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Mr. John B. Cotton  
Vice President - TMI Unit 1  
AmerGen Energy Company  
P.O. Box 480  
Middletown, PA 17057

March 10, 2000

SUBJECT: TMI-1 - AMENDMENT RE: REVISED SEISMIC VERIFICATION  
METHODOLOGY FOR AUXILIARY STEAM SYSTEM PIPING (TAC NO.  
MA5617)

Dear Mr. Cotton:

The Commission has issued the enclosed Amendment No. 221 to Facility Operating License No. DPR-50 for the Three Mile Island Nuclear Station, Unit 1, (TMI-1) in response to the application dated May 26, 1999, filed by GPU Nuclear, Inc., as the then-licensee for TMI-1.

The amendment approves a revision to the TMI-1 Final Safety Analysis Report (UFSAR) for use of the Conservative Deterministic Failure Margin (CDFM) methodology for seismic analysis of the portions of the auxiliary steam line located in the Auxiliary, Control and Fuel Handling Buildings at TMI-1. Chapters 5 and 14 of the UFSAR will be revised to reflect the use of the CDFM methodology.

A copy of the related safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,  
/RA/  
Timothy G. Colburn, Senior Project Manager, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-289

OFFICE OF NUCLEAR REACTOR REGULATION

Enclosures: 1. Amendment No. 221 to DPR-50  
2. Safety Evaluation

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

March 10, 2000

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Vice President - TMI Unit 1  
AmerGen Energy Company  
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

AMERGEN ENERGY COMPANY, LLC

DOCKET NO. 50-289

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1  
AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 221  
License No. DPR-50

1. The Nuclear Regulatory Commission (the Commission or NRC) has found that:
  - A. The application for amendment by GPU Nuclear, Inc., et al., dated, May 26, 1999, adopted by AmerGen Energy Company, LLC, (the licensee), complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, changes to the Updated Final Safety Analysis Report (UFSAR) to reflect the use of the Conservative Deterministic Failure Margin (CDFM) methodology as specified in the UFSAR changes to Chapter 5 and 14, and as set forth in the licensee's application for amendment dated May 26, 1999, are authorized.
3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Marsha K. Gamberoni, Acting Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Date of Issuance: March 10, 2000



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 221 TO FACILITY OPERATING LICENSE NO. DPR-50

AMERGEN ENERGY COMPANY, LLC

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated May 26, 1999, GPU Nuclear, Inc. (the then-licensee), submitted a request for approval of changes to the Three Mile Island Nuclear Station, Unit 1 (TMI-1), Updated Final Safety Analysis Report (UFSAR). AmerGen Energy Company, LLC, has since adopted this license amendment request. The requested changes would allow use of the Conservative Deterministic Failure Margin (CDFM) methodology for seismic analysis of the portions of the auxiliary steam line located in the Auxiliary, Control and Fuel Handling Buildings at TMI-1. The licensee proposes to use the CDFM methodology, developed by Electric Power Research Institute (EPRI), to demonstrate the integrity of the auxiliary steam piping. The auxiliary steam piping is not safety-related. However, failure of the piping could impact safety-related equipment. Chapters 5 and 14 of the UFSAR will be revised to reflect the use of the CDFM methodology.

2.0 EVALUATION

The TMI-1 UFSAR indicates that the auxiliary steam piping is analyzed in accordance with the USA Standard Code for Pressure Piping USAS B31.1. However, the piping was not designed to withstand a seismic event. The auxiliary steam piping performs no direct safety function related to plant operation or safe shutdown. The pipe is not required to provide steam to any system following a seismic event and is not required to remain leak tight. However, a breach of this line could result in a release of steam to some portions of the Auxiliary, Control or Fuel Handling Buildings. According to the licensee, some equipment in these areas was not evaluated for the effects of harsh environment which would result from a rupture of the auxiliary steam pipe. Since the auxiliary steam piping was not designed to withstand a seismic event, the licensee used an alternative evaluation criteria to demonstrate that the piping will not rupture during a seismic event.

The alternative criteria used by the licensee to demonstrate the seismic adequacy of the auxiliary steam piping is based on the CDFM methodology described in EPRI Report NP-6041-SL. The CDFM methodology described in EPRI Report NP-6041-SL relies, in part, on earthquake experience data. The EPRI NP-6041-SL Report and procedures have not been formally reviewed and approved by the NRC staff for the deterministic operability evaluation for safety-related systems, components and the associated supports. In general, the staff does not endorse the use of the CDFM procedure for the qualification of piping and supports.

According to the licensee, the auxiliary steam piping operates at a relatively low pressure (normal pressure 11 psig). The licensee further indicated that the auxiliary steam piping had been evaluated for leakage cracks in accordance with the TMI-1 pipe break criteria. The TMI-1 criteria for postulating breaks in piping outside the containment is contained in Appendix 14A of the TMI-1 UFSAR. The criteria requires that crack breaks be postulated for pipes with fluid temperatures above 200° F and/or pressures above 275 psig. The criteria does not require longitudinal or circumferential breaks to be postulated unless both the temperature is above 200° F and the pressure is above 275 psig.

The pipe break criteria cited above does not require postulation of longitudinal and circumferential breaks in the auxiliary steam line. However, the criteria applies to seismically analyzed piping. Therefore, in order to comply with the pipe break criteria, it is necessary for the licensee to demonstrate that a complete rupture of the piping will not occur during a seismic event. The licensee evaluated the auxiliary steam piping using criteria based on the CDFM methodology which is less stringent than the criteria used to evaluate safety-related piping at TMI-1. The staff agrees that a less stringent seismic criteria may be used to evaluate this piping since the piping is not required to maintain pressure boundary integrity (the piping does not have to remain leak tight) during a seismic event. The staff evaluation discussed below only applies to the criteria as it is implemented on the TMI-1 auxiliary steam piping.

The evaluation of the TMI-1 auxiliary steam piping is described in EQE Report No. 240046-R-001. The evaluation involved a walkdown of the piping by a review team using the criteria that was developed from earthquake experience data. Piping that did not meet the walkdown screening criteria was analyzed further. The walkdown identified one section of branch piping containing threaded connections that required further evaluation. The staff agrees that threaded connections are appropriate candidates for further evaluation based on earthquake experience data.

The evaluation includes a dynamic analysis of a substantial portion of the piping (approximately 25 percent). The criteria used for the analysis are more conservative than the criteria permitted by the CDFM methodology. However, the criteria are less conservative than the criteria used in the analysis of safety-related piping at TMI-1. The staff considers the use of less conservative criteria for the analysis appropriate since the auxiliary steam line does not need to remain leak tight following a seismic event. The significant aspects of the criteria specified in the proposed revision to Chapter 5 of the UFSAR are discussed below.

The amplified in-structure response spectra used in the evaluation were developed for the resolution of Unresolved Safety Issue (USI) A-46. The staff's safety evaluation of the USI A-46 spectra is contained in a September 26, 1994, letter to the licensee. The staff found that the method used to develop the spectra is consistent with the applicable Standard Review Plan positions and the current staff positions and was acceptable for the resolution of USI A-46. The staff also considers this spectra acceptable for the evaluation of the nonsafety-related auxiliary steam piping.

The seismic inputs used for the piping analysis are obtained from 5 percent damped amplified response spectra. The staff has accepted the use of up to 5 percent damping for the analysis of piping provided the spectra have been developed based on current seismic analysis techniques. On the basis of the staff's September 26, 1994, safety evaluation of the USI A-46 spectra, 5 percent damped spectra is considered acceptable for this analysis.

The American Society for Mechanical Engineers (ASME) Code service level D allowable stresses were used as acceptance criteria. The ASME Code specifies higher allowable stresses for service level D than the stresses specified in the USAS B31.1 that were used for the design of the auxiliary steam piping at TMI-1. The ASME Code service level D allowable stresses are intended to assure pressure boundary integrity of the piping. However, it is not necessary that the auxiliary steam line maintain pressure boundary integrity during a seismic event, it is only necessary that a rupture of the line not occur. The staff has determined that the ASME Code service level D allowable stresses provide adequate margin for that purpose.

The licensee used a factor of safety of three on ultimate capacity for the evaluation of concrete expansion anchor bolts. This factor of safety is less than that required for the design of safety-related pipe supports. However, the staff considers the factor of safety of three adequate for the evaluation of the non-safety-related auxiliary steam line.

The licensee's evaluation of a significant portion of the line (approximately 25 percent) demonstrated that the acceptance criteria, as described above, were met. This evaluation represents a bounding case since it contains the section of piping judged to be most vulnerable to a seismic event. The staff has determined that this evaluation provides reasonable assurance that the auxiliary steam line will not rupture during a postulated safe shutdown earthquake (SSE) at the TMI-1 site.

The staff finds that the licensee's evaluation, as described above, provides reasonable assurance that a complete rupture of the auxiliary steam piping in the Auxiliary, Fuel Handling and Control Buildings will not occur during an SSE at the TMI-1 site. Therefore, the staff finds the proposed revision of Chapters 5 and 14 of the UFSAR, which provide an alternate method to demonstrate that a seismic event will not cause a complete rupture of the auxiliary steam piping, acceptable.

### 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

### 4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (64 FR 35207). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: J. Fair

Date: March 10, 2000