

MAR 8 1985

The Honorable Arlen Specter
United States Senate
Washington, DC 20510

Dear Senator Specter:

The letter from Albert J. Manik of PANE which your office forwarded to NRC has been referred to me for response.

In that letter, Mr. Manik refers to Commissioner Asselstine's memorandum to me dated December 19, 1984, and urges that the NRC review the causes and consequences of the TMI-1 steam generator tube defects discussed in Mr. Asselstine's memorandum. We responded to Mr. Asselstine's request in the enclosed memorandum from me dated January 15, 1985.

The licensee has submitted its evaluation of the defects which is currently under review. Based on our present understanding of the problem, our response to Mr. Manik's four questions is as follows.

Based on our present understanding of the problem, our response to Mr. Manik's four questions is as follows.

Question a. What mechanism caused tube failure?

Response. The newly reported defects in the TMI-1 steam generator tubes are not cracks and do not represent continuing or new intergranular stress corrosion cracking (IGSCC) which was responsible for the previous extensive damage to the steam generators. Rather they are "pits" and "islands" resulting from previous intergranular attack (IGA) developed during the prior sulfur contamination of the TMI-1 reactor coolant system. In the early stages of IGA, the grain boundary of the tubing is degraded but the grains remain in place. As IGA progresses whole grains of tubing alloy become dislodged and fall out. These regions of IGA may have further deteriorated because the OTSGs were kept idle in the cold shutdown condition for 2 years. In addition, stresses and disturbances resulting from the desulfurization process and the hot functional testing might have accelerated the deterioration of the IGA regions.

Question b. Is tube strength sufficient for reactor operation?

Response. The TMI-1 Technical Specifications require that any identified steam generator tube defects beyond the repair limit be repaired or removed from service. The repair limit is based on assuring that the integrity of the tubes is maintained for design basis accidents even allowing for additional degradation up to the time of the next inspection. (It should be noted that the licensee has recently requested a change in the repair limit.) In the event of a tube leak, which would be expected to occur before any

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possible tube rupture, the Technical Specifications require plant shutdown if the total leakage exceeds one gallon per minute (gpm). In addition, the operating license is conditioned to require plant shutdown for inspection and repair if there is any increase in leakage of 0.1 gpm over previously observed leakage.

Question c. Will tube failure become a recurring problem?

Response: It is expected that "grain dropout" which the licensee has concluded is the cause of the current defect indications will continue at a decreasing rate. However, as discussed above, this should not constitute a safety problem because the Technical Specifications limit the degradation allowed for continued operation of the plant.

Question d. Is safety compromised by tube failure?

Response: Please see the response to Question b.

Our review of these matters is continuing and will address all aspects of these tube defects, including the questions raised in Mr. Manik's letter, to assure adequate protection of public health and safety.

Sincerely,

(Signed) T. A. Rehm
William J. Dircks
Executive Director for Operations

Enclosure:
Memorandum from W. Dircks to
Commissioner Asselstine Dated
January 15, 1985

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Question c. Will tube failure become a recurring problem?

Response: It is expected that "grain dropout" which the licensee has concluded is the cause of the current defect indications will continue at a decreasing rate. However, as discussed above, this does not constitute a safety problem because the Technical Specifications limit the degradation allowed for continued operation of the plant.

Question d. Is safety compromised by tube failure?

Response: No. Please see the response to Question b. above for further explanation.

Our review of these matters is continuing and will address all aspects of these tube defects to assure adequate protection of public health and safety.

William J. Dircks
Executive Director for Operations

Enclosure:
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Question c. Will tube failure become a recurring problem?

Response: It is expected that "grain dropout" which the licensee has concluded is the cause of the current defect indications will continue at a decreasing rate. However, as discussed above, this does not constitute a safety problem because the Technical Specifications limit the degradation allowed for continued operation of the plant.

William J. Dircks
Executive Director for Operations

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JAN 15 1985

MEMORANDUM FOR: Commissioner Asselstine
FROM: William J. Dircks
Executive Director for Operations
SUBJECT: TMI-1 STEAM GENERATOR TUBE DEFECTS

Regarding the TMI-1 steam generator tube defects reported in the Weekly Information Report dated November 29, 1984 (SECY-84-451), the licensee has just completed inspection of both steam generators and they are in the process of analyzing the eddy current inspection results. The licensee is planning on submitting its evaluation to the staff in January 1985. The following responses to the questions contained in your memorandum of December 19, 1984 are based on the staff's current information.

1. Question:

To what extent has this type of defect (in terms of location, nature, and apparent speed of the deterioration) been found in other once through steam generators of B&W designed plants?

Answer:

This type of defect has not been found in other OTSGs of B&W designed plants. The newly reported defects in the TMI-1 OTSG tubes are primary-side initiated, while defects observed in other B&W plants are typically secondary-side initiated. The defects at TMI-1 are in the free span near the top of the tubes around the periphery of the tube bundle, while defects in other OTSGs of B&W designed plants are mainly in the region of the open tube lane. The TMI-1 steam generator tube degradation resulted from rapid attack by reduced sulfur species in the primary coolant at low temperature, while the corrosion attack in other B&W steam generators was caused by impurities in the secondary water at high temperature.

Contact: P. Wu
x28555

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2. Question:

Has staff confidently ruled out the possibility of the prior sulfur contamination of the TMI-1 reactor coolant system as a cause of the defects? If not, what is the staff plan and schedule for resolving this? If staff has ruled out sulfur as a cause of the defects, what is the basis?

Answer:

The staff has not ruled out the possibility of the prior sulfur contamination of the TMI-1 reactor coolant system as a cause of the defects. In the SER, the staff determined that the licensee has (1) eliminated the principal source of sulfur corrodent by removing the sodium thiosulfate tank; (2) removed the sulfur in the bulk water by purification, and reduced residual sulfur species on reactor coolant system (RCS) surfaces by peroxide treatment; (3) instituted administrative controls to prevent the reintroduction of sulfur or other contaminants into the RCS; (4) implemented new administrative limits on primary coolant chemistry control; (5) instituted frequent RCS sulfate analysis, pH, and conductivity checks to detect any inadvertent contamination by sulfur or other potential corrodents; and (6) established an acceptable pre-critical and post-critical test and power escalation program to confirm that the leak tight integrity of repaired OTSG is maintained. The staff concluded that these measures provide reasonable assurance that cracking of the OTSG tubes will not recur. In addition, if cracking due to sulfur does recur after return to operation, it would be expected to occur when the system is in cold condition. Post-repair leak tests with mid-cycle eddy current inspection of the OTSG tubes will detect any possible reinitiation of SCC.

Based on preliminary verbal information from the licensee, the newly reported defects in the TMI-1 OTSG tubes are not cracks. They are "pits" and "islands" resulting from previous intergranular attack (IGA) developed during the prior sulfur contamination of the TMI-1 reactor coolant system. These regions of IGA may have further deteriorated because the OTSGs were kept idle in the cold shutdown condition for 2 years. In addition, stresses and disturbances resulting from the desulfurization process and the hot functional test might have accelerated the deterioration of the IGA regions.

3. Question:

Why were these defects not found in earlier eddy current tests of the tubes?

Answer:

Unlike intergranular stress corrosion cracking (IGSCC), intergranular attack (IGA), especially at the early stage, is extremely difficult to detect by eddy current test (ECT). ECT detects tube defects by monitoring the tubes for metal loss. In the early stages of IGA, the grain boundary of the tubing is degraded but the grains remain in place. Therefore, ECT does not indicate a significant metal loss. As IGA progresses whole grains of tubing alloy become dislodged, fall out, and can be detected by the eddy current tests. However, the ECT signals were weak and within the background noise levels, because significant grain drop out had not occurred. This appears to be the reason why these defects were not reported in earlier eddy current tests of the tubes. On reexamination of the previous eddy current measurements, the licensee is reporting that the majority of the newly reported defects were already there two years ago.

(Signed) William J. Dircks

William J. Dircks
Executive Director for Operations



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

EDO PRINCIPAL CORRESPONDENCE CONTROL

FROM:

SEN. ARLEN SPECTER

DUE: ~~02/25/85~~ ^{3/11/85}

EDO CONTROL: 000333
DOC DT: 01/25/85
FINAL REPLY:

TO:

NRC

FOR SIGNATURE OF:

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SECY NO: 85-97

EXECUTIVE DIRECTOR

DESC:

ENCL. LETTER FM ALBERT J. MANIK RE TMI-1
STEAM GENERATOR TUBE DEFECTS

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TAYLOR
MURLEY

DATE: 02/08/85
ASSIGNED TO: NRR

CONTACT: DENTON

SPECIAL INSTRUCTIONS OR REMARKS:

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Received NRR: 2/11/85
contact: Thompson

cc: Eisenhut/Denton
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1- G. Linnas
2- Stolny

CORRESPONDENCE CONTROL TICKET

SECY NUMBER: 85-97

LOGGING DATE: 2/7/85

OFFICE OF THE SECRETARY

ACTION OFFICE: EDO

AUTHOR: Sen Arlen Specter, Const REF

AFFILIATION: Albert Manik

LETTER DATE: 1/2/5/85 FILE CODE:

ADDRESSEE: NRC

SUBJECT: Ques concerning tube failure at TMI 1--req for investi-
gation

ACTION: Direct Reply...Suspense: Feb 20

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SPECIAL HANDLING: None

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