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January 16, 1979
IPN-79-1

Darrell G. Eisenhut
Assistant Director for Systems & Projects
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Steam Generator Operating History Questionnaire
Indian Point #3 Nuclear Power Plant
Docket - 50-286

Dear Mr. Eisenhut:

The enclosed Steam Generator Operating History Questionnaire with attached supplementary information is being submitted to you in response to the February 10, 1978 letter from Karl R. Goller, Assistant Director for Operating Reactors.

Very truly yours,

Paul J. Early
Asst. Chief Engineer-Projects

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ENCLOSURE
STEAM GENERATOR OPERATING
HISTORY QUESTIONNAIRE

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

I. BASIC PLANT INFORMATION

Plant:	Indian Point Unit No. 3
Startup Date:	Initial Criticality: 4/6/76
Utility:	Power Authority of the State of New York
Plant Location:	Buchanan, New York 10511
Thermal Power Level:	3025 MW_{th}
Nuclear Steam Supply System (NSSS) Supplier:	Westinghouse Electric Corp.
Number of Loops:	4
Steam Generator Supplier, Model No. and Type:	West., Series 44, Vertical, U-bend.
Number of Tubes per Generator:	3260
Tube Size and Material:	Inconel 600: 0.875" outside diameter 0.050" wall thickness

II. STEAM GENERATOR OPERATING CONDITIONS

Normal Operation

Temperature:	Primary	Secondary
	T_{hot} (SG_{in}) = 600.4°F	$Feedwater_{in}$ = 427.2°F
	T_{cold} (SG_{out}) = 542.6°F	$Steam_{out}$ = 513.8°F
	T_{avg} = 571.5°F	

Primary Flow Rate:	34.05×10^6 lb/hr per S.G.
Allowable Leakage Rate:	1 gpm (total primary to secondary). 500 gpd max. for any single S.G.
Primary Pressure:	2235 psig
Secondary Pressure:	755 to 780 psig

Accidents:

Design Base LOCA Max. Delta-P:	1600 psi (sec.to pri.)
Main Steam Line Break (MSLB) Max.Delta-P:	1600 psi (pri. to sec.)

III. STEAM GENERATOR SUPPORT PLATE INFORMATION

Material:	SA-285, Grade C.
Design Type:	Drilled Plate
Design Code:	ASME Section III
Dimensions:	9'8" diameter; 0.750" thickness.
Secondary Flow Rate:	3.315×10^6 lb/hr per S.G.
Tube Hole Dimensions:	29/32"
Flow Hole Dimensions:	11/16"

IV. STEAM GENERATOR BLOWDOWN INFORMATION

Frequency of Blowdown:	Continuous
Normal Blowdown Rate:	10 gpm per S.G.
Blowdown Rate w/Condenser Leakage:	Up to 30 gpm per S.G. depending on water chemistry.

Chemical Analysis Results

Results	Chemistry Parameter	Control Limits
8.8	pH @ 25°C	8.5 - 9.0[1]
*	Free Hydroxide as ppm $CaCO_3$	0.15
2.0	Total Conductivity umhos/cm @ 25°C	< 4.0
<.05	Chloride, ppm	.05
*	Sodium, ppm	<.1
*	NH_3, ppm	N/A
*	Dissolved Oxygen, ppb	N/A
*	SiO_2, ppm	N/A
*	Suspended Solids, ppm	N/A

1 To be maintained with hydrazine at sea and brackish water sites.

* Not tested for per IP3 Tech Specs.

V. WATER CHEMISTRY INFORMATION

Secondary Water

Type of Treatment:	AVT (All Volatile Treatment)
Effective Full Power (EFP) Days of Operation:	504.9 EFD (as of June 16, 1978)
Typical Chemistry or Impurity Limits:	Same as blowdown

Feedwater

Impurity Limits:	AVT - Normal Power
pH	8.8 - 9.2
Total Conductivity	$\leq$ 4 umhos/cm @ 25°c
Ammonia	$\leq$ 0.5 ppm
Hydrazine	O_2 + .005 ppm
O_2	$<$ 5 ppb.

Condenser Cooling Water

Typical Chemistry or Impurity Limits:	Saline Estuary
Demineralizers - Type:	Do not have condensate polishing.
Cooling Tower (open cycle, closed cycle or none):	None

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

Not applicable.

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

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

Inservice Inspection (ISI) Date: June 16, 1978

Number of EFP Days of Operation Since Last Inspection:	504.9 FPD
	This was first ISI since commencement of commercial operation.

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

Steam Generator Number:	31	32	33	34
Percentage of Tubes Inspected at this ISI:	0.450%	0%	8.957%	8.957%
Percentage of Tubes Inspected at this ISI That Had Been Inspected at the Previous Scheduled ISI:	NONE, FIRST ISI			
Percentage of Tubes Plugged Prior to this ISI:	NONE			
Percentage of Tubes Plugged at this ISI:	0.092%	0%	0%	0%
Percentage of Tubes Plugged That Did Not Exceed Degradation Limits:	SEE ATTACHED LETTER			
Percentage of Tubes Plugged as a Result of Exceedance of Degradation Limits:	NONE, SEE ATTACHED LETTER			

Sludge Layer Material Chemical Analysis Results:

Sludge Lancing (date): June 12, 1978

Ave. Height of Sludge Before Lancing:
Ave. Height of Sludge After Lancing:

Eddy current examination was performed after sludge lancing. See Table I for volumetric analysis.

Replacement, Re-tubing or other Remedial Action Considered: (Briefly Specify Details)

None necessary.

Support Plate Hourglassing: None

Support Plate Islanding: None

Tube Metallurgical Exam Results: None, done.

TABLE I

TUBESHEET CLEANING

SUMMARY SHEET

Plant: Indian Point Unit #3 Outage Dates: 6/12 - 6/20/78

S/G	Prelance Sludge Volume	Post Lance Sludge Volume	Percent Removal	Comments
31	24.8 Gal. 518 lbs.	0 Gal. 0 lbs.	100%	Return Water from S/G Visually Clear.
32	24.8 Gal. 518 lbs.	2.1 Gal. 43.2 lbs.	92%	Return Water from S/G Visually Clear.
33	33.1 Gal. 692 lbs.	2.1 Gal. 43.2 lbs.	94%	Return Water from S/G Visually Clear.
34	35.2 Gal. 734 lbs.	6.3 Gal. 130 lbs.	82%	Return Water from S/G Visually Clear.

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF 6/16/78

Percentage of Tubes Plugged	Other Preventive Measures
See accompanying letter.	

Wastage/Cavitation Erosion AS OF 6/16/78

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					
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)					
% of Tubes Plugged That Did not Exceed Degradation Limit					
Location Above Tube Sheet (3)					
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)					
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)					

Cracking AS OF 6/16/78

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

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

Cracking (Con't) SEE ACCOMPANYING LETTER

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					
% of Tubes Plugged Due to Cracking					
% of Tubes Plugged That Did Not Exceed Degradation Limit					
Location Above Tube Sheet (3)					
Rate of Leakage From Leaking Cracks (gpm)					

Denting (Not applicable to B&W S.G.) AS OF 6/16/78

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					
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)					
% of Tubes Plugged That Did Not Exceed Degradation Limit					
Rate of Leakage From Leaking Dents (gpm)					
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)					
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										
5										
6										
7										
8										
9										
10										
11										
12										

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)	SEE ACCOMPANYING LETTER
b. Patch Plate (wi/4 rows)	
c. Missing Tube Lane (B&W only) (wi/5 rows)	
c. Flow Slot Areas (C.E. and W only) wi/10 rows)	
d. Wedge Regions (C.E. and W only) (wi/8 rows)	
e. Interior of Bundle (remainder of tubes)	

(2)

Allowable Limit for Wastage/Cavitation Erosion:

Allowable Limit For Denting:

(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:

   Cracking:

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

See attached letter for details.

Condenser Material	Tube Leakage Date	Tube Leakage Rate (gpm)	Detectable Limit	Detection Method
Admiralty Brass	..	nominal	$1X10^{-5}$ gpm	Helium Mass Spectrometry

X. RADIATION EXPOSURE HISTORY WITH RESPECT TO STEAM GENERATORS

Date	Exam Dosage (Man-Rem)	Repair Dosage (Man-Rem)	Comments
6/12/78 to 8/9/78	19.5 Man-Rem for ISI 5.7 Man-Rem for Sludge lancing 33.8 Man-Rem for S.G. mechanical modifications made to secondary side	2.7 Man-Rem	Explosively plugged 3 tubes in #31 S.G.
12/12/78		4.5 Man-Rem	Explosively plugged 1 tube in #33 S.G.

SEE ACCOMPANYING LETTER

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:
Type of Degradation: (specify denting, wastage, cavitation erosion, caustic stress corrosion cracking, or flow induced vibration cracking)

(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:

INDIAN POINT 3 UNIT STEAM GENERATOR OPERATING HISTORY SUPPLEMENTAL INFORMATION

Tube sheet cleaning was performed on all four steam generators during the period of June 12, 1978 through June 20, 1978. Based on water balance result, an average of 92% of the sludge was removed on all four generators.

During the period of July 17, 1978 through July 26, 1978 eddy current testing was performed on steam generators 33 and 34 to inspect the tubes as part of the Inservice Inspection Program. Approximately 292 tubes in each generator were inspected, amounting to approximately 8% of the total amount of tubes in both steam generators. This was the first Inservice Inspection performed since commencement of commercial operation of the unit. There were no reportable eddy current indications noted in any of the tube walls. However, dent "indications" were observed at the tube to support plate intersection in approximately 90% of the tubes inspected. The probe used had a frequency of 400 KHZ and the size was 700. As a result of being able to pass a 700 size probe through all tubes, it was not possible to ascertain whether the "indications" were due to manufacturing/metallurgical flaws or the "denting phenomena" currently being experienced with most Westinghouse steam generators. However, the location of the indications suggests the latter as the more likely mechanism. A further evaluation of this data is being conducted; however, the results are not available at this point in time.

On August 7, 1978 while installing a tube line blocking device in steam generator #31, a welder inadvertently struck an arc across 3 tubes. Fifteen tubes in the vicinity of the subject tubes were examined by eddy current testing. All tubes showed denting similar to that noted in steam generators 33 and 34. One of the subject tubes was found to be leaking, but all others showed no reportable indications. As a precautionary measure, the three subject tubes were plugged. Therefore, the three plugged tubes indicated on the history questionnaire were not plugged due to degradation from denting.

An increase in radioactivity was noted while performing the steam generator blowdown analysis for No. 33 steam generator on December 8, 1978. Based on the activity levels, it was determined that approximately a 0.24 gpm primary to secondary leak existed in the generator. The unit was taken out of service and eddy current examination performed to determine the location of the leak. One tube in the generator was found to be leaking. Its location was Row 44, Column 56 in steam generator No. 33. Examination confirmed that the defect was located at the second tube support. This particular tube was examined during the first Inservice Inspection eddy current examination and was found to have a dent indication at this particular location at that time. The tube was plugged on December 12, 1978 and the unit returned to service. No further leakage has been detected to date.

Regarding item IX on the history questionnaire, we have experienced approximately six leaks in the condenser prior to August 10, 1978. Since August 10, 1978 to date we have, however, experienced substantial leaks (approximately 100) in one particular waterbox. The cause is unknown at this point in time, but is being analyzed. Steps are immediately taken to plug any failed tube, even if the leakage is nominal.

It is hoped that this supplemental information is of use to you and aids in understanding the data submitted in the history questionnaire.