ATTACHMENT II

PROPOSED TECHNICAL SPECIFICATIONS CHANGE

RELATED TO

STEAM GENERATOR INSPECTIONS

POWER AUTHORITY OF THE STATE OF NEW YORK
INDIAN POINT 3 NUCLEAR POWER PLANT
DOCKET NO. 50-286
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F. LEAKAGE OF REACTOR COOLANT

Specification

1. If leakage of reactor coolant is indicated by the means available such as water inventory balance, monitoring equipment or direct observation, a follow-up evaluation of the safety implications shall be initiated as soon as practicable but no later than within 4 hours. Any indicated leak shall be considered to be a real leak until is determined that the indicated leak cannot be substantiated by direct observation or other indication.

2. If the leakage rate, excluding controlled leakage sources such as the Reactor Coolant Pump Controlled Leakage Seals and Leakage into Closed Systems, exceeds 1 gpm and the source of leakage is not identified within twenty-four hours of detection, the reactor shall be brought to hot shutdown within four hours. If the source of leakage is not identified within an additional twenty-four hours, the reactor shall be brought to a cold shutdown condition within the next twenty-four hours.

3. If the sources of leakage are identified and the results of the evaluation are that continued operation is safe, operation of the reactor with a total leakage, other than from controlled sources or into closed systems, not exceeding 10 gpm shall be permitted except as specified in 3.1.F.4 below.

4. If it is determined that leakage exists through a non-isolable fault which has developed in a Reactor Coolant System Component Body, pipe wall (excluding steam generator tubes), vessel wall or pipe weld, the reactor shall be brought to the cold shutdown condition within twenty-four hours.

5. If the total leakage, other than from controlled sources or into closed systems, exceeds 10 gpm, the reactor shall be placed in the hot shutdown condition within four hours and the cold shutdown condition within an additional twenty-four hours.

6. The reactor shall not be restarted following shutdown as per items 3.1.F.2, 3, 4, or 5, above, until the leak is repaired or until the problem is otherwise corrected.

7. Whenever the reactor is shutdown, or a steam generator removed from service, in order to investigate steam generator tube leakage and/or to plug or otherwise repair a leaking tube, the Authority shall inform the NRC before the reactor is brought critical.

8. Primary to secondary leakage through the steam generator tubes shall be limited to 0.3 gpm (432 gpd) per steam generator and the total leakage through all four steam generators shall be limited to 1.0 gpm (1440 gpd). With any steam generator tube leakage greater than this limit the reactor shall be placed in the hot shutdown condition within four hours and the cold shutdown condition within an additional twenty-four hours.

9. If leakage from two or more tubes in the steam generators in any 20-day period is observed or determined, the reactor shall be brought to the hot shutdown condition within four hours and the cold shutdown condition within an additional twenty-four hours and Nuclear Regulatory Commission approval shall be obtained before resuming reactor operation. If two steam generator tube leaks attributable to the tube denting phenomena are observed after the reactor is in cold shutdown Nuclear Regulatory Commission approval shall be obtained before resuming reactor operation.

10. When the reactor is critical and above 2% power, two reactor coolant leak detection systems of different principles capable of detecting leakage into containment shall be in opertion, with one of the two systems sensitive to radioactivity. The system sensitive to radioactivity may be out-of-service for 48 hours, provided two other systems are available.

Basis:

Water inventory balances, monitoring equipment, radioactive tracing, boric acid crystalline deposits, and physical inspections can disclose reactor coolant leaks. Any leak of radioactive fluid, whether from the reactor coolant system primary boundary or not can be a serious problem with respect to in-plant radioactivity contamination and cleanup or it could develop into a still more serious problem; and therefore, first indications of such leakage will be followed up as soon as practicable.

Although some leak rates on the order of GPM may be tolerable from a dose point of view, it must be recognized that small leaks through any of the walls of the primary system could be indicative of materials failure such as by stress corrosion cracking. If depressurization, isolation and/or other safety measures are not taken promptly, these small leaks could develop into much larger leaks. Therefore, the nature of the leak, as well as the magnitude of the leakage must be considered in the safety evaluation.

The distinction between identified and unidentified leakage in the specification is made because once the leakage source is identified, the seriousness can be easily evaluated. The strict limit of 1 gallon per minute for unidentified leakage is adopted because in the worst case the leakage source may increase with time or the coolant may impinge on or accumulate in a critical component.

When the source of leakage has been identified, the situation can be evaluated to determine if operation can safely continue. This evaluation will be performed by the Watch Force. Under these conditions, an allowable primary system leakage rate of 10 gpm has been established. This explained leakage rate of 10 gpm is also well within the capacity of one charging pump and makeup would be available even under the loss of off-site power condition.

Controlled sources of reactor coolant system leakage are sources which are designed to leak at a controlled rate. For example, the reactor coolant pump seals are controlled leakage sources. Leakage through a valve packing or a closed valve is not considered as controlled leakage. Leakage into closed systems is that leakage which can be accounted for and contained by a system not directly connected to the atmosphere. Leakage past the pressurizer safety valve seats and steam generator tube leakage are examples of reactor coolant system leakage into closed systems.

If leakage is to the containment, it may be identified by one or more of the following methods:

a. The containment air particulate monitor (R-11).

b. The containment radiogas monitor (R-12).

c. The containment humidity detectors.

d. A leakage detection system which determines leakage losses from all water and steam systems within the containment. This system collects and measures moisture condensed from the containment atmosphere by cooling coils of the main air recirculation units.

The most sensitive and rapid method for detecting small amounts of Reactor Coolant System leakage is the monitoring of the containment airborne radioactivity. Containment gaseous and particulate activity is continuously, automatically monitored. The leakage rate can be determined by the relationship of the airborne activity to the reactor coolant activity.

Measurement of the leakage rate to the containment atmosphere is also possible through humidity detection and condensation collection and measurement. However, it is expected that the containment activity method will give the initial indication of coolant leakage. The other methods will be employed primarily to confirm that leakage exists, to indicate the location of the leakage sources, and to measure the leakage rate.

As described above, the four reactor coolant leak detection systems are based on three different principles, i.e., activity, humidity and condensate flow measurements. Two systems of different principles provide, therefore, diversified ways of detecting leakage to the containment.

Total reactor coolant leakage can be determined by means of periodic water inventory balances. If leakage is into another closed system, it will be detected by the plant radiation monitors and/or inventory control.

Twenty-four hours is allowed from the time of leakage detection to identify the leakage source and to measure the leakage rate. This time period is required since identification and quantification of leakage sources of less than ten gallons per minute require a careful gathering and evaluation of data and/or a visual inspection of the reactor coolant system.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those limits found to result in negligible corrosion of the steam generator tubes. If stress corrosion cracking occurs, the extent of cracking during plant operation would be limited by the limitation of steam generator leakage between the primary coolant system and the secondary coolant system. Cracks having a primary-to-secondary leakage less than 500 gallons per day during operation will have an

adequate margin of safety against failure due to loads imposed by design basis accidents. Operating plants have demonstrated that primary-to-secondary leakage as low as 0.1 gpm will be detected. Leakage in excess of 432 gallons per day per steam generator or 1 gpm total for all four steam generators will require plant shutdown and an unscheduled eddy current inspection, during which the leaking tubes will be located and plugged. The 500 gallon per day per steam generator limit is also consistent with the assumptions used to develop the Technical Specification limit on secondary coolant activity.

References

FSAR Sections 11.2.3 and 14.2.4

G. Secondary Coolant Activity

Specification

1. Whenever the average reactor coolant temperature is $\geq$ 350°F, the specific activity of the secondary coolant system shall be $\leq$ 0.10 μCi/gram of Dose Equivalent I-131.

2. If the specific activity of the secondary coolant system exceeds 0.10 μCi/gram of Dose Equivalent I-131, the reactor shall be immediately brought to the hot shutdown condition with T_{avg} < 350°F utilizing normal operating procedures.

Basis

The limitations on secondary system specific activity ensure that the resultant off-site radiation dose will be limited to a small fraction of 10CFR Part 100 limits in the event of a steam line rupture. The restriction of 0.1 μCi/gram Dose Equivalent I-131 in the secondary system limits the two-hour thyroid exposure dose to 1.5 rem at the site boundary under these accident conditions. This accident analysis also includes the effects of a coincident 500 gallons per day primary to secondary tube leak in the steam generator of the affected steam line and considers the effect of a coincident iodine spike. Accident meteorological conditions are assumed (5% X/Q) and a decontamination factor of 10 is applied between the water and steam phases.

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 limit. A tube containing a defect is defective.

f. Plugging Limit is the imperfection depth at or beyond which the tube must be removed from service. This is considered

to be an imperfection depth of 40%.

g. Tube Inspection is an inspection of tube from the point of entry (hot leg side) completely around the U-bend to the top support of the cold leg.

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

a. At the first inservice inspection subsequent to the preservice 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 preservice 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 preservice 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-

secondary tube leaks (not including leaks originated from tube-to-tube sheet welds) exceeding technical specifications, a seismic occurrence greater than an operating basis earthquake, a loss-of-coolant accident requiring actuation of engineered safeguards, or a major steam line or feedwater line break.

3. Extent and Result of Steam Generator Tube Inspection

a. The minimum sample size, inspection result classification, and the corresponding action required are specified in Table 4.9-1.

b. Tubes for the inspection should be selected on a random basis except where experience in similar plants with similar water chemistry indicates critical areas to be inspected.

c. The first sample inspection subsequent to the preservice inspection should include all nonplugged tubes that previously had detectable wall penetration (> 20%) and should also include tubes in those areas where experience has indicated potential problems.

d. The second and third sample inspections in Table 4.9-1 may be limited to the partial tube inspection only, concentrating on tubes in the areas of the tube sheet array and on the portion of the tube where tubes with imperfections were found.

e. In all inspections, previously degraded tubes must exhibit significant (> 10%) further wall penetration to be included in the percentage calculation for the result categories in Table 4.9-1.

4. Interval of Inspection

a. The first inservice inspection of steam generators should be performed after six effective full power months but not later than completion of the first refueling outage.

b. Subsequent inservice inspections should be not less than 12 or more than 24 calendar months after the previous inspection.

c. If the results of two consecutive inspections, not including the preservice inspection, all fall in the C-1 category, the frequency of inspection may be extended to 40-month intervals. Also, if it can be demonstrated through two consecutive inspections that previously observed degradation has not continued and no additional degradation has occurred, a 40-month inspection interval may be initiated.

B. Corrective Measures

All leaking tubes and defective tubes should be plugged.

C. Reports

1. Following each inservice inspection of steam generator tubes, the number of tubes plugged in each steam generator shall be reported to the Commission within 15 days.

2. The complete results of the steam generator tube inservice inspections shall be reported in writing on an annual basis for the period in which the inspection was completed per Specification 6.9.2.f. This report shall include:
   a. Number and extent of tubes inspected.
   b. Location and percent of wall-thickness penetration for each indication of an imperfection.
   c. Identification of tubes plugged.

3. Results of steam generator tube inspections which fall into Category C-3 of Table 4.9-1 require notification of the Commission within 15 days of this determination*. The written followup of this report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

*Note - Table 4.9-1 requires NRC approval prior to startup in one case.

BASIS

Inservice inspection of steam generators is essential in order to monitor the integrity of the tubing and to maintain surveillance in the event that there is evidence of mechanical damage or progressive

deterioration due to design, manufacturing errors, or chemical imbalance. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

An essentially 100% tube inspection was performed on each tube in every steam generator by eddy current techniques prior to service in order to establish a baseline condition for the tubing. This inspection was conducted under conditions and with equipment and techniques equivalent to those expected to be employed in the subsequent inservice inspections.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those limits found to result in negligible corrosion of the steam generator tubes. If stress corrosion cracking occurs, the extent of cracking during plant operation would be limited by the limitation of steam generator leakage between the primary coolant system and the secondary coolant system. Cracks having a primary-to-secondary leakage less than 500 gallons per day during operation will have an adequate margin of safety against failure due to loads imposed by design basis accidents. Operating plants have demonstrated that primary-to-secondary leakage as low as 0.1 gpm will be detected. Leakage in excess of 432 gallons per day per steam generator or 1 gpm total through all four steam generators will require plant shutdown and an unscheduled eddy current inspection, during which the leaking and defective tubes will be located and plugged. The 500 gallon per day limit is also consistent with the assumptions used to develop the Technical Specification limit for secondary coolant activity.

Wastage-type defects are unlikely with the planned all volatile treatment (AVT) of secondary coolant. However, even if this type of defect occurs, the steam generator tube surveillance specification will identify steam generator tubes with impurifications having a depth greater than 40% of the 0.050 inch tube wall thickness as being unacceptable for continued service. The results of steam generator tube burst and collapse tests have demonstrated that tubes having wall thickness not less than 0.025 inch have adequate margins of safety against failure due to loads imposed by normal plant operation and design basis accidents.

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.

TABLE 9-1

STEAM GENERATOR TUBE INSPECTION

First Sample Inspection			Second Sample Inspection		Third Sample Inspection	
Minimum Size	Result	Action	Result	Action	Result	Action
S* Tubes per steam generator	C-1					
	C-2	Plug defective tubes. Inspect additional 2S tubes in this SG.	C-1			Go to power.
			C-2	Plug defective tubes. Inspect additional 4 S tubes in this SG.	C-1	
					C-2	Plug defective tubes Go to power
					C-3	Go to first sample. C-3 action
			C-3	Go to first sample. C-3 action		
	C-3	Inspect all tubes in this SG. Plug defective tubes. Inspect 2 S tubes in each other SC	All other SGs C-1			Go to power
			Some SGs C-2 But no add'l C-3	Go to second sample. C-2 action		
			Add'l SG C-3	Inspect all tubes in all SGs. Plug defective tubes.		Report to NRC. NRC approval req'd prior to startup.

* $S = 3\frac{N}{n}\%$ where N is the number of steam generators in the plant, and n is the number of steam generators inspected during an inspection.

Category C-1: Less than 5% of the total tubes inspected are degraded tubes and none of them is defective.

Category C-2: One or more of the total tubes inspected is defective but not more than 1% of the tubes inspected or between 5 and 10% of the tubes inspected are degraded tubes.

Category C-3: More than 10% of the total tubes inspected are degraded or more than 1% of the tubes inspected are defective.

d. Abnormal degradation of systems other than those specified in 6.9.1.7.c above designed to contain radioactive material resulting from the fission process. 7/

SPECIAL REPORTS

6.9.2 Special reports shall be submitted to the Director of the Office of Inspection and Enforcement Regional Office within the time period specified for each report. These reports shall be submitted covering the activities identified below pursuant to the requirements of the applicable reference specification:

a. Sealed source leakage on excess of limits (Specification 3.9)

b. Inoperable Seismic Monitoring Instrumentation (Specification 4.10)

c. Primary coolant activity in excess of limits (Specification 3.1.D)

d. Seismic event analysis (Specification 4.10)

e. Inoperable fire protection and detection equipment (Specification 3.14)

f. The complete results of the steam generator tube inservice inspection (Specification 4.9.C)

6.10 RECORD RETENTION

6.10.1 The following records shall be retained for at least five years:

a. Records and logs of facility operation covering time interval at each power level.

b. Records and logs of principal maintenance activities, inspections, repair and replacement of principal items of equipment related to nuclear safety.

c. ALL REPORTABLE OCCURRENCES submitted to the Commission.

d. Records of surveillance activities, inspections and calibrations required by these Technical Specifications.

e. Records of changes made to Operating Procedures.

f. Records of radioactive shipments.

g. Records of sealed source and fission detector leak tests and results.

h. Records of annual physical inventory of all source material of record.

i. Records of reactor tests and experiments.

7/ Sealed sources or calibration sources are not included under this item. Leakage of packing, gaskets, mechanical joints and seal welds within the limits for identified leakage set forth in technical specifications need not be reported under this item.