

YANKEE ATOMIC ELECTRIC COMPANY

B.3.2.1



20 Turnpike Road Westborough, Massachusetts 01581

WYR 78-104

November 27, 1978

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulation

References: (a) License No. DPR-3 (Docket No. 50-29)
(b) USNRC Letter dated September 24, 1976
(c) YAEC Letter, D. E. Vandenburg to USNRC dated November 30, 1976, Proposed Change No. 119, Supplement No. 1 (WYR 76-123)

Dear Sir:

Subject: Inservice Inspection of Steam Generator Tubes

Pursuant to Section 50.59 of the Commission's Rules and Regulations and in compliance with your request, Reference (b), Yankee Atomic Electric Company hereby requests the following change to supersede letter WYR 76-12, dated November 30, 1976 (Reference c).

PROPOSED CHANGE: Reference is made to Operating License No. DPR-3 issued to Yankee Atomic Electric Company for the Yankee Rowe Plant. We propose to amend the License as follows:

Add Specification 3.4.10 and Specification 4.4.10 to Appendix A of the current Operating License.

The new specifications are presented as Attachment "A" of this letter.

REASON FOR CHANGE: The purpose of this change is to document revisions to our technical specifications submittal of Reference c, based on recent discussions between YAEC and members of your staff.

SAFETY CONSIDERATIONS: This proposed change incorporates into the Technical Specifications limiting Conditions for Operation and Surveillance Requirements for Steam Generators in accordance with the request made by the Nuclear Regulatory Commission. This change does not endanger the health and safety of the public. This proposed change has been reviewed by the Nuclear Safety Audit and Review Committee.

FEE DETERMINATION: Proposed Change No. 119, Supplement No. 1, was submitted to the USNRC on November 30, 1976 (Reference c). In accordance

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with your recent request, we are enclosing herewith an entire resubmittal of the Technical Specifications of Reference c with some minor word changes for clarification. Yankee Atomic Electric Company proposes that no fee be paid with this submittal because (1) this resubmittal of information is for the convenience of the USNRC, and (2) our initial Proposed Change was submitted almost two years before the implementation of the Amendment Fees of 10CFR170.

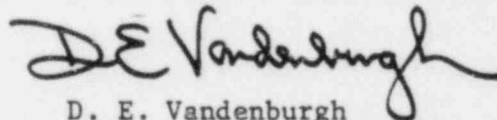
SCHEDULE OF CHANGE: Yankee Rowe Technical Specifications will be changed immediately upon Commission approval.

Also enclosed for your information, is Attachment "B" which lists the results of the November, 1978, Eddy Current Inspections for the No. 1 and No. 4 Steam Generators.

We trust you will find this information satisfactory; however, should you desire additional information, please contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY



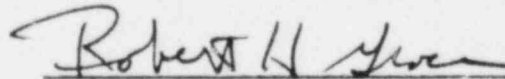
D. E. Vandenburg
Senior Vice President

Enclosure

COMMONWEALTH OF MASSACHUSETTS)) ss
COUNTY OF WORCESTER)

November 27, 1978

Then personally appeared before me, D. E. Vandenburg, who, being duly sworn, did state that he is a Senior Vice President of Yankee Atomic Electric Company, that he is duly authorized to execute and file the foregoing request in the name and on the behalf of Yankee Atomic Electric Company, and that the statements therein are true to the best of his knowledge and belief.



Robert H. Groce Notary Public
My Commission Expires September 14, 1984



LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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STEAM GENERATORSLIMITING CONDITIONS FOR OPERATION

3.4.10 Each steam generator in a non-isolated reactor coolant loop shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

- a. With one or more steam generators in non-isolated main coolant loops inoperable, restore the inoperable generator(s) to OPERABLE prior to increasing T_{avg} above 200°F.

SURVEILLANCE REQUIREMENTS

4.4.10.1 Steam Generator Sample Selection and Inspection - Each steam generator shall be determined OPERABLE during shutdown by selecting and inspecting at least the minimum number of steam generators specified in Table 4.4-4.

4.4.10.2 Steam Generator Tube Sample Selection and Inspection - The steam generator tube minimum sample size, inspection result classification, and the corresponding action required shall be as specified in Table 4.4-5. The inservice inspection of steam generator tubes shall be performed at the frequencies specified in Specification 4.4.10.3 and the inspected tubes shall be verified acceptable per the acceptance criteria of Specification 4.4.10.4. The tubes selected for each inservice inspection shall include at least 3 percent of the total number of tubes in all steam generators; the tubes selected for these inspections shall be selected on a random basis except:

- a. Where experience in similar plants with similar water chemistry indicates critical areas to be inspected, then at least 50 percent of the tubes inspected shall be from these critical areas.
- b. The first sample of tubes selected for each inservice inspection of each steam generator shall include:
1. All nonplugged tubes that previously had detectable wall penetrations >20 percent, and
 2. Tubes in those areas where experience has indicated potential problems.
 3. A tube inspection pursuant to Specification 4.4.10.4.a.8 shall be performed on each selected tube. If any selected tube does not permit the passage of the eddy current probe for a tube inspection, it shall be recorded and an adjacent tube shall be selected and subjected to a tube inspection.

SURVEILLANCE REQUIREMENTS (Continued)

- c. The tubes selected as the second and third sample, if required by Table 4.4-5, during each inservice inspection may be subjected to a partial tube inspection provided:
1. The tubes selected for these samples include the tubes from those areas of the tubesheet array where tubes with unperfections were previously found.
 2. The tube inspections include those portions of the tubes where imperfections were previously found.

The results of each sample inspection shall be classified into one of the following three categories:

<u>Category</u>	<u>Inspection Results</u>
C-1	Less than 5 percent of the total tubes inspected are degraded tubes and none of the inspected tubes are defective.
C-2	One or more tubes, but not more than 1 percent of the total tubes inspected are defective, or between 5 or 10 percent of the total tubes inspected are degraded tubes.
C-3	More than 10 percent of the total tubes inspected are degraded tubes or more than 1 percent of the inspected tubes are defective.

NOTE: In all inspections, previously degraded tubes must exhibit significant (>10 percent) further wall penetrations to be included in the above percentage calculations.

- 4.4.10.3 Inspection Frequencies - The above required inservice inspections of steam generator tubes shall be performed at the following frequencies:
- a. Inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months, after the previous inspection. If two consecutive inspections results in all inspection results falling into the C-1 category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months.
 - b. If the results of the inservice inspection of a steam generator conducted in accordance with Table 4.4-5 at 40 month intervals fall in Category C-3, the inspection frequency shall be increased to at least once per 20 months. The increase in inspection frequency shall apply until the subsequent inspections satisfy the criteria of Specification 4.4.10.3.a; the interval can be extended to a 40 month period.

SURVEILLANCE REQUIREMENTS (Continued)

- c. Additional, unscheduled inservice inspections shall be performed on each steam generator in accordance with the first sample inspection specified in Table 4.4-5 during the shutdown subsequent to the following condition.
1. Primary-to-secondary tubes leaks (not including leaks originating from tube-to-tube sheet welds) in excess of the limits of Specification 3.4.5.2.
 2. A loss of coolant accident requiring actuation of the engineered safeguards.
 3. A Main steam line or feedwater line break.

4.4.10.4 Acceptance Criteria

- a. As used in this Specification:

1. Imperfection means an exception to the dimensions, finish or contour of a tube from that required by fabrication drawings or specifications. Eddy-current testing indications below 20 percent of the nominal tube wall thickness, if detectable, may be considered as imperfection.
2. Degradation means a service-induced cracking, wastage, wear or general corrosion occurring on either inside or outside of a tube.
3. Degraded Tube means a tube containing imperfections ≥ 20 percent of the nominal wall thickness caused by degradation.
4. % Degradation means the percentage of the tube wall thickness affected or removed by degradation.
5. Defect means an imperfection of such severity that it exceeds the plugging limit.
6. Plugging Limit means the imperfection depth at or beyond which the tube shall be removed from service because it may become unserviceable prior to the next inspection and is equal to 40 percent of the nominal tube wall thickness.
7. Unserviceable describes the condition of a tube if it leaks or contains a defect large enough to affect its structural integrity in the event of a loss of coolant accident or a main steam line or feedwaterline break.
8. Tube Inspection means an inspection of the steam generator tube from the point of entry (hot leg side) past the top (fifth) support and where practical, completely around the U-Bend to the top support of the cold leg.

- b. The steam generator shall be determined OPERABLE after completing the corresponding actions (plug all tubes exceeding the plugging limit and all tubes containing through-wall cracks) required by Table 4.4-5.

4.4.10.5 Reports

- a. Following each inservice inspection of steam generator tubes, the number of tubes plugged in each steam generator shall be reported to the Commission in a Special Report pursuant to Specification 6.9.6 within 15 days.
- b. The complete result of the steam generator tube inservice inspection shall be submitted to the Commission in a Special Report within 12 months following the completion of the inspection. This report shall include.
 - 1. Number and extent of tubes inspected.
 - 2. Location and percent of wall-thickness penetration for each indication of an imperfection.
 - 3. Identification of tubes plugged.
- c. Results of steam generator tube inspections which fall into Category C-3 and require prompt notification of the Commission shall be reported pursuant to Specification 6.9.4 prior to resumption of plant operation. The written follow-up of this report shall provide a description of investigations conducted to determine cause of the tube degradation and corrective measures taken to prevent recurrence.

TABLE 4.4-4

MINIMUM NUMBER OF STEAM GENERATORS TO BE
INSPECTED DURING INSERVICE INSPECTION

Preservice Inspection	No
No. of Steam Generators per Unit	Four
First Inservice Inspection	All
Second & Subsequent Inservice Inspections	One ¹

Table Notation:

1. The inservice inspection 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. Note that 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 sequence shall be modified to inspect the most severe conditions.

TABLE 4.4-5

STEAM GENERATOR TUBE INSPECTION

Sample Size	1st Sample Inspection		2nd Sample Inspection		3rd Sample Inspection	
	Result	Action Required	Result	Action Required	Result	Action Required
A minimum of S tubes per S.G.	C-1	None	N/A	N/A	N/A	N/A
	C-2	Plug defective tubes and inspect additional 2S tubes in this S.G.	C-1	None	N/A	N/A
			C-2	Plug defective tubes and inspect additional 4S tubes in this S.G.	C-1	None
					C-2	Plug defective tubes
					C-3	Perform action for C-3 result of first sample
	C-3	Perform action for C-3 result of first sample	N/A	N/A		
	C-3	Inspect all tubes in this S.G., plug defective tubes and inspect 2S tubes in each other S.G. Prompt notification to NRC pursuant to specification 6.9.4	All other S.G.'s are C-1	None	N/A	N/A
			Some S.G.'s C-2 but no additional S.G. are C-3	Perform action for C-2 result of second sample	N/A	N/A
			Additional SG is C-3	Inspect all tubes in each S.G. and plug defective tubes. Prompt notification to NRC pursuant to specification 6.9.4	N/A	N/A

$S > 3 \frac{N\%}{n}$ Where N is the number of steam generators in the unit, and n is the number of steam generators inspected during an inspection.

BASES

For normal opening and reclosing, the structural integrity of the Main Coolant System is unchanged. Therefore, satisfactory performance of a system leak test at 2200 psig following each opening and subsequent reclosing is acceptable demonstration of the system's structural integrity. These leak tests will be conducted within the pressure-temperature limitations for Inservice Leak and Hydrostatic Testing of Figure 3.4-4 and 3.4-5.

3/4.4.10 STEAM GENERATORS

The Surveillance Requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the MCS will be maintained. The program for inservice inspection of steam generator tubes is based on a modification of Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. The examination of the hot leg tubing as well as the U-bends where practicable, ensures that these types of degradation are detected. Due to small radius of the inner U-bends, the inspections in this area will be limited to those tubes beyond the seventh row. 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.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these limits, localized corrosion may likely result in stress corrosion cracking. The extent of cracking during plant operation would be limited by the limitation of steam generator tube leakage between primary coolant system and the secondary coolant system (primary-to-secondary leakage = 1 gallon per minute of total leakage). Cracks having a primary-to-secondary leakage less than this limit during operation will have an adequate margin of safety to withstand the loads imposed during normal operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary leakage of 1 gallon per minute total leakage can readily be detected by radiation monitors of steam generator blowdown. Leakage in excess of this limit will require plant shutdown and an unscheduled inspection, during which the leaking tubes will be located and plugged.

Wastage-type defects are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tube examinations. Plugging will be required for all tubes with imperfections exceeding the plugging limit of 40 percent of the tube nominal wall thickness. Steam generator tube inspections of operating plants have demonstrated the capability to reliably detect degradation that has penetrated 20 percent of the original tube wall thickness.

Whenever the results of any steam generator tubing inservice inspection fall into Category C-3, these results will be promptly be reported to the Commission pursuant to Specification 6.9.4 prior to resumption of plant operation. Such cases will be considered by the Commission on a case-by-case basis and may result in a requirement for analysis, laboratory examinations, tests, additional eddy-current inspection, and revision of the Technical Specifications, if necessary.

- (d) Total dissolved gas radioactivity (in curies) and average concentration released to the unrestricted area.
- (e) Total volume (in liters) of liquid waste released.
- (f) Total volume (in liters) of dilution water used prior to release from the restricted area.
- (g) Total gross radioactivity (in curies) by nuclide released based on representative isotopic analyses performed.
- (h) Percent of Technical Specifications limit for total radioactivity.

(3) Solid Wastes

- (a) The total amount of solid waste shipped (in cubic feet).
- (b) The total estimated radioactivity (in curies) involved.
- (c) Disposition including date and destination.

6.9.6 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. Inservice Inspection Program Reviews, Specification 4.4.9.1.
- b. ECCS Actuation, Specifications 3.5.2 and 3.5.3
- c. Inoperable Meteorological Monitoring Instrumentation, Specification 3.3.3.3.
- d. Sealed Source leakage in excess of limits, Specification 4.7.6.3.
- e. Radioactive Solid Waste Disposal, Specification 3.7.7.1
- f. Fire Detection Instrumentation, Specification 3.3.3.4
- g. Fire Suppression Systems, Specifications 3.7.10.1, 3.7.10.2 and 3.7.10.3
- h. Environmental Monitoring Program, Specification 3.7.8
- i. Steam Generator Inservice Inspection Results, Specification 4.4.10.5

YANKEE ROWE

Eddy Current Test Results
140 KHz test frequency
ZETEC Inc,

#1 Steam Generator
November, 1978
Inlet

ROW	COLUMN	% DEFECT	ORIGIN	LOCATION
K	21	57 *	OD	2" above tube sheet (ts)
J	24	54 *	OD	3" above ts
F	25	42 *	OD	2" above ts
M	25	37	OD	2" above ts
M	32	60 *	OD	2" above ts
H	33	64 *	OD	1" above ts
M	34	45 *	OD	2" above ts
M	35	29	OD	2" above ts
J	39	46 *	OD	2" above ts
L	41	44 *	OD	1" above ts
N	41	100 *	OD	1/2" above ts
O	43	51 *	OD	1/2" above ts
L	44	80 *	OD	1/2" above ts
M	44	71 *	OD	1/2" above ts
N	44	100 *	OD	1/2" above ts
L	45	70 *	OD	1/2" above ts
L	46	65 *	OD	1/2" above ts

* plugged any defect over 40%

Eddy Current Test Results

140 KHz Test Frequency

ZETEC Inc.

#4 Steam Generator

November, 1978

Inlet

ROW	COLUMN	% DEFECT	ORIGIN	LOCATION
J	2 **	67 *	OD	27" above tube sheet (ts)
G	19	67 *	OD	2" above ts
I	22	under 20	OD	3" above ts
K	23	48 *	OD	5" above ts
L	23	none	(38% defect in 1975)	
J	26	none	(34% defect in 1975)	
I	27	under 20	ID	25" above first support
J	27	under 20	OD	4" above ts
K	27	32	OD	4" above ts
L	28	under 20	OD	2" above ts
K	29	under 20	OD	4" above ts
L	29	29	OD	4" above ts
O	29	91 *	OD	2" above ts
N	30	31	OD	2" above ts
N	31	31	OD	2" above ts
J	35	29	OD	3" above ts
K	35	37	OD	3" above ts
L	36	under 20	OD	3½" above ts
G	37	83 *	OD	½" above ts
J	37	63 *	OD	3½" above ts
G	38	21	OD	3" above ts
H	38	84 *	OD	2½" above ts
K	38	27	OD	4½" above ts
L	38	51 *	OD	4" above ts
L	39	67 *	OD	4" above ts
O	41	75 *	OD	2" above ts
N	43	86 *	OD	2" above ts
N	45	75 *	OD	above ts

* plugged any defect over 40%

** suspect manufacturer's defect