

ATTACHMENT I

TECHNICAL SPECIFICATION CHANGES

RELATED TO

STEAM GENERATOR SURVEILLANCE

REQUIREMENTS

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
November 6, 1981

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to be an imperfection depth of 40%. However, for the purposes of identifying defective tubes between the tube sheet and first support plate of the cold leg sides of all four steam generators, which have been subjected to the pitting phenomenon discovered during the Fall 1981 unscheduled inspection, the plugging limit shall be an imperfection depth of 65% or greater.

- g. Tube Inspection is an inspection of tubes from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg. However, for the purposes of the Fall 1981 unscheduled inspection of all four steam generators, the inspection required by Table 4.9-1 may be performed on the cold leg side of all four steam generators up to the second support plate on that side.

2. Sample Size and the Number of Steam Generators to be Inspected.

- a. At the first inservice inspection subsequent to the pre-service inspection, six percent of the tubes in each of two steam generators shall be inspected as a minimum.
- b. At the second inservice inspection subsequent to the pre-service inspection, twelve percent of the tubes in one of the two steam generators not inspected during the first inservice inspection shall be inspected as a minimum.
- c. At the third inservice inspection subsequent to the pre-service inspection, twelve percent of the tubes in the steam generator not inspected during the first two inservice inspections shall be inspected as a minimum.
- d. Fourth and subsequent inservice inspections may be limited to one steam generator on a rotating schedule encompassing $3/N\%$ of the tubes (where N is the number of steam generators in the plant) if the results of the first or previous inspections indicate that all steam generators are performing in a like manner. Under some circumstances, the operating conditions in one or more steam generators may be found to be more severe than those in other steam generators. Under such circumstances, the sample sequences should be modified to inspect the steam generator with the most severe conditions.
- e. Unscheduled inspections should be conducted on the affected steam generator(s) in accordance with the first sample inspection specified in Table 4.9-1 in the event of primary-to-

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.

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 plugging limit also provides that an imperfection depth of 65% or greater shall be applied to the Fall 1981 unscheduled inspection of the cold leg sides of all four steam generators. This increased plugging limit is restricted to the area between the tube sheet and first support plate since the dynamic loads in this area are negligible. In addition, the increased plugging limit shall be applied only to those tubes which have been subjected to the pitting phenomenon discovered during the Fall 1981 unscheduled inspection. 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. A 65% plugging limit also incorporates 10% margin for measurement inaccuracies. Finally, operation will continue for only three effective full power months until the end of cycle 3 at which time this criteria will be re-evaluated.

The definition of tube inspection also provides that the Fall 1981 unscheduled inspection of all four generators may be performed on the cold leg sides up to the second support plate on that side. This is acceptable since the leakage which initiated this inspection occurred on the cold leg side, a hot leg inspection shall be performed on all four steam generators at the end of cycle 3 after 3 effective full power months of operation, and since the pitting phenomenon has been observed to have occurred between the tube sheet and first support plate.

ATTACHMENT II

OPERATING LICENSE CHANGE

RELATED TO

STEAM GENERATOR SURVEILLANCE

REQUIREMENTS

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
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Revise Condition 2.J of Facility Operating License No. DPR-64 to read as follows:

- 2.J The plant shall be brought to the cold shutdown condition within twelve equivalent months of operation from achieving criticality after the Cycle 3 mid-cycle outage, but in any event, no later than March 31, 1982. For the purpose of this requirement, equivalent operation is defined as operation with reactor coolant temperature greater than 350°F. An inspection of all four steam generators shall be performed and Nuclear Regulatory Commission approval shall be obtained before bringing the reactor critical following this inspection.

ATTACHMENT III

SAFETY EVALUATION

RELATED TO

STEAM GENERATOR SURVEILLANCE

REQUIREMENTS

POWER AUTHORITY OF THE STATE OF NEW YORK
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SECTION I - DESCRIPTION OF MODIFICATION

This application seeks to amend Appendix A, Section 4.9 and Condition 2.J of the Operating License. The proposed changes result from the Fall 1981 unscheduled steam generator inspection and consist of the following:

1) A revised definition of "tube inspection" (§4.9.A.1.g) to allow the Fall 1981 inspection of all four steam generators to be performed on the cold leg sides up to the second support plate of those sides.

2) A revised steam generator tube "plugging limit" (§4.9.A.1.f) from an imperfection depth of 40% to one of 65%. This is limited to the portion of the cold leg generator tubes between the tube sheet and first support plate, which have been subjected to the pitting phenomenon, discovered during the Fall 1981 inspection;

3) A Revised Condition 2.J to allow the steam generator inspection outage at the end of cycle 3 to begin after February 1, 1982 but not later than March 31, 1982.

SECTION II - PURPOSE AND EVALUATION OF MODIFICATION

The purpose of this modification is to:

1) Provide an inspection of tubes in the area where the pitting phenomenon discovered during the Fall 1981 unscheduled inspection has been observed, i.e., the cold leg sides of all four steam generators between the tube sheet and first support plate. A strict reading of §4.9.A.1.g of the technical specifications would require a hot leg inspection to be performed. An inspection of the tubes on the cold leg sides of all four steam generators up to the second support plate is considered acceptable for the following reasons:

- a) the leakage which initiated this inspection occurred on the cold leg side of steam generator no. 31.
- b) a 100% inspection of the tubes on the cold leg side of steam generator no. 31 up to the sixth support plate revealed no indications of defective tubes above the second support plate; with the exception of a few indications of defects at about 2 to 3 inches above the first tube support plate, all defects were between the tube sheet and first support plate.
- c) a 6% inspection of the tubes on the hot leg side of steam generator no. 31 completely around the U-bend revealed no indications of defective tubes.

- d) a 3% inspection of the tubes on the cold leg sides of steam generators nos. 32, 33 and 34 up to the sixth support plate revealed no indications of defective tubes above the second tube support plate.
- e) a hot leg inspection of all four steam generators is scheduled to be performed at the end of cycle 3 following approximately three effective full power months of operation.

2) Reduce the total amount of tube plugging required by the discovery of tube degradation, due to pitting, during the Fall 1981 unscheduled inspection. An increase in the allowable imperfection depth from 40% to 65%, for these tubes, is the most reasonable approach from a safety standpoint for the following reasons:

- a) burst tests (corrected to 600° F) of representative tubing with various flaw lengths and remaining wall thicknesses have demonstrated that 25% remaining wall thickness for all flaw lengths is adequate to withstand the maximum ΔP (2650 psi) calculated to occur during faulted conditions (see attached fig. 1). By limiting the increased plugging limit to flaw lengths of 1 inch or smaller, added conservatism is incorporated since a burst strength improvement is not required for multiple segmented flaws, which have a higher burst strength than single defects of the same length.

Since the area of pitting and application of the 65% plugging limit is restricted to the area between the tube sheet and first support plate of the cold leg sides of the generators, dynamic loads are negligible and need not be postulated.

For flaw lengths less than or equal to 0.5 inch and remaining wall thicknesses less than 25%, there is no potential for bursting, only leakage. This leak before break condition is considered applicable to IP-3 since a maximum pit diameter of 0.1 inch was measured during a laboratory analysis of four tubes pulled from steam generator no. 31.

A second test program was undertaken to establish additional data points with simulated pit diameters of .125 and .187 inch, with pit depths up to 90% of the wall and as little as .01 inch ligaments between pits. These tests demonstrated that pits with greater diameters than those observed on IP-3 steam generator tubes withstood pressures of 2.5 times the calculated maximum ΔP (2650 psi) across the tube walls for faulted conditions.

- b) a pitted tube (R22 C 46) removed from steam generator no. 31 having a measured pit depth of approximately 65% and a pit diameter of approximately .1 inch was pressurized to 10,000 psi with slight bulging but no rupture or leakage. This strength is comparable to a virgin (non-pitted) tube. (see figure 1)
- c) a comparison of the burst pressures of single flaws of different types with the same flaw lengths has demonstrated that different type flaws do not yield significantly different results.
- d) a plugging limit of 65% provides a 10% margin beyond the maximum allowable degradation of 75% to account for eddy current measurement inaccuracy.
- e) Even if the ΔP calculated to occur during faulted conditions were sufficient to cause tube rupture, the probability of a design basis accident occurring during normal operation is small, and the probability that the accident would occur during the short period of time while the plant was operating with a tube of sufficient degradation is even smaller. See NUREG-0523, entitled "Summary of Operating Experience with Recirculation Steam Generators" §6.2, which utilized similar rationale for justification of operation with steam generator tube denting.
- f) The process which resulted in the pitting has been evaluated as an acid chloride attack. The Authority has implemented short term actions which are expected to arrest the pitting phenomenon and no further degradation is expected to occur in the three month period of full power operation prior to the cycle 3/4 refueling outage at which time this plugging criteria will be reevaluated. Near term measures include sludge lancing which has already been completed, to remove as much as possible of the various species in the sludge which lead to an acid chloride attack. This will be followed by a lay up in a nitrogen inerted reducing environment. This sort of lay up will serve to reduce any residual oxides in the sludge, pits and crevices and will tend to further inert the potential for this type of attack. A steam generator hot flush will also be conducted before returning the unit to service. The boiling, pump action from this type of flush should further reduce or eliminate the presence of contaminants which can lead to this type of attack. Finally, the use of boric acid as a steam generator treatment has been suspended pending further evaluation.

- g) since the Authority's long term corrective action involves sleeving or some similar process, any plugs installed must ultimately be removed. This consideration has a major ALARA impact. On the average about 0.1 man rem is expended per plug installed. More significantly, about 1 man rem is expended per plug removed. (These figures include only jumper exposure. They do not include support personnel exposures.)
- h) Indian Point 3 is scheduled for a refueling after about three more effective full power months of operation. This will permit follow up eddy current testing to assess the results of the remedial action in a time frame that is long enough to permit conditions to develop but short enough to provide reasonable assurance that excessive degradation does not occur before reinspection.

3) Allow full power operation to proceed three months to the end of cycle 3. This period is expected to extend beyond February 1, 1982 but not later than March 31, 1982. The Condition 2.J inspection is designed to monitor the progress of the tube denting and flow slot closure phenomena. A two month extension of this inspection is considered to be insignificant since IP-3 is a light to moderately dented facility.

SECTION III - IMPACT OF THE MODIFICATION

This modification will not alter the conclusions reached in the FSAR and SER accident analyses.

SECTION IV - IMPLEMENTATION OF THE MODIFICATION

This modification will not adversely impact the ALARA or Fire Protection Program at IP3. This change is designed to significantly reduce the ALARA impact of installing tube plugs and subsequently removing them in order to effect a long term corrective action (e.g., tube sleeving).

SECTION V - CONCLUSION

The implementation of this modification: 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, and d) does not constitute an unreviewed safety question.

SECTION VI - REFERENCES

(a) IP3 FSAR

(b) IP3 SER

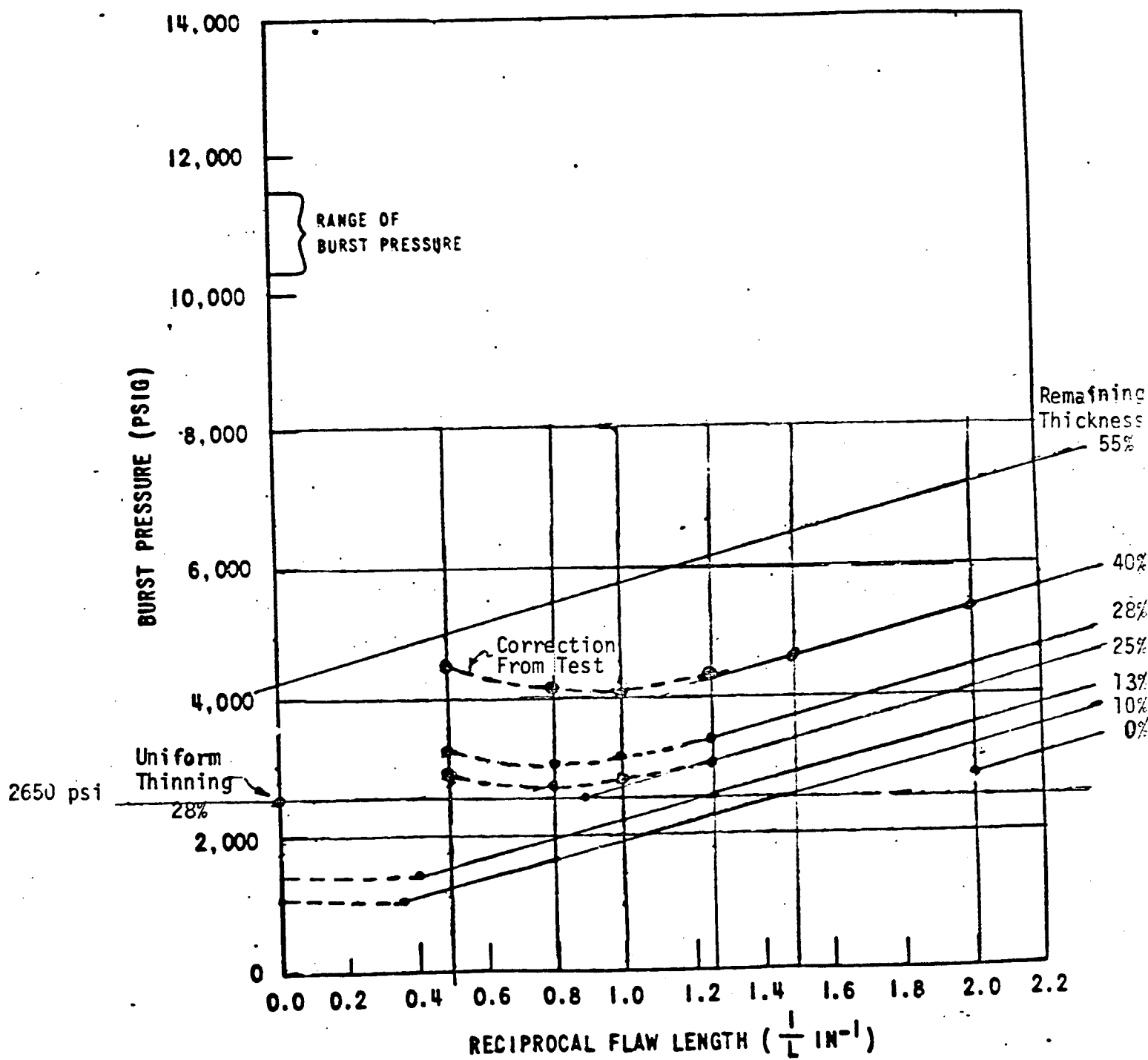


FIGURE 1