Indian Point 3
Nuclear Power Plant
P.O. Box 215
Buchanan, New York 10511
914 739.8200

New York Power Authority

November 8, 1984
IPN-84-54

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTENTION: Mr. Steven A. Varga, Chief
Operating Reactor Branch No. 1
Division of Licensing

SUBJECT: INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
STARTUP REQUEST FOLLOWING
MID-CYCLE STEAM GENERATOR INSPECTION

REFERENCES:
1) Letter from J. C. Brons to Dr. T. E. Murley dated November 5, 1984 (IP-WDH-3742) entitled: "Mid-Cycle Inspection of Steam Generators"

2) Letter from J. C. Brons to S. A. Varga dated November 6, 1984 (IPN-84-53) entitled: "Indian Point 3 Mid-Cycle Steam Generator Inspection"

Dear Mr. Varga:

Indian Point 3 Technical Specifications Table 4.9-1, Steam Generator Tube Inspection, requires a report to the NRC and NRC approval prior to startup for a sample result C-3.

Reference 1 reported this condition and Reference 2 transmitted information as requested at the November 2, 1984 meeting held in Bethesda, Maryland concerning the Indian Point 3 mid-cycle steam generator inspection.

The purpose of this letter is to request approval for startup following completion of the inspection and required tube plugging.

In support of this request the following information is being submitted in addition to that already provided in Reference 2.

Attachment I is the hot leg information requested at the meeting of November 2, 1984.

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Attachment II is an updated version of the Steam Generator Mid-Cycle (IV) Inspection Presentation that was presented at the November 2, 1984 meeting.

Plant startup for the remainder of Cycle 4 is scheduled for November 14, 1984 and thus your expeditious review and approval of this request will be appreciated.

Sincerely,

John C. Brons
Resident Manager

WDH:jmd

cc: Resident Inspector's Office
Indian Point Unit 3
U. S. Nuclear Regulatory Commission
P.O. Box 66
Buchanan, New York 10511

Dr. Thomas E. Murley
Regional Administrator
Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

NEW YORK POWER AUTHORITY
Indian Point 3

RESPONSE TO NRC QUESTIONS FROM MEETING OF NOVEMBER 2, 1984

Question: Provide the 1982 ECT results for the approximately 80 tubes in Steam Generators 31 and 34 with hot leg indications as determined by the ongoing mid cycle outage. Estimate a growth rate for degradation on the hot leg tubes.

Response: A tube by tube comparison of the 1982 data with the 1984 mid cycle test results for all hot leg indications found in Steam Generators 31 and 34 is attached. In order to make this comparison valid, the 1982 data for these tubes was reanalyzed using the same equipment being used for the entire mid cycle (1984) inspection. This data reanalysis is as described to the NRC on November 2, 1984 and in subsequent communications.

Some of the tubes exhibit a substantial change from the reanalyzed 1982 data for these tubes. In fact, four (4) of the tubes with degradation greater than 40% apparently had no detectable degradation as a result of the 1982 inspection. Also, 13 tubes in these two steam generators which appeared to have defects in 1982, have been determined to have no degradation at all using equipment with improved sensitivity. The major reason for these findings is the low voltage signals which have been a characteristic of tube data at Indian Point 3 since the tube pitting problem was discovered in 1981. As a result, new probes were designed to detect these small volume signals in the presence of copper. It must also be noted that as a result of the data reanalysis, 15 tubes have been determined to have had indications in excess of 40% in the 1982 inspection. These findings are considered to be expected results of technique improvements.

On average, tubes with hot leg indications in Steam Generators 31 and 34 (attached list) have exhibited a change from the reanalyzed 1982 data of less than 7% for the entire nine month operating period. The Indian Point 3 Technical Specification bases point out that a 10% allowance for tube degradation that may occur between tube examinations can be added to the 40% plugging limit and provide adequate margin for steam generator operations. Indian Point 3 will conduct an eddy current inspection in accordance with plant Technical Specifications at the conclusion of Cycle 4.

The type of degradation mechanism on the hot leg is not known. No tube degradation (other than denting) had been detected on the hot

leg side of the steam generators at Indian Point 3 until the 1982 tube inspection. It should be noted that the 1982 inspection was the first inspection which utilized the new narrow coil probe designed to reliably detect small volume pitting signals. During that 1982 inspection, a total of approximately 150 indications were detected on the hot leg sides of all four steam generators. These indications were detected between the tubesheet and the first support plate primarily in the center of the bundle. These were presumed to be pitting on the hot leg side due to the similarities in the indications and their locations to the confirmed pitting degradation on the cold leg side.

One tube however indicated a 99% (essentially through wall) defect with a saturating signal voltage ($>$ 10 volts). A reanalysis of the 1982 data for this tube with present analysis equipment indicated a voltage signal for this tube of 22.9 volts. This tube was pulled and destructively examined. An intergranular through wall crack, axially oriented, and approximately ½" in length was the cause of the indication. Some small pits were also found on the tube. The results of the examination of this tube were reported to the NRC in our meeting on September 21, 1982. For about two months prior to plant shutdown the unit had been operating with an approximate .003 gpm of primary to secondary leakage. This tube was the source of that leakage and most of the contaminants had been flushed out of the crack making identification of a definitive cause of the failure impossible.

The Authority, as a result of this tube examination, elected to conservatively plug tubes with voltage signals unlike cold leg pitting degradation regardless of the depth of the degradation. Tubes which exhibit moderate to large voltage signals will also be plugged during this mid cycle outage. Note that no tubes presently indicate signal voltages approaching the 22.9 volts signal corresponding to the tube that was pulled in 1982. The overwhelming majority of eddy current signals (both hot and cold leg sides) are $\sim$ 1 volt or less.

The locations of these indications have been examined for the possibility of being caused by loose parts and this is considered very unlikely. Indian Point 3 has inspected the steam generators for loose parts during this outage and also is equipped with a loose parts monitoring system.

This information is considered sufficient to allow startup of Indian Point 3 and operation for the remainder of Cycle 4 because:

1. The average growth rate of degraded tubes on the hot leg was less than 7%.

2. The remainder of Cycle 4 is not expected to result in change which exceeds the 10% degradation allowance which provides the basis for a 40% tube plugging limit.

3. The large majority of hot leg eddy current signals resemble pitting in location in the tube bundle, defect height and signal sizes.

4. Those hot leg tubes with eddy current signals which even remotely approach the 22.9 volts recorded for the pulled hot leg tube have been and will continue to be conservatively plugged regardless of the depth of degradation.

INDIAN POINT 3

LIST OF ALL HOT LEG INDICATIONS

COMPARISON WITH 1982 DATA

SG #31 HOT LEG :

TUBE	1982 Data	1984 Data	Signal Voltage*
10-16	<20	35	0.43
2-18	39	46	1.33
4-18	<20	26	1.59
2-19	46	23	1.17
15-19	30	32	1.82
2-20	41	60	1.12
5-21	39	47	2.27
3-23	44	36	0.30
24-24	DS	34	1.50
8-25	35	21	1.32
3-26	<20	22	0.57
9-26	24	36	1.01
29-27	41	43	1.52
9-28	41	36	0.86
9-29	<20	26	1.14
10-29	NDD	DS	0.52
11-29	DS	28	0.95
2-30	<20	31	1.33
10-30	<20	23	0.61
18-30	42	26	0.92
11-31	<20	23	1.88

TUBE	1982 DATA	1984 DATA	Signal Voltage
2-33	<20	21	0.95
4-33	43	32	2.42
11-35	<20	29	3.78
25-35	32	32	5.30
42-35	39	39	1.75
44-35	54	51	0.90
34-36	21	31	1.05
37-36	NDD	28	1.44
30-37	<20	34	0.92
11-38	36	32	1.58
13-38	35	31	1.31
40-38	<20	22	1.84
3-40	28	30	1.21
4-40	<20	31	2.58
34-40	29	39	0.88
3-41	36	36	2.64
27-41	28	32	1.08
31-41	<20	23	2.03
35-42	45	48	2.02
2-43	<20	24	1.83
33-43	NDD	35	1.03
39-43	<20	41	1.47
5-44	NDD	25	1.96
13-45	<20	33	1.92
29-45	26	32	5.99
40-45	NDD	36	1.34
14-46	NDD	32	1.40

TUBE	1982 DATA	1984 DATA	Signal Voltage
26-46	32	55	1.07
15-47	NDD	41	2.52
32-48	28	34	0.65
30-49	34	38	1.27
32-49	<20	35	1.29
20-57	<20	31	1.19
4-58	NDD	31	1.96
30-58	NDD	37	1.35
7-61	<20	21	1.93
2-79	33	33	3.05

SG #34 HOT LEG:

TUBE	1982 DATA	1984 DATA	Signal Voltage*
16-16	21	27	0.93
17-18	62	62	0.87
19-20	44	45	1.37
25-22	41	41	0.42
43-33	43	44	1.21
31-36	<20	23	2.94
36-38	42	47	0.49
28-39	23	24	1.20
3-43	DS	21	1.45
16-45	43	61	0.89
28-45	NDD	46	1.24
33-45	<20	26	1.13
12-46	33	33	0.82
13-46	21	32	1.56
28-46	NDD	49	1.63
13-49	<20	41	0.68
27-60	<20	29	0.93
23-69	32	30	1.53
36-72	NDD	53	0.89

* For comparison purposes, note that the ASME calibration standard defects produce signal voltages of 4-6 volts.

ATTACHMENT II

INDIAN POINT 3
NEW YORK POWER AUTHORITY

STEAM GENERATOR MIDCYCLE (IV) INSPECTION PRESENTATION

TO THE

NUCLEAR REGULATORY COMMISSION

NOVEMBER 2, 1984

DISCUSSION TOPICS

I. REVIEW OF PREVIOUS INSPECTION RESULTS
   - A. FALL, 1981
   - B. SPRING/SUMMER, 1982

II. ONGOING CORRECTIVE ACTIONS

III. CYCLE IV OPERATION

IV. MIDCYCLE INSPECTION
   - A. INSPECTION PURPOSE
   - B. PRELIMINARY PROGRAM
   - C. EXPANDED PROGRAM
   - D. DEGRADATION GROWTH ANALYSIS
   - E. INSPECTION STATUS & FINDINGS

V. REPAIR (PLUGGING) LIMIT

VI. RETURN TO SERVICE

INDIAN POINT 3

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FALL, 1981 STEAM GENERATOR REPAIR OUTAGE

- PRIMARY TO SECONDARY TUBE LEAK PREVENTED THE RETURN OF INDIAN POINT 3 TO SERVICE AT THE CONCLUSION OF A MAINTENANCE OUTAGE.
- 100% OF THE TUBES IN THE OUTLET LEGS OF ALL FOUR STEAM GENERATORS WERE INSPECTED
- APPROXIMATELY 2,000 TUBES AFFECTED BY THE NEWLY DISCOVERED CORROSION MECHANISM ON THE OUTLET LEGS;
  SAMPLE INSPECTION INDICATED THAT INLET LEGS WERE UNAFFECTED.
- DETECTION DIFFICULTIES CONFIRMED BY TUBE PULLS;
  PITTING IDENTIFIED AS THE DEGRADATION MECHANISM.
- 65% TEMPORARY PLUGGING LIMIT IN THE AFFECTED AREA APPROVED BY THE NUCLEAR REGULATORY COMMISSION FOR THE BALANCE OF CYCLE III OPERATION.
- 376 STEAM GENERATOR TUBES PLUGGED PRIOR TO RETURNING INDIAN POINT 3 TO SERVICE.

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1982/1983 STEAM GENERATOR REPAIR OUTAGE

- PRIMARY TO SECONDARY TUBE LEAK FORCED INDIAN POINT 3 OUT OF SERVICE TWO DAYS PRIOR TO SCHEDULED REFUELING OUTAGE.
- 100% OF THE TUBES IN BOTH LEGS OF ALL FOUR STEAM GENERATORS WERE INSPECTED, UTILIZING AN IMPROVED ECT TECHNIQUE.
- PIT DETECTION/COPPER SUPPRESSION IMPROVEMENTS VERIFIED BY TUBE PULLS.
- TUBE WALL DEGRADATION RATE OVER THE DECEMBER 1981, THROUGH MARCH, 1982, OPERATING PERIOD ESTIMATED AT 1.7% PER MONTH.
- 50% REPAIR LIMIT APPROVED BY THE NUCLEAR REGULATORY COMMISSION.
- 2971 TUBES SLEEVED AND AN ADDITIONAL 396 PLUGGED IN ORDER TO RESTORE STEAM GENERATORS TO AN OPERABLE CONDITION.
- EXTENSIVE REPAIRS WERE ALSO MADE TO THE GIRTH WELDS OF ALL 4 STEAM GENERATORS FOLLOWING THE DISCOVERY OF LEAK THROUGH THE SHELL AND SUBSEQUENT ULTRASONIC INSPECTION.
- NEW YORK POWER AUTHORITY COMMITMENT TO A CYCLE IV MIDCYCLE INSPECTION.

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STEAM GENERATOR TUBE DEGRADATION

-CORRECTIVE ACTIONS-

OPERATIONS & MAINTENANCE ACTIONS WHICH HAVE BEEN IMPLEMENTED TO MINIMIZE OR ELIMINATE FURTHER TUBE CORROSION INCLUDE:

- FREQUENT SLUDGE LANCING APPLICATIONS
- IMPROVED WET LAYUP PROCEDURE
- OPERATION WITH MORE STRINGENT CHEMISTRY LIMITS AND CORRECTIVE MEASURES
- INCREASED EFFORTS TO REDUCE CONDENSER IN-LEAKAGE.

PLANT IMPROVEMENTS WHICH HAVE BEEN COMPLETED OR ARE PRESENTLY UNDERWAY, INCLUDE:

- INSTALLATION OF A CONDENSATE FILTRATION SYSTEM
- INSTALLATION OF A MAKE-UP DEAERATOR SYSTEM
- MOISTURE SEPARATOR/REHEATER REPLACEMENT (COPPER REMOVAL)
- HIGH PRESSURE FEEDWATER HEATER REPLACEMENT (COPPER REMOVAL)
- CONDENSER REPLACEMENT

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Cycle IV Operations Summary

- Indian Point 3 has operated successfully over the first nine months of Cycle IV with no steam generator tube leaks.
- The capacity factor over this operating period was 89.8%.
- Secondary Plant Water Chemistry continued to show improvement.

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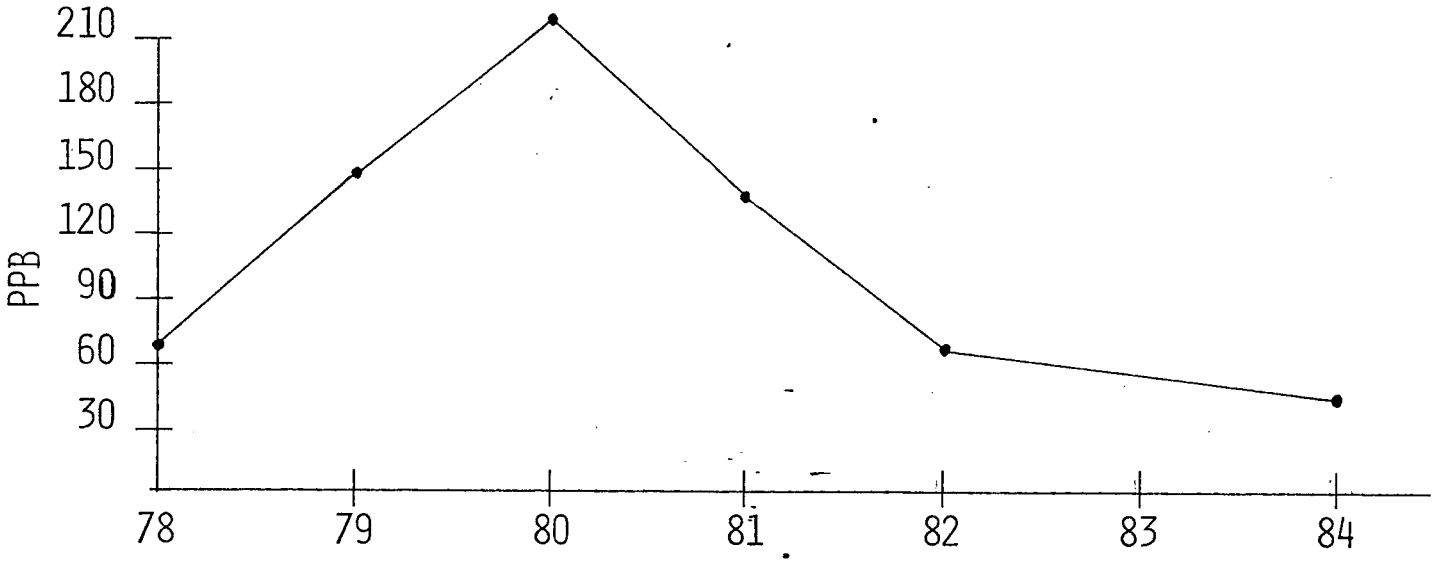
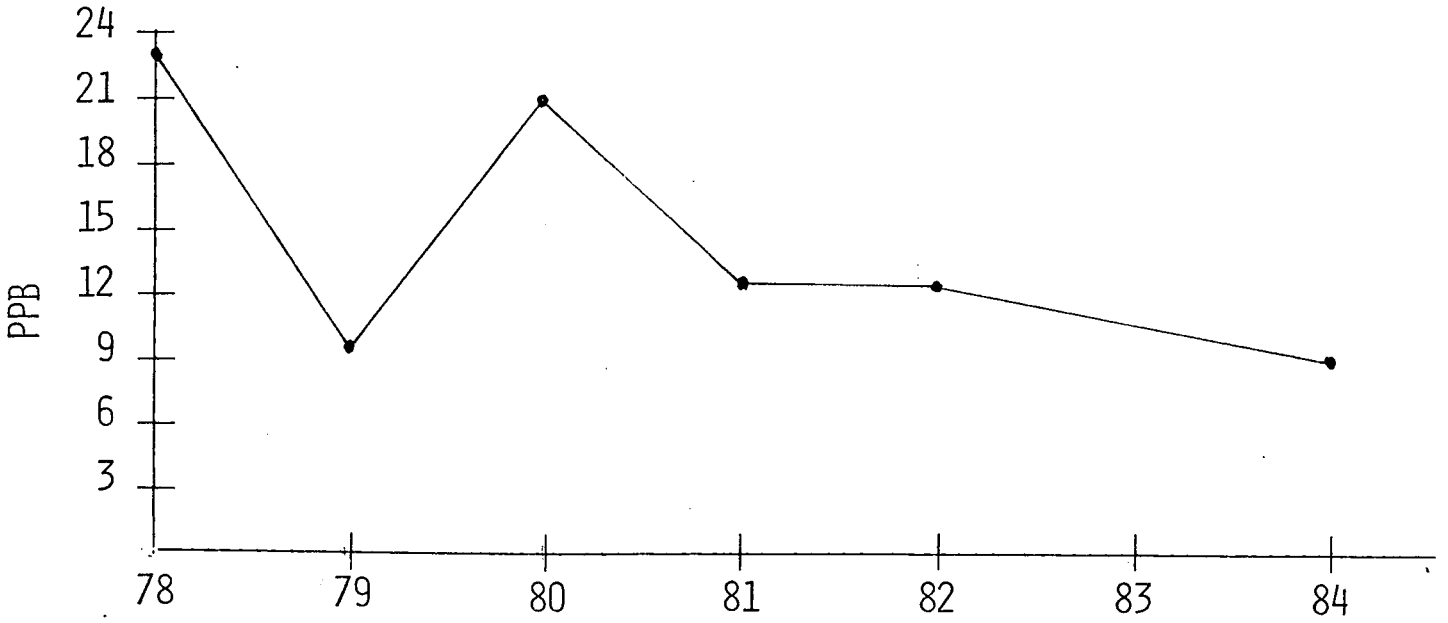
CHEMISTRY HISTORY

SG BLOWDOWN CHLORIDES



CONDENSATE PUMP DISCHARGE DISSOLVED OXYGEN



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STEAM GENERATOR MIDCYCLE (IV) INSPECTION OBJECTIVES

- CONFIRM DEGRADATION GROWTH RATE UTILIZING 1982 AND 1984 INSPECTION DATA OBTAINED WITH THE IMPROVED ECT TECHNIQUE.
- ASSESS THE SPREAD OF THE CORROSION MECHANISM TO PREVIOUSLY UNAFFECTED TUBES.
- MONITOR THE PERFORMANCE OF THE PREVIOUSLY INSTALLED SLEEVES.

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1984 MID-CYCLE OUTAGE ECT INSPECTION PLAN

- INSPECT AT LEAST 6% OF THE TUBES BOTH HOT AND COLD LEG SIDES TO THE SECOND SUPPORT PLATE IN TWO STEAM GENERATORS.

- WITHIN THIS SAMPLE:
  - INSPECT ALL PREVIOUS INDICATIONS
  - INSPECT A SAMPLE OF TUBES WITH NO DETECTABLE DEGRADATION (NDD) AS DETERMINED DURING THE 1982 INSPECTION
  - INSPECT A SAMPLE OF SLEEVED TUBES

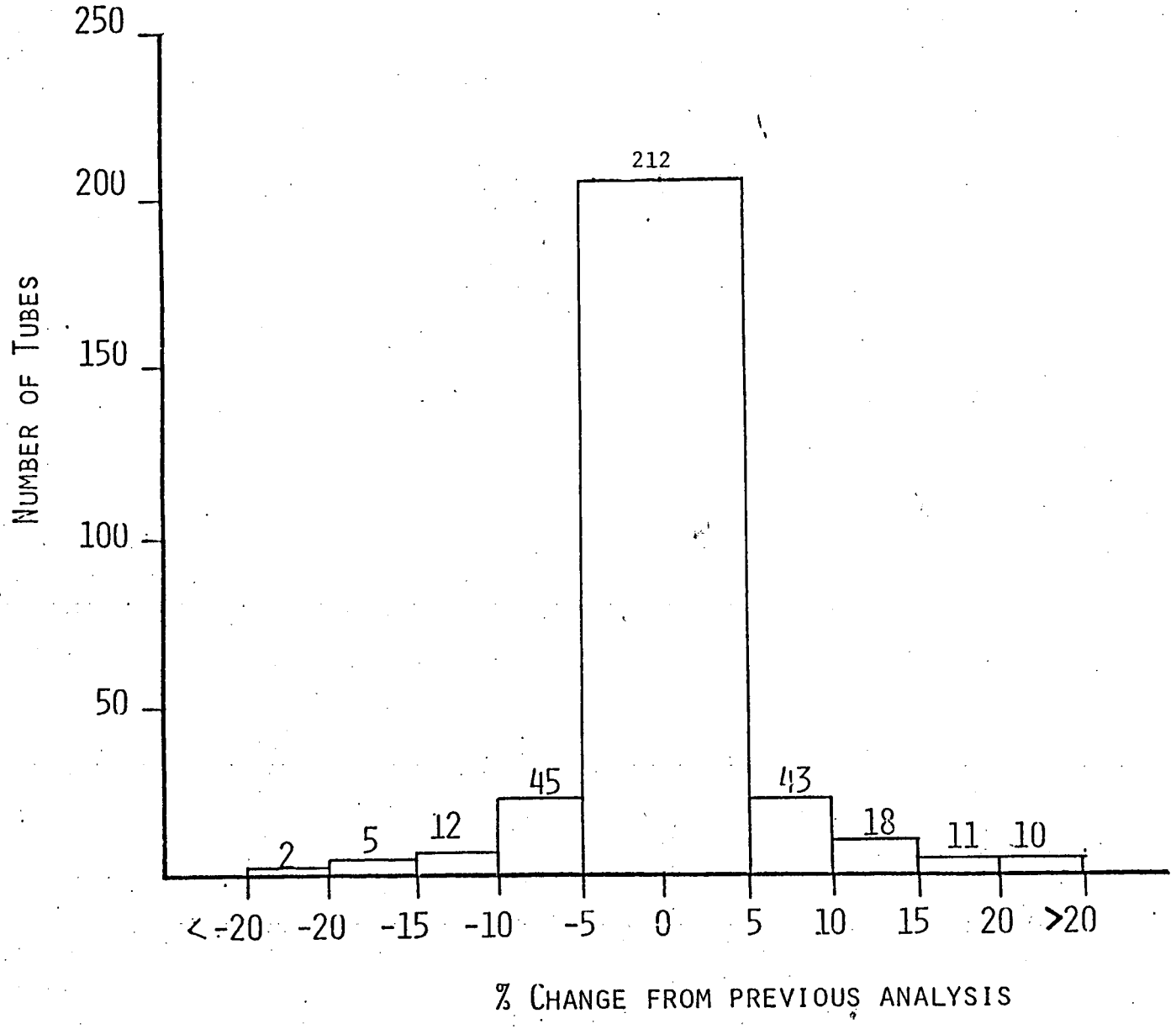
- RESULTING IN THE FOLLOWING SAMPLE PROGRAM:

	STEAM GENERATOR #31		STEAM GENERATOR #34	
	H/L	C/L	H/L	C/L
TUBES WITH DEGRADATION	18	167	2	219
NDD'S	182	89	198	36
SLEEVED TUBES	-	45	-	45
	200	301	200	300

- IMMEDIATELY PRECEDING PLANT SHUTDOWN, A COMPLETE REANALYSIS OF THE 1982 DATA PERTAINING TO THE TUBE SAMPLE PROGRAM WAS CONDUCTED USING THE SAME EQUIPMENT AND ANALYSTS TO BE USED FOR THIS OUTAGE.

- THE RESULTS OF THIS REANALYSIS WERE VERY CONSISTENT WITH THE 1982 ANALYSIS.

INDIAN POINT 3
1982 DATA RE-EVALUATION
(SAMPLE PROGRAM)



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SAMPLE INSPECTION FINDINGS

STEAM GENERATOR	NDD's	SLEEVE - NDD's	DEGRADED TUBES < 50%	DEGRADED TUBES ≥ 50%
31 OUTLET	103	45	122	31
34 OUTLET	61	45	175	19

STEAM GENERATOR	NDD's	DEGRADED TUBES < 40%	DEGRADED TUBES ≥ 40%
31 INLET	189	8	3
34 INLET	196	1	3

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MIDCYCLE IV DEGRADATION GROWTH ANALYSIS

- AVERAGE GROWTH RATE OF OUTLET LEG FLAWS OVER THE FIRST 9 MONTHS OF CYCLE IV OPERATION IS 1.5%.
- CALCULATED GROWTH RATE OF LESS THAN .2% PER MONTH IS AN ORDER OF MAGNITUDE LESS THAN THE 1.7% OBSERVED DURING THE PREVIOUS INSPECTION.
- THE ESTIMATED GROWTH OF 1.2% OVER THE BALANCE OF CYCLE IV OPERATION IS WELL WITHIN THE 2% CORROSION ALLOWANCE USED IN SETTING THE PROPOSED OUTLET LEG PLUGGING LIMIT.

INDIAN POINT 3
1982/1984 INDICATION GROWTH DISTRIBUTION
(SAMPLE PROGRAM)

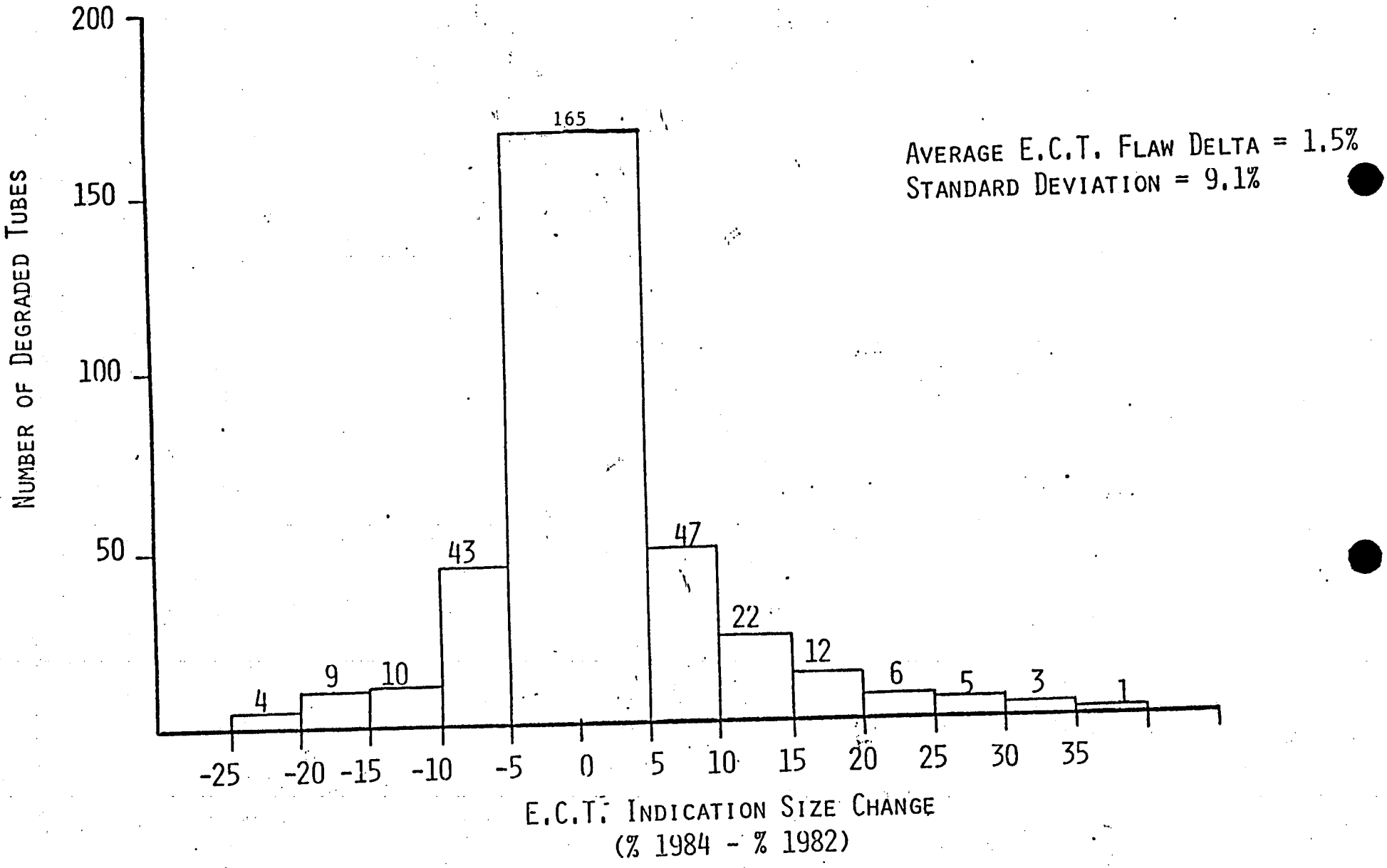
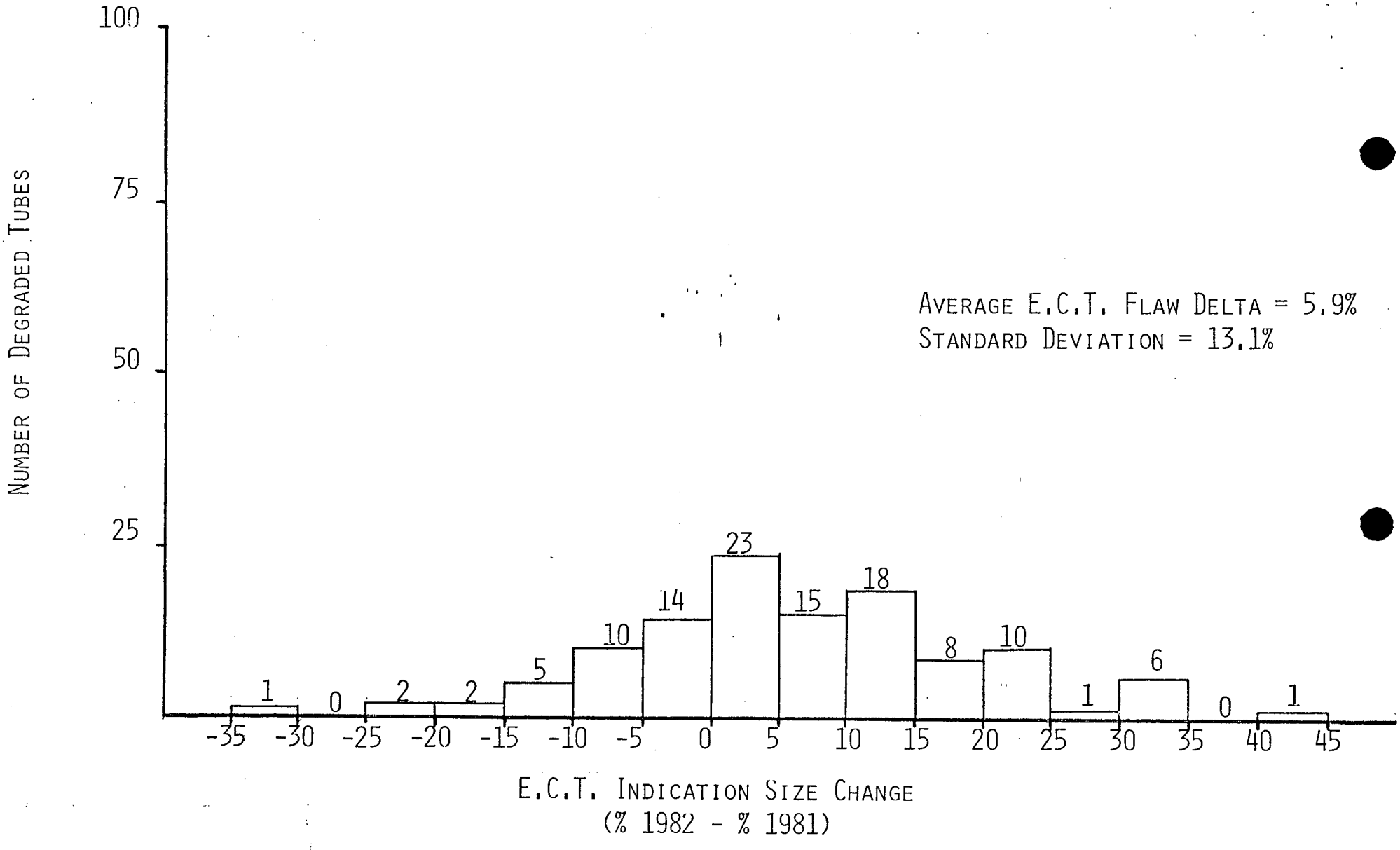


Figure 2 Rev 1

Indian Point 3
1981/1982 Indication Delta Distribution
(Sample Program)



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EXPANDED INSPECTION PROGRAM

- ECT PROGRAM EXPANDED BECAUSE OF SAMPLE INSPECTION FINDINGS.
- EXPANDED PROGRAM TO CONSIST OF 100% OF THE TUBES IN ALL FOUR STEAM GENERATORS, BOTH INLET AND OUTLET LEGS, TO THE 2ND TUBE SUPPORT PLATE.
- 100% OF ALL OUTLET LEG DATA (EXCEPT SLEEVES) TO RECEIVE INDEPENDENT 3RD PARTY EVALUATION.

CURRENT STEAM GENERATOR ECT STATUS*
(CRITICAL SIZE RANGES - PRESENT PLUGGING LIMITS)

PROGRAM DESCRIPTION	EXTENT COMPLETE	NUMBER OF DEGRADED TUBES ≤50%	≥50%	TOTAL
31 OUTLET	99%	186	48	234
32 OUTLET	75%	198	27	225
33 OUTLET	96%	173	17	190
34 OUTLET	100%	232	20	252

PROGRAM DESCRIPTION	EXTENT COMPLETE	NUMBER OF DEGRADED TUBES ≤40%	≥40%	TOTAL
31 INLET	99%	48	11	59
32 INLET	0%	-	-	-
33 INLET	98%	25	10	35
34 INLET	100%	9	11	20

*ECT INSPECTION AND DATA ANALYSIS IS PRESENTLY INCOMPLETE, RESULTS PRESENTED HEREIN ARE PRELIMINARY.

NEW YORK POWER AUTHORITY

CURRENT STEAM GENERATOR ECT STATUS*

(CRITICAL SIZE RANGES - PROPOSED PLUGGING LIMITS)

PROGRAM DESCRIPTION	EXTENT COMPLETE	NUMBER OF DEGRADED TUBES < 63%	≥ 63%	TOTAL
31 OUTLET	99%	226	8	234
32 OUTLET	75%	221	4	225
33 OUTLET	96%	185	5	190
34 OUTLET	100%	246	6	252

PROGRAM DESCRIPTION	EXTENT COMPLETE	NUMBER OF DEGRADED TUBES <40%	≥40%	TOTAL
31 INLET	99%	48	11	59
32 INLET	0%	-	-	-
33 INLET	98%	25	10	35
34 INLET	100%	9	11	20

* ECT INSPECTION AND DATA ANALYSIS IS PRESENTLY INCOMPLETE; RESULTS PRESENTED HEREIN ARE PRELIMINARY.

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RATIONALE FOR INCREASED PLUGGING LIMIT

- PROJECTION OF ECT DATA INDICATES THAT ABOUT 112 TUBES WILL BE PLUGGED UNNECESSARILY UNDER THE PRESENT TECHNICAL SPECIFICATION PLUGGING LIMITS.

- IT IS ESTIMATED THAT THIS WILL RESULT IN INCREASED EXPOSURE TO THE PLUGGING CREW OF ABOUT 30 MANREM.

- ADDITIONAL UNNECESSARY EXPOSURE OF ABOUT 30 MANREM WILL ALSO BE INCURRED IF SEVERAL OF THESE PLUGS ARE REMOVED DURING A FUTURE REPAIR PROGRAM (ASSUMING CHANNEL HEAD DECON).

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REPAIR (PLUGGING) LIMIT

- CURRENT OUTLET LEG LIMIT OF 50% APPROVED IN 1982 WAS BASED ON TUBE BURST DATA AND FIELD DETERMINED CORROSION ALLOWANCE.

- PROPOSED LIMIT OF 63% WITHIN THE TUBE PITTING REGION IS BASED ON:

MINIMUM BURST THICKNESS	25% (.0125")
ALLOWANCE FOR ECT	10% (.005")
CORROSION ALLOWANCE OVER BALANCE OF CYCLE IV OPERATION BASED ON MIDCYCLE OBSERVATIONS	2% (.001")
TOTAL THICKNESS REQUIRED =	37% (.0185")

- ALLOWABLE WALL DEGRADATION OF BETWEEN 0% AND 62%.

- TUBES WITH FLAWS GREATER THAN OR EQUAL TO 63% ARE TO BE PLUGGED PRIOR TO RESUMING CYCLE IV OPERATION.

NOTES: 1. BROKEN LINES (---) INDICATE CORRECTION TO ACCOUNT FOR SEGMENTED FLAWS

2. ROOM TEMPERATURE DATA - ⊙ SINGLE PIT DATA (l/L ≥ 8); ⊡ MULTIPLE PIT DATA

3. ASTERISK (*) - INDICATES 20% REMAINING THICKNESS SIMULATED PITS (DATA CORRECTED TO 600°F)

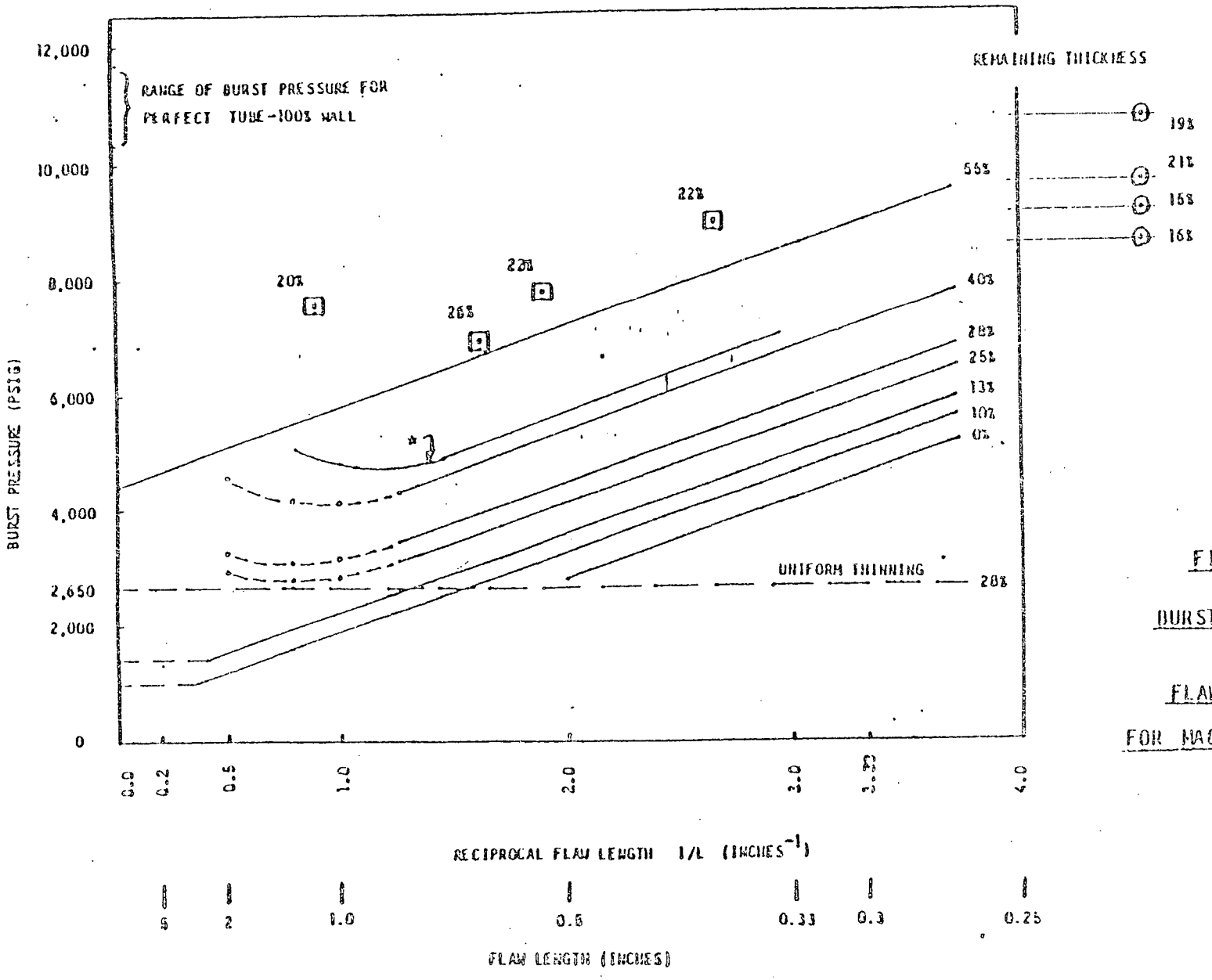

FIGURE 1

BURST PRESSURE VS FLAW LENGTH FOR MACHINED FLATS

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RETURN TO SERVICE

- AT THE PROPOSED 63% PLUGGING (REPAIR) CRITERIA, IT IS PROJECTED THAT THE INDIAN POINT 3 PLANT WILL RETURN TO SERVICE AS FOLLOWS:

STEAM GENERATOR	PREVIOUSLY PLUGGED TUBES	ESTIMATED* PLUGS	ESTIMATED* % PLUGGED
31	483	19	16.6
32	286		
33	231		
34	227	17	8.6

- THE PROJECTED PLUGGING LEVELS FOR ALL FOUR STEAM GENERATORS ARE WITHIN THE 24% TECHNICAL SPECIFICATION LIMIT.

* THE MIDCYCLE PLUGGING REQUIREMENTS HAVE BEEN ESTIMATED BASED ON PRELIMINARY ECT RESULTS FROM TWO STEAM GENERATORS.