ATTACHMENT I

PROPOSED TECHNICAL SPECIFICATIONS CHANGES

RELATED TO

STEAM GENERATOR TUBE PLUGGING LIMIT

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286

4.9 STEAM GENERATOR TUBE INSERVICE SURVEILLANCE

Applicability

Applies to inservice surveillance of the steam generator tubes.

Objective

To assure the continued integrity of the steam generator tubes that are a part of the primary coolant pressure boundary.

Specification

Steam generator tubes shall be determined operable by the following inspection program and corrective measures:

A. Inspection Requirements

1. Definitions

a. Imperfection is an exception to the dimension, finish, or contour required by drawing or specification.

b. Degradation means a service-induced cracking, wastage, wear or corrosion.

c. Degraded Tube is a tube that contains imperfections caused by degradation large enough to be reliably detected by eddy current inspection. This is considered to be 20% degradation.

d. % Degradation is an estimate % of the tube wall thickness affected or removed by degradation.

e. Defect is an imperfection of such severity that it exceeds the plugging limt. A tube containing a defect is defective.

f. Tube Plugging Limit is the tube imperfection depth at or beyond which the tube must either be removed from service or repaired. This is considered to be an imperfection depth of 40%. However, for the purposes of identifying defective tubes due to pitting between the tubesheet and first support plate of the cold leg side of all four steam generators, the tube plugging limit shall be an imperfection depth of 63%.

g. Sleeve Plugging Limit - is the sleeve imperfection depth at or beyond which the sleeved tube must be removed from service or repaired. This is considered to be an imperfection depth of 40% for tube sleeves.

A 10% allowance for tube degradation that may occur between inservice tube examinations added to the 40% tube plugging limit provides an adequate margin to assure that SG tubes acceptable for operation will not have a minimum tube wall thickness less than the acceptable 50% of normal tube wall thickness (i.e., 0.025 in) during the service lifetime of the tubes. This minimum wall thickness is not applicable to pitted tubes in the cold leg region for Cycle 4.

Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect wastage type defects that have penetrated 20% of the original 0.050 inch wall thickness.

The definition of tube plugging limit also provides that an interim tube imperfection depth of 63% shall be applied for the remainder of Cycle 4, to tubes which have experienced pitting on the cold leg side of a steam generator between the tube sheet and first support plate.

This 13% increase in allowable tube degradation from the 50% allowed for pitted tubes in Amendment 47 is acceptable since burst tests, corrected to 600°F, of representative tubing with various flaw types, lengths and wall thicknesses, have demonstrated that 25% remaining wall thickness for all flaw lengths is adequate to withstand the max ΔP (2650 psi) calculated to occur during faulted conditions. The 63% plugging limit incorporates a 12% margin, which includes a 10% margin for measurement inaccuracies and a 2% safety margin for corrosion allowance.

The definition of sleeve plugging limit provides that a sleeve imperfection depth of 40% (.0156 inch) or greater shall be applied to tube sleeves.

The definition of tube inspection also provides that the steam generator inspection conducted as a result of the March 24, 1982 tube leak may be performed on the cold leg sides up to the second support plate on that side except that in at least one steam generator the inspection shall extend up the sixth tube support plate on the cold leg side. This is acceptable since the leakage which initiated this inspection occurred on the cold leg side and since a 100% inspection of the cold leg side of one steam generator up to the sixth tube support plate on that side revealed negligible defects. In addition, a 100% inspection of the hot leg sides of two steam generators up to the sixth tube support plate revealed negligible defects.

ATTACHMENT II

SAFETY EVALUATION OF PROPOSED TECHNICAL SPECIFICATIONS

RELATED TO STEAM GENERATOR TUBE PLUGGING LIMIT

NEW YORK POWER AUTHORITY
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286

INDIAN POINT 3 NUCLEAR POWER PLANT
SAFETY EVALUATION
FOR REVISION TO TECHNICAL SPECIFICATIONS

I. DESCRIPTION OF CHANGE

This revision to the Indian Point 3 Technical Specifications seeks to revise the steam generator tube plugging limit (Section 4.9) from 50% to 63%.

1. The Authority's past experience has indicated the conservatism of eddy current testing in estimating maximum pit size. During IP-3's 1982 outage three pitted tubes were removed from the Steam Generators following eddy current testing for nondestructive and destructive failure analysis. (Note that tube R19C47 was the leaker that caused the 1982 outage to begin two days early.) A comparison of the field eddy current test and the actual lab measurement of the maximum pit depth is presented below:

	Field ECT	Lab Measurement
R19C47	100%	100%
R2C72	78%	70%
R12C46	73%	60%

These results indicate overall conservatism of the field eddy current test. It is also important to recall as presented in a meeting with the NRC on September 21, 1982, that the Authority presented the details of a recently developed eddy current probe which was used for these tests and which was specifically designed to detect pits in the presence of copper. This probe design was optimized to detect and accurately size pits of 40% depth and greater.

2. Also, during the Authority's September 21, 1982 presentation and subsequently documented in the Authority's letter to the NRC dated October 18, 1982, extensive tube burst test data was presented. The most applicable results are attached as Figure 1 and illustrates the results of tests performed by Westinghouse and documented in the Authority's presentations to the NRC in October 1981 and September 1982.

In Figure 1, the Authority pointed out that 25% remaining wall thickness for all tested flaw lengths (up to 2") is adequate to withstand the maximum ΔP (2650 psi) calculated to occur during faulted conditions. By adding 10% eddy current uncertainty and a 2% corrosion allowance which is conservative

for the remainder of Cycle 4, based on the 1984 midcycle (Cycle 4) outage results for 511 tube cold leg sample of 2 generators. These results indicate an average increase in defect size of less than 2% over a 9 month operating period, as shown in the attached Figure 2. As noted in Figure 2, the actual average flaw growth rate for 9 months is 1.5% with a standard deviation of 9.1%.

This description correlating the burst test data with the flaw sizes and lengths on the tubes in question incorporates two additional conservatisms. The first is that no credit is assumed for the ligaments between the defects. If this were taken into account, the curve marked by an asterisk in Figure 1 is appropriate which indicates an increase of approximately a factor of 2 in the Δ P needed to cause a burst tube. The second conservatism is that the flaws are assumed to be located in a straight line on the tube such that they can be simulated by a machined flat. In fact it is more likely that these are distinct pits oriented at different positions around the circumference of the tube and do not lie in a straight line. This would greatly improve the tubes ability to withstand high Δ P's approaching the strength of non-pitted tubes.

3. This analysis has incorporated a 10% eddy current uncertainty for conservatism. This is true despite the fact that available evidence indicates that pit depths may already be overestimated by field eddy current testing.

4. During late 1982 early 1983 the Authority conducted an extensive tube inspection and resultant tube plugging and sleeving. Approximately 400 tubes were plugged and nearly 3000 tubes were sleeved. To date, this repair program is judged as highly successful since IP-3 has operated at approximately 90% capacity for the past 9 months and has not experienced any instances of primary to secondary leakage.

5. Part of the explanation for the demonstrated success of the repair program is in the continued improvement in secondary plant water chemistry. This trend is illustrated by comparing data from 1978 - 82 with the data thus far in 1984. The average Steam Generator blowdown chlorides and condensate pump discharge (CPD) oxygen have been used for this comparison although other parameters show similar trends.

	78	79	80	81	82	83*	84
SG Blowdown Cl^-(ppb)	70	150	220	140	70	NA	51
CPD Oxygen (ppb)	23	10	22	13	13	NA	9

*Indian Point 3 operated for only 10 days in 1983.

Plant improvements including make-up deaeration, feedwater filtration on plant startup, replacement of moisture separator reheater tube bundles as well as aggressive condenser leak detection and air inleakage reduction by the plant staff have been instrumental in achieving this improved chemistry.

6. Tube leaks due to pits do not constitute a safety problem but rather an operational one. On March 24, 1982, Indian Point 3 did experience a tube leak due to a pit (confirmed by removing the tube). The best estimate of the leak rate was 1.8 gpm which exceeded the tech. spec. limit and resulted in an orderly plant shutdown with essentially no radiological consequences (.002 millirem at the site boundary).

7. In summary, all of the following factors support the acceptability of the proposed change:

   - The observed conservatism of the ECT results in actual pulled tube samples.

   - The acceptable burst test results for machined flat type defects which conservatively simulate tubes with pits.

   - The fact that the acceptance criteria of no leak with a ΔP of 2650 psi is very conservative since this condition would only arise in the unlikely event of a main steam line break during the remainder of Cycle 4, for which this Technical Specification will apply.

   - The continued improvement in plant chemistry has resulted in lower than assumed growth rates.

   - Low Cycle 4 average defect growth rates, as evidenced by the eddy current test results obtained during the October 1984 outage.

   - The success of the repair program at IP-3 which has repaired the steam generators to allow for continued safe and reliable operation.

II. IMPACT OF CHANGE

The revision to Technical Specifications will not adversely affect or alter the conclusions reached in any FSAR accident analyses or applicable SER's.

The change also will not adversely affect the plant fire protection program or site emergency plan.

This change will benefit the site ALARA program in that it will result in a savings of approximately 60 man-rem.

III. CONCLUSION

The Authority considers that the proposed change can be classified as not likely to involve significant hazards considerations as presented in Example (vi), Federal Register, Vol. 48, No. 67 dated April 6, 1983, page 14870.

Furthermore, the Indian Point 3 Plant Operations Review Committe and the offsite Safety Review Committee have determined that this revision: a) will not increase the probability nor the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the Safety Analysis Report; b) will not increase the possibility for an accident or malfunction of a different type than any evaluated previously in the Safety Analysis Report; c) will not reduce the margin of safety as defined in the basis for any Technical Specification; d) does not constitute an unreviewed safety question as defined in 10 CFR 50.59; e) involves no significant hazards considerations as defined in 10 CFR 50.92.

IV. REFERENCES

(a) IP-3 FSAR

(b) IP-3 SER

(c) Amendment 47 to Indian Point 3 Facility Operating License

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

2. ROOM TEMPERATURE DATA - ⊙ SINGLE PIT DATA (1/L ≳ 0); ⊡ MULTIPLE PIT DATA

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

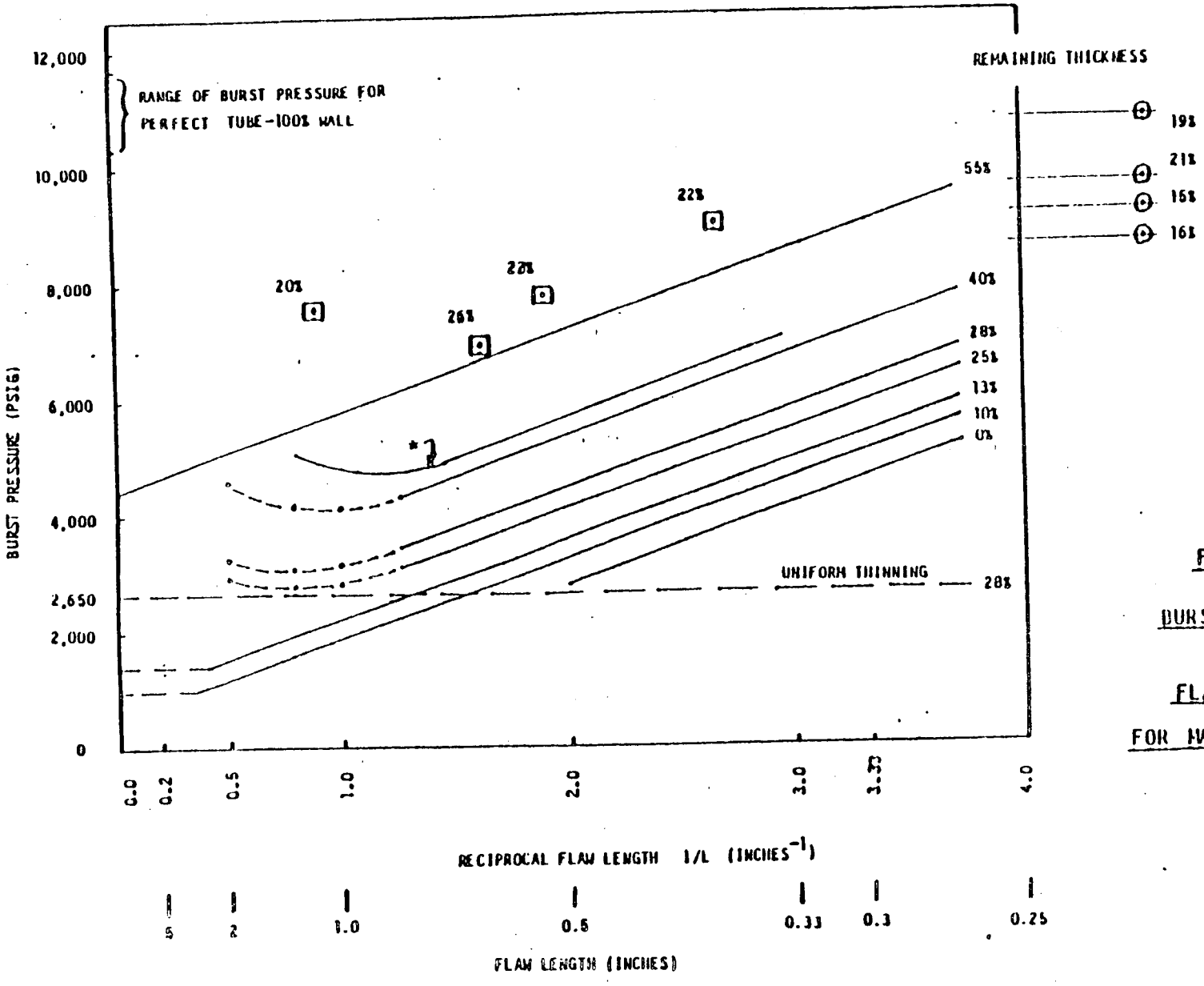

FIGURE 1

BURST PRESSURE VS FLAW LENGTH FOR MACHINED FLATS

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

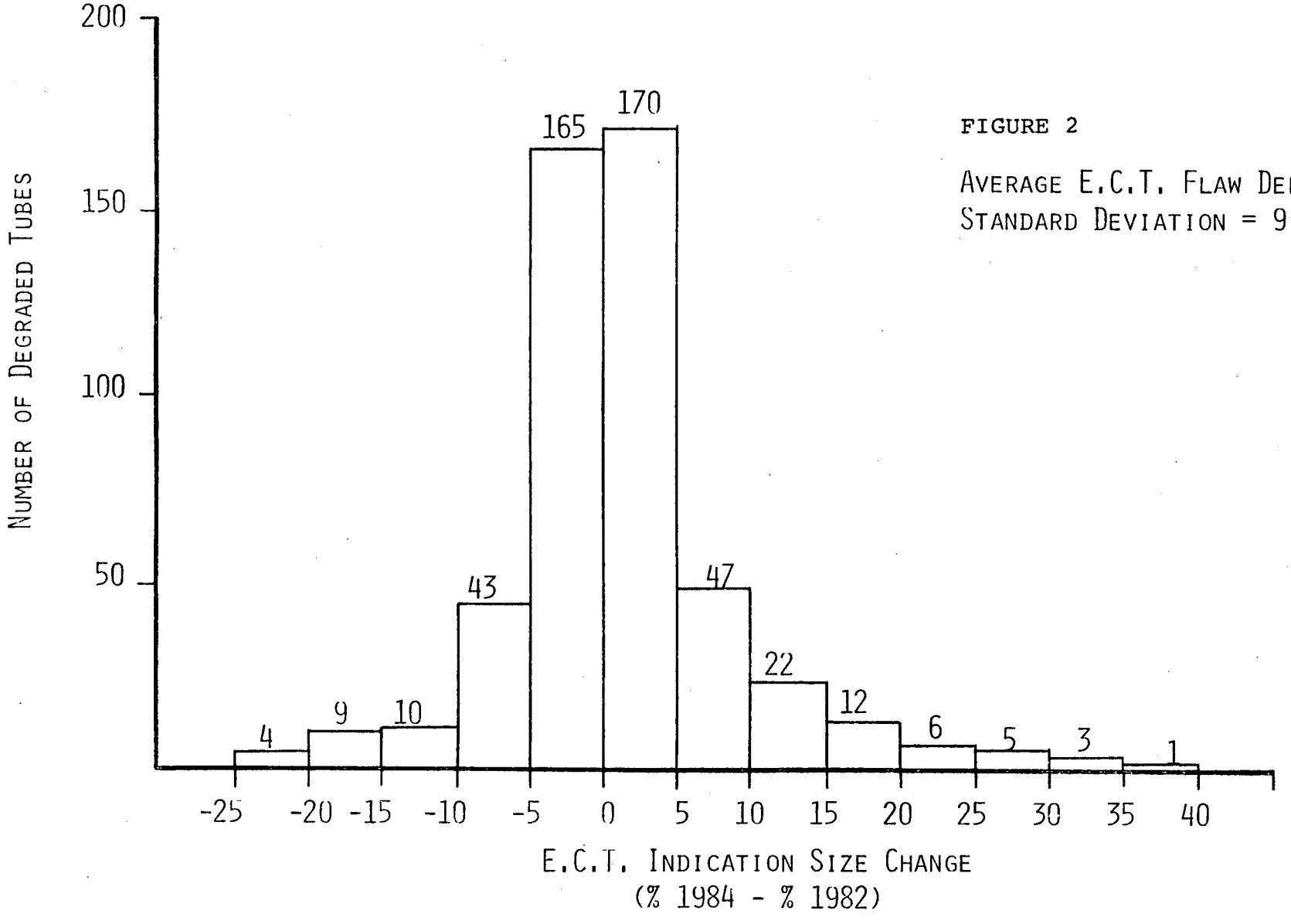

FIGURE 2

AVERAGE E.C.T. FLAW DELTA = 1.5%
STANDARD DEVIATION = 9.1%