



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

July 11, 2019

Mr. Eric Epstein, Chairman  
Mr. Scott D. Portzline, Security Consultant  
Three Mile Island Alert  
4100 Hillsdale Road  
Harrisburg, PA 17112

SUBJECT: 2.206 PETITION FOR THREE MILE ISLAND NUCLEAR STATION, UNIT 1,  
STEAM GENERATOR REPLACEMENT

Dear Messrs. Epstein and Portzline:

Your petition dated March 11, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19085A335), addressed to the Executive Director for Operations, has been referred to the Office of Nuclear Reactor Regulation pursuant to Section 2.206 of Title 10 of the *Code of Federal Regulations* (10 CFR 2.206) of the U.S. Nuclear Regulatory Commission's (NRC's) regulations. In your petition, you requested that enforcement action be taken against Three Mile Island Nuclear Station, Unit 1 (TMI-1), including shutting down the reactor, until the issue of an apparent design and manufacturing defect with the replacement steam generators causing tube-to-tube wear is understood and remediated. As the basis for your request, you state, in part, that:

Unexpected tube-to-tube wear was found during the first outage and inspection of the new steam generators in October and November of 2011. Some of the steam tubes became damaged when they struck or rubbed together caused by the fluttering of the tubes or banging into each other. This behavior was not expected and can lead to tube ruptures. The potential for this behavior was not discussed in the TMI Unit 1 updated Final Safety Analysis Report dated April 2014.

and:

Analysis has been performed on steam tube loads during reactor transient conditions. But, that analysis did not examine the damaging behavior of steam tube flutter. In-situ pressure testing does not account for the fluttering behavior. The calculations for compressive and tensile loads also does not account for the fluttering behavior. Therefore, we conclude that a proper analysis and remediation is needed. Until remediated, this leaves Exelon out of compliance with its license.

and:

SG [steam generator] tube ruptures are potentially risk significant events because thermally induced SG tube failures caused by hot gases from a damaged reactor core can result in a containment bypass event and a large release of fission products to the environment.

and:

The steam generators steam tubes made from metal Alloy 690 are bowing under normal operating temperatures. This is because the steam generators are experiencing unexpected thermal expansion. This unwanted bowing was determined by the manufacturer AREVA to be attributable to three root causes:

#### Root Causes

1. The steam generators were not constructed as designed. Specifically, the preload tensile value was less than called for by the design specification. The result is that the tubes experience a higher compressive load than planned.
2. The steam generator shell stays cooler than expected during normal operation. The steam tubes expand at a greater rate than the shell. The result is that the tubes experience higher compressive loads than planned for.
3. The margin to buckling (bowing) was not conservative.

The previous three points constitute a design error and a manufacturing error. They also call into question whether or not Exelon has met its obligation under the scope of "Regulation §50.59 section (6) (2)" as listed on the page 3 of this petition. TMI Alert asserts that the design changes and the material changes used for the replacement steam generators, along with the errors, constitute a violation of the "change" parameter of the regulation.

Consistent with NRC Management Directive 8.11, "Review Process for 10 CFR 2.206 Petitions," a petition review board (PRB) was established to consider your petition. The PRB consists of staff from headquarters and Region I who are knowledgeable of steam generators and the inspections conducted at TMI-1. In evaluating your petition, the PRB conducted several internal meetings and evaluated the NRC's records regarding the issues you raised on the TMI-1 steam generators.

The PRB's initial assessment was that your submittal does not meet the criteria for consideration under 10 CFR 2.206 in accordance with Management Directive 8.11, Section III.C, because the technical issues raised in your petition have already been the subject of NRC staff review and evaluation, and no new information was provided that had not already been reviewed and evaluated or otherwise warranted further inquiry for this particular issue.

On June 5, 2019, you were informed by e-mail of the PRB's initial assessment. On June 26, 2019, a public meeting by teleconference was held between you and the PRB to discuss its initial assessment (transcript found at ADAMS Accession No. ML19184A466). Following that meeting, on June 27, 2019, you provided additional information by e-mail (ADAMS Accession No. ML19179A128). The results of that discussion and the additional information you provided have been considered in the PRB's final determination regarding your request for immediate action and whether the petition meets the criteria for consideration under 10 CFR 2.206.

The PRB has determined that the tube-to-tube wear issue for the replacement steam generators at TMI-1 does not meet the criteria for consideration under 10 CFR 2.206 because these issues have been the subject of NRC staff review and evaluation since they were first identified in

2011. Some of the NRC's previous considerations of this issue can be found in the following documents:

1. Inspection Report 2009-005 – contains inspection activities associated with steam generator replacement, including 10 CFR 50.59 review (ADAMS Accession No. ML100330674)
2. Summary of public meeting held on January 26, 2012, regarding tube-to-tube wear at TMI-1 and Arkansas Nuclear One, Unit 1 (ADAMS Accession No. ML120270416)
3. Summary of public meeting held on June 17, 2013, regarding tube-to-tube wear at TMI-1 (ADAMS Accession No. ML13179A093)
4. Inspection Report 2013-004 – contains inspection activities associated with the corrective action taken to address the tube-to-tube wear root causes for TMI-1 (ADAMS Accession No. ML13301A503)
5. Summary of Conference Calls Regarding the Fall 2013 Steam Generator Tube Inservice Inspection (ADAMS Accession No. ML14015A356)
6. Inspection Report 2013-005 – contains inspection activities associated with steam generator tube examinations (ADAMS Accession No. ML14041A047)

Inservice steam generator tubes are designed to retain structural integrity over the full range of normal operating conditions, anticipated transients included in the design specification, and design-basis accidents. In 2011, the licensee plugged four tubes in Steam Generator A and three tubes in Steam Generator B because of tube-to-tube wear. While this was unexpected, the NRC staff reviewed the licensee's determination that there was no loss of structural or leakage integrity in the affected tubes and reached the same conclusion. The NRC staff found that for the last three operational cycles (2013, 2015, and 2017), the wear rate of the tube-to-tube degradation mechanism was minor, and no additional tubes have been plugged due to tube-to-tube wear. Based on past reviews of the reports provided by the licensee, along with reviews of reports that are periodically submitted by the licensee, the affected tubes continue to maintain the structural and leakage integrity margins that account for design-basis accident conditions. The NRC staff had previously reviewed and evaluated the licensee's inspection reports of the steam generators and found there were no issues with the tube-to-tube wear that required follow up. The NRC staff's evaluations of the 2011, 2013, 2015, and 2017 reports can be found at ADAMS Accession Nos. ML13039A436, ML15043A144, ML17010A020, and ML19059A028, respectively.

The PRB notes that your petition contained either reference to, or quotes from, an Advisory Committee on Reactor Safeguards meeting with the NRC staff and NUREG-2195, "Consequential SGTR [Steam Generator Tube Rupture] Analysis for Westinghouse and Combustion Engineering Plants with Thermally Treated Alloy 600 and 690 Steam Generator Tubes." The Westinghouse and Combustion Engineering steam generator designs discussed during the Advisory Committee on Reactor Safeguards meeting and in NUREG-2195 are recirculating steam generators with U-bend tubes. TMI-1 has once-through steam generators, which are a significantly different design. NUREG-2195 specifically states that once-through steam generator designs are not susceptible to a severe accident effect of a backflow of steam.

The regulations in 10 CFR 2.206 provide an opportunity for safety issues to be raised by interested persons, and while the PRB determined that the issue raised does not require further review, the NRC understands that this process takes time, resources, and energy by petitioners.

Accordingly, I thank you for taking the time to raise your concerns to the attention of the NRC and participating in this process.

Sincerely,

*/RA/*

Brian W. Smith, Deputy Director  
Division of Engineering  
Office of Nuclear Reactor Regulation

Docket No. 50-289

cc: Listserv

SUBJECT: 2.206 PETITION FOR THREE MILE ISLAND NUCLEAR STATION, UNIT 1,  
STEAM GENERATOR REPLACEMENT DATED JULY 11, 2019

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**ADAMS Accession Nos.: Package ML19078A283; Letter ML19189A333** \*by e-mail

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OFFICE	OGC – NLO*	NRR/DORL/D	PRB Chair	NRR/D
NAME	JGillespie	CErlanger (BWelling for)	BSmith	HNieh (MEvans for)
DATE	07/08/19	07/10/19	07/11/19	07/11/19

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