. Delta-P:

No specific analysis has been done since the steam generators are not in a degraded condition.

III. STEAM GENERATOR SUPPORT PLATE INFORMATION

Material: SA-285 Grade C

Design Type:
Design Code:
Dimensions:
} Solid drilled plate typical for the Westinghouse 51 Series Steam Generator

Flow Rate: 33.9 x 10^6 lb./hr.

Tube Hole Dimensions: .891" { .906" / .891" } Dia

Flow Hole Dimensions: .750" { .766" / .750" } Dia

IV. STEAM GENERATOR BLOWDOWN INFORMATION

Frequency of Blowdown: Continuous

Normal Blowdown Rate: 20 gpm/ S/G

Blowdown Rate w/Condenser Leakage: 62.5gpm/S/G

Chemical Analysis Results

Results	Parameter Control Limits	Normal Values
pH	8.8 - 9.2	8.9
Conductivity	-	5.0 µmho
Cation Conductivity	<2.0 µmho	1.0 µmho
Sodium	< 100 ppb	< 7 ppb
Ammonia	-	0.5 ppm
Phosphate	-	Nil
Chloride	< 0.15 ppm	Nil
Free Hydroxide	< 0.15 ppm	Nil
Silica	< 1.0 ppm	Nil

V. WATER CHEMISTRY INFORMATION

Secondary Water

Type of Treatment and Effective Full Power (EFP) Months of Operation: AVT

Typical Chemistry or Impurity Limits:

Feedwater

		Typical
Typical Chemistry or Impurity Limits:	Oxygen	< 10 ppb
	Hydrazine	3-5 ppb residual
	pH	9.2

Condenser Cooling Water

		Typical
Typical Chemistry or Impurity Limits:	pH	7.2
	Na	100 - 300 ppb

Demineralizers - Type: None

Cooling Tower (open cycle, closed cycle or none): None

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual:

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: April 13 to May 1, 1976

Number of EFP Days of Operation Since Last Inspection: 266.37

(The following is to be repeated for each steam generator)

Steam Generator Number: 1

Percentage of Tubes Inspected At This ISI: 22%

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: N/A

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: NONE

Sludge Lancing (date): NOT DONE

Ave. Height of Sludge Before Lancing: 3 1/2" Max. Localized Inletside Outlet side not Recorded

Ave. Height of Sludge After Lancing: n/a

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Wastage/Cavitation Erosion		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR Cold Leg
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/a				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3			N/A				N/A			
4										
5										
6										
7										
8										
9										
10										
11										
12										

SAME FOR COLD LEG

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual:

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: April 13 to May 1, 1976

Number of EFP Days of Operation Since Last Inspection: 266.37

(The following is to be repeated for each steam generator)

Steam Generator Number: 2

Percentage of Tubes Inspected At This ISI: 22%

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: N/A

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: NONE

Sludge Lancing (date): NOT DONE

Ave. Height of Sludge Before Lancing: 3" Max. Localized 1" scattered (Inlet Side) Outlet side not recorded

Ave. Height of Sludge After Lancing: N/A

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Wastage/Cavitation Erosion		NONE				Same for Cold Leg
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4		N/A					N/A			
5										
6										
7										
8										
9										
10										
11										
12										

SAME FOR COLD LEG

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual: N/A

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: April 13 to May 1, 1976

Number of EFP Days of Operation Since Last Inspection: 266.37

(The following is to be repeated for each steam generator)

Steam Generator Number: 3

Percentage of Tubes Inspected At This ISI: 40%

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: N/A

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits:

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: NONE

Sludge Lancing (date): NOT DONE

Ave. Height of Sludge Before Lancing: 3 1/2" to 4" Max. Localized inlet side 1 to 2" Max. Broad Area Outlet Side

Ave. Height of Sludge After Lancing: N/A

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mils/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mils)		N/A			

SAME FOR COLD LEG

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mils)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4		N/A					N/A			
5										
6										
7										
8										
9										
10										
11										
12										

SAME FOR COLD LEG

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted N.A.

Actual:

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: April 13 to May 1, 1976

Number of EFP Days of Operation Since Last Inspection: 266.37

(The following is to be repeated for each steam generator)

Steam Generator Number: 4

Percentage of Tubes Inspected At This ISI: 40%

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI:

Percentage of Tubes Plugged Prior to This ISI: .03% (1 tube)

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: NONE

Sludge Lancing (date): NOT DONE

Ave. Height of Sludge Before Lancing: 3 to 4" Max. Localized Inlet Side outlet side not done

Ave. Height of Sludge After Lancing: N/A

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

NONE

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A			

SAME FOR COLD LEG

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				Same For Cold Leg
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4		N/A					N/A			
5										
6										
7										
8										
9										
10										
11										
12										

Same for Cold Leg

TABLE KEY

NOTE: All percentages refer to the percent of the tubes within a given area of the tube bundle.

(1)

Area of the Tube Bundle	No. of Tubes Within the Area*
a. Periphery of Bundle (wi/20rows for B&W; wi/10 rows for C.E. and W)	1204
b. Patch Plate (wi/4 rows)	366
c. Missing Tube Lane (B&W only) (wi/5 rows)	NA
c. Flow Slot Areas (C.E. and W only) wi/10 rows)	934
d. Wedge Regions (C.E. and W only) (wi/8 rows)	242
e. Interior of Bundle (remainder of tubes)	1304

(2)

Allowable Limit for Wastage/Cavitation Erosion: 40% of tubewall

Allowable Limit For Denting: Not Determined. No denting has been detected in these units.

(3)

1. Specifies area between the tube sheet and the first support plate

2. Specifies in the following locations: (list the additional locations)

Wastage/Cavitation Erosion: N/A

Cracking: N/A

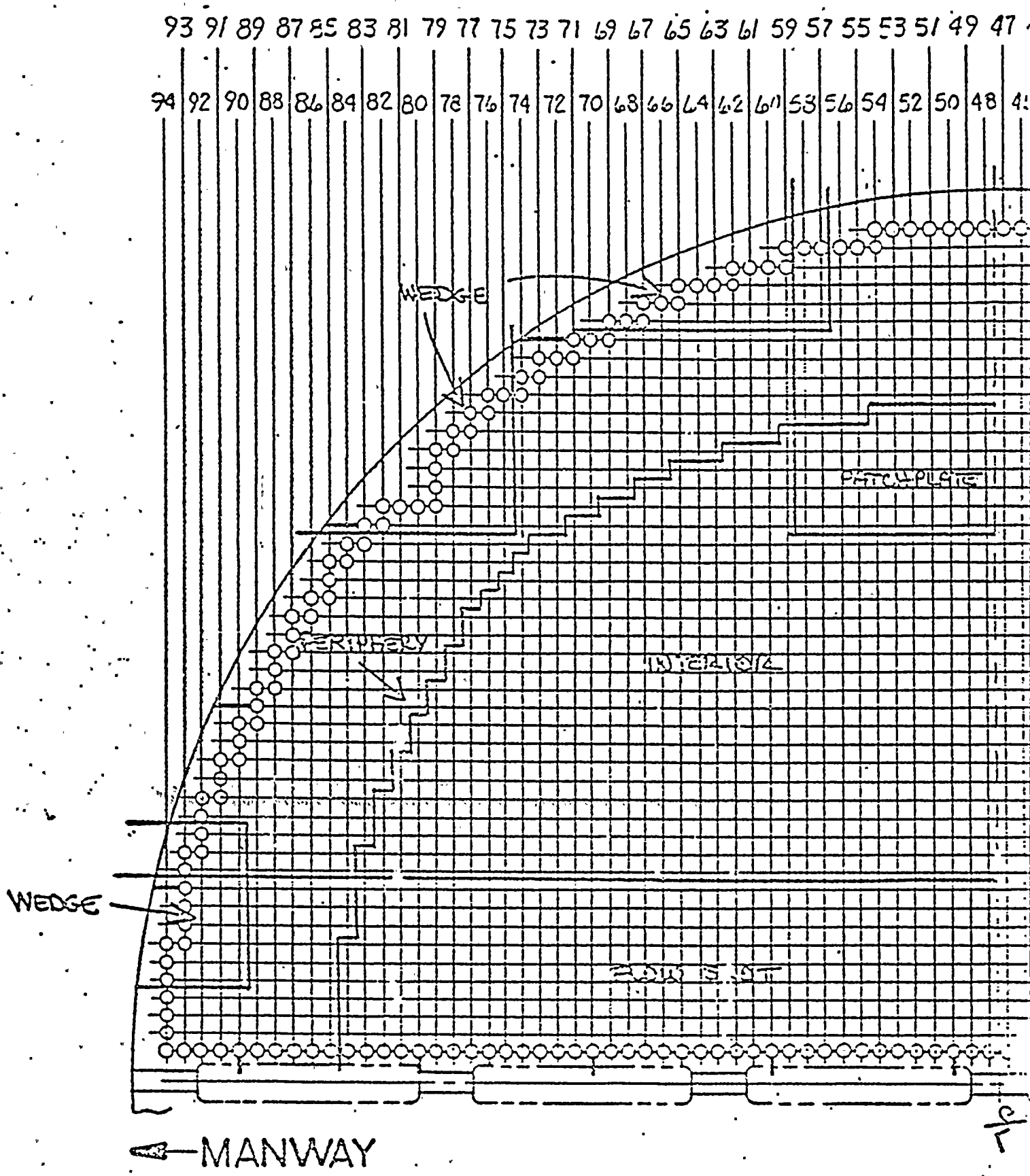
To date these units have not shown signs of these items

(4) April 13 to May 1,1976.

Specify the date of the inspection for which results have been tabulated.

*NUMBER OF TUBES EXCEEDS 3388 DUE TO OVERLAP OF AREAS AS INDICATED ON THE ATTACHED TUBESHEET MAP.

SERIES 51
STEAM GENERATOR



SYMMETRY ASSUMED

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted N. A.

Actual:

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: February 1977

Number of EFP Days of Operation Since Last Inspection: 195.57

(The following is to be repeated for each steam generator)

Steam Generator Number: 1

Percentage of Tubes Inspected At This ISI: NONE

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: N/A

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: See attached analysis Attachment "A"

Sludge Lancing (date): February 1977

Ave. Height of Sludge Before Lancing: Not Recorded

Ave. Height of Sludge After Lancing: Not Recorded

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: Not Done

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N.A.

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A			

Same for Cold Leg

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		none				Same for Cold Leg
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				Same for Cold Leg
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area					
	a	b	c	d	e	a	b	c	d	e	
1											Same for Cold Leg
2											
3											
4		N/A					N/A				
5											
6											
7											
8											
9											
10											
11											
12											

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual:

Manufacturer Recommendation: N. A.

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: February 1977

Number of EFP Days of Operation Since Last Inspection: 195.57

(The following is to be repeated for each steam generator)

Steam Generator Number: 2

Percentage of Tubes Inspected At This ISI: NONE

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: N/A

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: See attached analysis Attachment "A"

Sludge Lancing (date): February 1977

Ave. Height of Sludge Before Lancing: Not recorded

Ave. Height of Sludge After Lancing: Not Recorded

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N. A.

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A			

Same for Cold Leg

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking.		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4										
5		N/A					N/A			
6										
7										
8										
9										
10										
11										
12										

SAME FOR COLD LEG

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual: N.A.

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: February 1977

Number of EFP Days of Operation Since Last Inspection: 195.57

(The following is to be repeated for each steam generator)

Steam Generator Number: 3

Percentage of Tubes Inspected At This ISI: 38.1

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: All

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: See attached Analysis Attachment "A"

Sludge Lancing (date): February 1977

Ave. Height of Sludge Before Lancing: 4" Max. localized inlet side
2" Max. localized outlet side

Ave. Height of Sludge After Lancing: 3" Max. Localized inlet side*
Outlet side Not done.

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

* Results believed not accurate pending further review of next inspection.

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A			

same for cold leg

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		none				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A				

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4										
5			N/A				N/A			
6										
7										
8										
9										
10										
11										
12										

SAME FOR COLD LEG

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

N/A

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual:

Manufacturer Recommendation: N. A.

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

(The following is to be repeated for each scheduled ISI)

Inservice Inspection (ISI) Date: February 1977

Number of EFP Days of Operation Since Last Inspection: 195.57

(The following is to be repeated for each steam generator)

Steam Generator Number: 4

Percentage of Tubes Inspected At This ISI: 38.1

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: All

Percentage of Tubes Plugged Prior to This ISI: NONE

Percentage of Tubes Plugged At This ISI: NONE

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: NONE

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: NONE

Sludge Layer Material Chemical Analysis Results: See attached Analysis Attachment "A"

Sludge Lancing (date): February 1977

Ave. Height of Sludge Before Lancing: 4" Max. Localized Inlet Side
2" Max. Localized outlet side

Ave. Height of Sludge After Lancing: Not recorded

Replacement, Retubing or Other Remedial Action Considered: (Briefly Specify Details) NONE

Support Plate Hourglassing: NONE

Support Plate Islanding: NONE

Tube Metalurgical Exam Results: NOT DONE

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures
NONE	N/A

Wastage/Cavitation Erosion AS OF (4)

Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion		NONE			
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE			
% of Tubes Plugged That Did not Exceed Degradation Limit		NONE			
Location Above Tube Sheet (3)		N/A			
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A			
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)		N/A			

SAME FOR COLD LEG

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Con't)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected By Cracking		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Cracking		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Location Above Tube Sheet (3)		N/A				
Rate of Leakage From Leaking Cracks (gpm)		N/A				

Denting (Not applicable to B&W S.G.) AS OF (4)

Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e	
% of Tubes Affected by Denting		NONE				SAME FOR COLD LEG
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)		NONE				
% of Tubes Plugged That Did Not Exceed Degradation Limit		NONE				
Rate of Leakage From Leaking Dents (gpm)		N/A				
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)		N/A				
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)						

Denting (Con't)

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1										
2										
3										
4		N/A					N/A			
5										
6										
7										
8										
9										
10										
11										
12										

Same for Cold Leg

TABLE KEY

NOTE: All percentages refer to the percent of the tubes within a given area of the tube bundle.

(1)

Area of the Tube Bundle	No. of Tubes Within the Area*
a. Periphery of Bundle (wi/20rows for B&W; wi/10 rows for C.E. and W)	1204
b. Patch Plate (wi/4 rows)	366
c. Missing Tube Lane (B&W only) (wi/5 rows)	NA
c. Flow Slot Areas (C.E. and W only) wi/10 rows)	934
d. Wedge Regions (C.E. and W only) (wi/8 rows)	242
e. Interior of Bundle (remainder of tubes)	1304

(2)

Allowable Limit for Wastage/Cavitation Erosion: As per tech. Spec. 40% of wall.

Allowable Limit For Denting: Not determined. No denting has been detected in these units.

(3)

1. Specifies area between the tube sheet and the first support plate

2. Specifies in the following locations: (list the additional locations)

Wastage/Cavitation Erosion: N/A

Cracking: N/A

To date the Unit 1 Stm. Gen. have not shown signs of these items

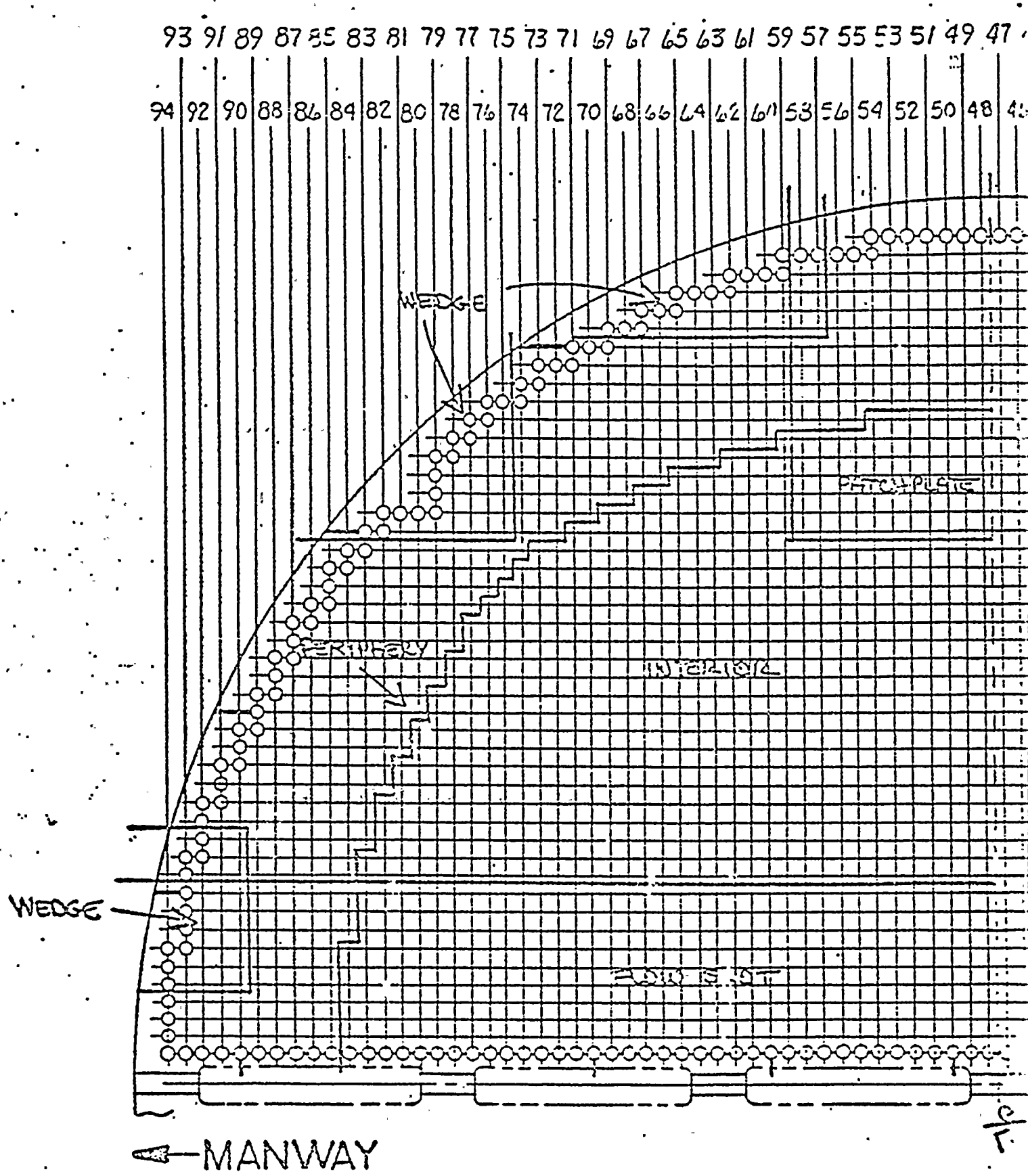
(4)

Specify the date of the inspection for which results have been tabulated.

February 1977.

*NUMBER OF TUBES EXCEEDS 3388 DUE TO OVERLAP OF AREAS AS INDICATED ON THE ATTACHED TUBESHEET MAP.

SERIES 51
STEAM GENERATOR



SYMMETRY ASSUMED

VIII. SIGNIFICANT STEAM GENERATOR ABNORMAL OPERATIONAL EVENTS

NONE

DATE	SUMMARY
	(Include event description; unscheduled ISI results, if performed; and subsequent remedial actions)

IX. CONDENSER INFORMATION

Condenser Material	Tube Leakage Date	Tube Leakage Rate (gpm)	Detectable Limit	Detection Method
Copper & Stainless Steel	See attached list of dates of condenser leaks. Attachment "B"		0.1 μmho increase in cation conductivity can detect a condenser leak.	Cation Conductivity increase detected by isolating halves of hotwell samples.

X. RADIATION EXPOSURE HISTORY WITH RESPECT TO STEAM GENERATORS

Date	Exam Dosage (Man-Rem)	Repair Dosage (Man-Rem)	Comments
	Exposure not available in Man-Rem exposures.		

XI. DEGRADATION HISTORY FOR EACH TYPE OF DEGRADATION EXPERIENCED FOR TEN REPRESENTATIVE, UNPLUGGED TUBES FOR WHICH THE RESULTS OF TWO OR MORE ISI'S ARE AVAILABLE

If the results for ten tubes are not available, specify this information for all those tubes for which results are available.

(repeat the following information for each tube and degradation type)

Steam Generator No:
Tube Identification: N/A
Type of Degradation: (specify denting, wastage, cavitation erosion, caustic stress corrosion cracking, or flow induced vibration cracking)

N/A

(repeat the following information chronologically for each ISI for which results are available)

ISI Date:
Amount of Degradation: (specify amount and units)
EFP Months of Operation Since Last ISI for Which Results are Given:

ITEM VII
ATTACHMENT "A"

Four sludge samples removed from the four Unit #1 Steam generators during sludge lancing were received fromchemical analysis. The sludge was co-lected at the one micron filter used to remove sludge prior to recirculation or discharge of the lancing water. The amount of sludge removed and the weight of sample received are shown below:

Steam Generator	Pounds Removed	Analysis No.	Grams Received*
No. 1	153	32352	26.26
No. 2	228	32353	26.52
No. 3	76	32354	31.46
No. 4	190	32355	18.46

* Samples had been dried at 100° C prior to weighing.

The four samples contained metal filings, metal shavings, weld beads, metallic copper, brush hairs and small amounts of other fiberous material. These inclusions were separated from the oxides and smaller metal particles by grinding the samples and passing them through a 100 mesh screen. The weights of metal and other inclusions separated were 2.58, 1.84, 10.24 and 3.21 grams for numbers one through four steam generators respectively.

The portions of the samples passing through the 100 mesh screen were analyzed with the following results:

Constituent	(1) 32352	(2) 32353	(3) 32354	(4) 32355
Silica, SiO_2	2.4	3.2	0.7	1.4
Iron Oxide, FE_2O_3	89.6	91.7	90.2	97.5
Aluminum Oxide, Al_2O_3	1.3	1.7	0.5	0.7
Calcium Oxide, CaO	0.5	0.7	0.2	0.3
Magnesium Oxide, MgO	0.5	0.9	0.2	0.4
Copper Oxide, CuO	6.9	4.7	10.8	3.2
Chromium Oxide, Cr_2O_3	0.1	0.2	0.2	0.2
Manganese Oxide, Mn_3O_4	0.6	0.8	0.6	0.7
Nickel Oxide, NiO	0.4	0.2	0.4	0.2
Sodium Oxide, Na_2O	<0.1	< 0.1	<0.1	<0.1
Potassium Oxide, K_2O	<0.1	<0.1	0.1	<0.1
Lead Oxide, PbO_2	0.2	0.2	0.1	0.2
Zinc Oxide, ZnO_2	<0.1	<0.1	<0.1	<0.1
Tin Oxide, SnO_2	<0.1	<0.1	<0.1	<0.1

Constituent	32353	32353	32354	32355
Molybdenum Oxide, MoO_3	<0.1	<0.1	<0.1	<0.1
Phosphorous Pentoxide, P_2O_5	0.2	0.2	0.1	0.2
Sulfur Trioxide, SO_3	<0.1	<0.1	<0.1	<0.1
	102.7	104.5	104.1	105.0
Net Ignition Gain	-4.0	-5.1	-4.3	-4.4
	98.7	99.4	99.8	100.6

ATTACHMENT "B"

IX. Condenser Leaks

A NE/ A NW	B NE/ B NW	C NE/ C NW
8/22/75	8/22/75	1/3/77
12/11/75	9/15/76	3/12/76
10/14/75	5/11/77	8/22/75
12/6/75		12/5/76
1/8/78		
12/12/77		
9/14/76		

A SE/ A SW	B SE/ B SW	C SE/ C SW
9/14/76	8/22/75	9/14/76
1/3/77	5/31/77	1/3/77
10/28/76	9/15/76	12/9/77
3/9/76	12/15/77	12/11/76
		8/22/75