

POWER AUTHORITY OF THE STATE OF NEW YORK

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November 9, 1981  
IPN-81-90

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

Attention: Mr. Steven A. Varga, Chief  
Operating Reactors Branch No. 1  
Division of Licensing

Subject: Indian Point 3 Nuclear Power Plant  
Docket No. 50-286  
Summary of the Fall 1981 Steam  
Generator Inspection

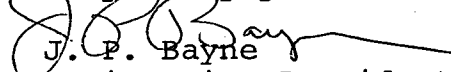


Dear Sir:

The events which lead to the Authority's November 6, 1981 (IPN-81-88) proposed amendment to the Operating License and Technical Specifications are discussed in Attachment I.

Please contact Mr. J. Lamberski of my staff if you have any further questions.

Very truly yours,

  
J. P. Bayne  
Senior Vice President  
Nuclear Generation

cc: Resident Inspector  
Indian Point Unit 3  
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**ATTACHMENT I**

**SUMMARY OF**

**THE FALL 1981 STEAM GENERATOR INSPECTION**

**POWER AUTHORITY OF THE STATE OF NEW YORK  
INDIAN POINT 3 NUCLEAR POWER PLANT  
DOCKET NO. 50-286  
NOVEMBER 9, 1981**

## Summary of the Fall 1981 Steam Generator Inspection

A primary to secondary steam generator tube leak was discovered at Indian Point Unit No. 3 at the conclusion of a scheduled maintenance period on September 23, 1981. The leak was discovered while in the hot shutdown condition, immediately following a reactor coolant system operational hydro-test. The plant was returned to the cold shutdown condition, reactor coolant system drained, steam generator opened and a determination of the leak rate was established as approximately .77 gallons per minute on the cold leg side of No. 31 steam generator.

### Eddy Current Test Program

An eddy current test (ECT) program was begun in accordance with the Technical Specifications and because of the number of indicated defects, the inspection size ultimately grew to include 100% of the tubes on the cold leg side of all four steam generators. Inspection of the cold leg side was performed based on the fact that the leak was located on the cold leg side. In addition a 6% sample of tubes in the no. 31 steam generator was inspected through the U-bend and the entire length of the hot leg side, to the tube sheet. No defects were noted in the hot leg side tubing; no defects were noted in any steam generator above the second tube support plate.

The results of the ECT inspection indicated that 1,091 of the over 13,000 tubes in the steam generators were defective according to Technical Specification limits and that another 558 tubes had distorted ECT signals which were not quantifiable.

### Laboratory Analyses

Two tubes with positive eddy current indications were removed from no. 31 steam generator; one tube was removed that had no detectable defects and a fourth tube was removed which had exhibited a distorted signal. All four tubes showed pitting had occurred above the height of the sludge in the steam generators.

Several important conclusions were drawn from the metallographic analysis of the tubes:

1. The pits present all the evidence of an acid chloride attack.
2. Some pitting was observed in the tube which was analyzed by ECT to have a distorted signal and the tube which was analyzed to have no detectable defects.

3. The tube with a distorted signal, with a subsequently measured pit approximately 65% of wall thickness, successfully withstood a burst test to a pressure of 10,100 psi, demonstrating that the pitting did not degrade tube strength from that of a virgin (non-pitted) tube.
4. The pits appeared to be dormant. This conclusion is based upon visual inspection, an immersion test and an electro-chemical test.

#### Cause of the Pitting Attack

An analysis was made of the changes affecting the steam generators and steam generator chemistry that have occurred at Indian Point 3 since the tubes were last sampled and found to be in good condition.

The leakage of Hudson River water into the steam generators in January 1981, although it was rapidly stopped and the generators flushed, is considered to be the most likely initiating event for this pitting attack for two reasons. First the high addition of chlorides is known to be a factor in pitting attack of steam generator tubes. Second the addition of such a large quantity of Hudson River water also depressed the pH of the steam generators. It is known that acidic pH promotes almost any form of corrosive attack.

#### Remedial Actions

The necessary remedial actions to be taken are a combination of near and long term items together with some interim actions until the long term measures can be implemented.

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 reduce 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.

As a long term measure, the Authority intends to install a permanent mechanical correction for all tubes which do not meet the existing Technical Specification limits. It is more likely that this will be sleeving. The measure selected will be installed as soon as practical. However, until that time, any tube plugs installed must ultimately be removed. This consideration has a major ALARA impact. On the average, of about 0.1 man-rem is expended per plug installed. More significantly, about 1 man-rem is expended per plug removed. Therefore, as an interim measure, until the end of fuel cycle 3 (approximately three more effectively full power months of operation) a revised temporary plugging limit of 65%, in lieu of 40%, is proposed based on the results of tube burst testing.