10 CFR 50.90

AmerGen
A PECO Energy/British Energy Company

AmerGen Energy Company, LLC
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August 9, 2000
5928-00-20059

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Dear Sir or Madam:

SUBJECT: THREE MILE ISLAND, UNIT 1 (TMI UNIT 1)
OPERATING LICENSE NO. DPR-50
DOCKET NO. 50-289
LICENSE AMENDMENT REQUEST NO. 294 - REVISED STEAM GENERATOR TUBE FAILURE ACCIDENT ANALYSIS DOSE CONSEQUENCE

In accordance with 10CFR50.4(b)(1), enclosed is License Amendment Request No. 294.

The purpose of this License Amendment Request is to revise the TMI Unit 1 Updated Final Safety Analysis Report (UFSAR) Section 14.1.2.10, Steam Generator Tube Failure analysis to include the dose resulting from the postulated post-accident steam release through the main steam safety valves (MSSVs). The revised dose for the TMI Unit 1 Steam Generator Tube Failure analysis would be increased above the values previously reviewed by the NRC, but they continue to be well below the limits contained in 10CFR100. This change modifies the existing TMI Unit 1 UFSAR to account for the MSSV release of radioactivity to the atmosphere for the postulated accident analysis. The existing radiological dose calculations described in the UFSAR do not account for this release.

Using the standards in 10CFR50.92, AmerGen has concluded that these proposed changes do not constitute a significant hazards consideration, as described in the enclosed analysis performed in accordance with 10CFR50.91(a)(1). Pursuant to 10 CFR 50.91(b)(1), a copy of this License Amendment Request is provided to the designated official of the Commonwealth of Pennsylvania, Bureau of Radiation Protection, as well as the chief executives of the township and county in which the facility is located.

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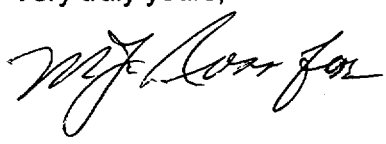
Approval of this license amendment to authorize the identified UFSAR change is requested by July 31, 2001, in order to correct this UFSAR discrepancy. If any additional information is needed, please contact David J. Distel at (610) 640-6672.

Very truly yours,



Mark E. Warner
Vice President, TMI Unit 1

MEW/djd

Enclosures: (1) TMI Unit 1 License Amendment Request No. 294, Safety Evaluation and No Significant Hazards Consideration
(2) Affected TMI Unit 1 Updated Final Safety Analysis Report Pages

cc: USNRC Regional Administrator, Region I
USNRC TMI Unit 1 Senior Project Manager
USNRC TMI Senior Resident Inspector
Director, Bureau of Radiation Protection -
PA Department of Environmental Resources
Chairman, Board of County Commissioners of Dauphin County
Chairman, Board of Supervisors of Londonderry Township
File No. 00050

AMERGEN ENERGY COMPANY, LLC

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

Operating License No. DPR-50
Docket No. 50-289
License Amendment Request No. 294

COMMONWEALTH OF PENNSYLVANIA)
) **SS:**
COUNTY OF DAUPHIN)

This License Amendment Request is submitted in support of Licensee's request to change the Updated Final Safety Analysis Report (UFSAR) for Three Mile Island Nuclear Station, Unit 1. As a part of this request, proposed revised pages for the TMI Unit 1 UFSAR are also included. All statements contained in this submittal have been reviewed, and all such statements made and matters set forth therein are true and correct to the best of my knowledge.

AmerGen Energy Company, LLC

BY: _____
for
Vice President, TMI Unit 1

Sworn and Subscribed to before me
this 9th day of August 2000.

_____
Notary Public

Notarial Seal
Linda L. Ritter, Notary Public
Londonderry Twp., Dauphin County
My Commission Expires Feb. 26, 2002
Member, Pennsylvania Association of Notaries

ENCLOSURE 1

TMI Unit 1 License Amendment Request No. 294 Safety Evaluation

and No Significant Hazards Consideration

I. License Amendment Request No. 294

AmerGen Energy Company, LLC (AmerGen) requests authorization to include the following revised pages in the TMI Unit 1 Updated Final Safety Analysis Report (UFSAR):

Revised UFSAR Pages: 14.1-34, 14.1-35, 14.1-36, 14.1-64 and 14.3-7

These pages are attached as Enclosure 2.

II. Reason for Change

The purpose of this License Amendment Request is to revise the TMI Unit 1 UFSAR Section 14.1.2.10, Steam Generator Tube Failure analysis to include the dose resulting from the postulated post-accident steam release through the main steam safety valves (MSSVs). This change modifies the existing TMI Unit 1 UFSAR to account for the MSSV release of radioactivity to the atmosphere for the postulated accident analysis. The existing calculated radiological dose does not account for this release. Therefore, the existing TMI Unit 1 Steam Generator Tube Failure analysis calculated doses are being revised to conservatively account for the release from the MSSVs.

III. Safety Evaluation Justifying Change

The proposed change involves a change to the calculated dose presently contained in the TMI Unit 1 UFSAR Section 14.1.2.10 - Steam Generator Tube Failure, to account for postulated post-accident release through the MSSVs.

A review of the TMI Unit 1 UFSAR Section 14.1.2.10 - Steam Generator Tube Failure, identified a conflict in that the UFSAR states that the MSSVs release radioactivity to the atmosphere. However, the radiological dose assessment does not account for the contribution from this release. Further historical review confirmed that the dose from MSSV release is not accounted for in the UFSAR analysis. Analysis and plant data have demonstrated that following reactor trip and turbine trip, the MSSVs will lift for a short period of time (about 2 minutes), and the dose from this release should be included in the reported dose. The proposed change increases the existing calculated dose by adding the amount of dose resulting from MSSV release.

The revised dose values are calculated using assumptions consistent with the analysis in UFSAR Section 14.1.2.10. No partitioning of noble gases or iodines is assumed for the MSSV release path. The revised values of activity released to atmosphere are included in UFSAR Table 14.1-21. The dose increase is the result of the MSSV release direct to the atmosphere from MSSVs opening for about two minutes following reactor and turbine trip, after which the turbine bypass system is assumed to take full control.

The proposed change increases the calculated dose at the exclusion distance by 7.38 Rem for thyroid and by 0.0221 Rem for whole body as a result of MSSV discharge to the atmosphere during a Steam Generator Tube Failure event.

The NRC has previously approved a calculated dose increase for the Steam Generator Tube Failure event resulting from revised atmospheric dispersion factors (Re: TMI Unit 1 License Amendment No. 210, dated April 15, 1999). The revised total integrated dose results identified on the enclosed, updated TMI Unit 1 UFSAR Table 14.1-21 reflect the previously approved increase for the revised atmospheric dispersion factors as well as the calculated proposed increase to account for the MSSV release. The revised total integrated dose results remain well below the 10CFR100 limits.

The noble gas and iodine activity released during the Steam Generator Tube Failure event is a small fraction of that released during the postulated Maximum Hypothetical Accident (MHA) for TMI Unit 1. In addition, the release point for the tube failure event provides greater atmospheric dispersion of the source term released during the tube failure event. As a result, control room doses remain bounded by the MHA.

No change to any plant structures, systems or components is being made or proposed by this change. Therefore, the proposed change does not adversely affect nuclear safety or safe plant operation.

The following additional changes to the TMI Unit 1 UFSAR Steam Generator Tube Failure accident analysis description are being incorporated as a result of the completed review and upgrade of the TMI Unit 1 UFSAR accident analysis section. These changes are being included here in order to provide a comprehensive description of the changes to the Steam Generator Tube Failure accident analysis description in the TMI Unit 1 UFSAR, and only involve clarifications or additional detail to the existing assumptions and methods.

1. Section 14.1.2.10.a.1 is revised to clarify that the release from the MSSVs is direct to atmosphere, while the remainder of the noble gases and iodine would be released through the condenser air removal system as currently stated in the TMI Unit 1 UFSAR (Page 14.1-34). Since the MSSV release is being accounted for as described above, and a loss of offsite power is not assumed, the reference to the emergency feed pump turbine atmospheric steam exhaust is removed (Page 14.1-36). The gas-to-liquid partition factor for iodine in the condenser is incorrectly stated in the TMI Unit 1 UFSAR as 10^{-4}. The correct value was 10^{4} and this was revised to a more conservative value of 100 as previously approved by the NRC in the TMI Unit 1 License Amendment No. 142, dated July 18, 1988. These changes are considered an editorial clarification and correction of outdated information.

2. Section 14.1.2.10.a.2 (c)(d)(e) is revised to clarify the postulated sequence of events for the existing Steam Generator Tube Failure analysis. This change only provides an editorial clarification of the scenario. The previously described reactor coolant system (RCS) cooldown rate after termination of the MSSV release is removed since it does not provide any input to the analysis. No changes to the analysis assumptions or methods are identified. Therefore, this change is considered an editorial clarification.

3. Section 14.1.2.10 is revised to include grammatical revisions to the last paragraph describing use of TMI Unit 1 Abnormal Transient Procedure (ATP) 1210-5.

4. Table 14.1-21 is revised to properly identify that the 34-minute time period is the time to isolation of the affected OTSG, which is the termination of the release. This is an editorial clarification and has no effect on the accident analysis results.

The above changes are editorial and provide clarification or correction to the existing TMI Unit 1 UFSAR Steam Generator Tube Failure accident analysis description. Therefore, these additional changes do not adversely affect nuclear safety or safe plant operation.

IV. Environmental Consideration

AmerGen has determined that this change to the TMI Unit 1 Steam Generator Tube Failure accident analysis dose involves no significant change in the amount or type of any effluent that may be released offsite, and that there is no increase in individual or cumulative occupational radiation exposure. The new radiological consequences of the revised Steam Generator Tube Failure accident analysis remain well below 10CFR100 limits for the exclusion area boundary. As such, operation of TMI Unit 1 in accordance with the proposed change does not involve an unreviewed environmental safety question.

V. No Significant Hazards Consideration

AmerGen has determined that this License Amendment Request poses no significant hazards as defined by 10CFR50.92.

1. Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability of occurrence or the consequences of an accident previously evaluated. This change has no effect on structures, systems or components prior to the postulated steam generator tube failure accident or any other accident. The proposed change corrects the existing UFSAR Steam Generator Tube Failure accident analysis to account for the release to atmosphere through the main steam safety valves (MSSVs). The resulting revised radiological consequences for the postulated Steam Generator Tube Failure accident remain well below the 10CFR100 limits.

2. Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any previously evaluated. This change has no impact on any plant structures, systems or components. The only impact is the revised radiological consequences of the Steam Generator Tube Failure accident analysis to account for the release to atmosphere through the MSSVs. This change only corrects the existing TMI Unit 1 UFSAR.

3. Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety. No change to any plant structure, system or component is being made or proposed by this change. This change does not involve any change to safety system setpoints for operation. The revised radiological consequences of the Steam Generator Tube Failure accident analysis remain well below 10CFR 100 limits.

VI. Implementation

It is requested that the amendment authorizing this change become effective upon issuance.

ENCLOSURE 2

Affected TMI Unit 1 Updated Safety Analysis Report Pages

e. Conclusions

This analysis has shown that the reactor trips and remains subcritical. The initial blowdown results in a maximum neutron power of 131 percent of rated power; and a DNB analysis demonstrated that no fuel damage will occur. The maximum temperature differential that occurs in the steam generator does not produce excessive stresses, and steam generator integrity is maintained. The environmental doses are within acceptable limits.

14.1.2.10 Steam Generator Tube Failure

a. Steam Generator Tube Rupture

1) Identification of Accident

The environmental effects associated with steam generator tube leakage and subsequent release to the environment are evaluated in the preceding sections. An evaluation has also been performed for the complete severance of a steam generator tube. For this occurrence, activity contained in the reactor coolant would be released to the secondary system. Some of the radioactive noble gases and iodine would be released **directly** to the atmosphere ~~**through the condenser air removal system.**~~ **while the main steam line safety valves are open. The remainder of the noble gases and iodine would be released through the condenser air removal system**. The unaffected steam generator was assumed to have no significant amount of leakage flow of reactor coolant to the secondary side of the steam generator prior to the rupture event.

Acceptance criteria for this event are as follows:

1) Radiological doses must be within the limits of 10CFR100.

2) Additional tube failures and loss of reactor coolant boundary integrity resulting from temperature gradients (thermally induced tube loading) shall not occur.

Flow rates through the failed tube from the RCS to the steam generator secondary were maximized for the double-ended severance of a tube by assuming that the tube offered no hydraulic resistance to the flow.

2) Analysis and Results

In analyzing the consequences of this failure, the following sequence of events is assumed to occur (input parameters are shown in Table 14.1-20 and a summary of results is given in Table 14.1-21):

a) A double-ended rupture of one steam generator tube occurs with unrestricted discharge from each end, at full rated power level with nominal operating conditions.

b) The initial leak rate exceeds the normal makeup to the Reactor Coolant System, and pressurizer level decreases causing the system pressure to decrease. No initial operator action is assumed, and a low Reactor Coolant System pressure trip will occur.

c) **Following the reactor trip, the turbine stop valves will close. Steam line pressure will increase, opening the main steam safety valves (MSSVs). In less than two minutes, the turbine bypass system can handle all of the lead rejection and the MSSVs close. This behavior is supported by the system transient analysis provided in Reference No. 107. Additional leakage through the MSSVs may occur due to variations in reseating pressure before the operator can further reduce the secondary system pressure to ensure that the MSSVs are fully closed. The doses associated with these releases are insignificant, and assuming two minutes of full flow steam release in the dose calculations is appropriate.**

d e) Following reactor trip, the Reactor Coolant System pressure continues to decrease until high pressure injection is actuated. The capacity of the high pressure injection is sufficient to compensate for the leakage and maintains both pressure and volume control of the Reactor Coolant System. Thereafter, the reactor is assumed to be cooled down and depressurized at 100°F per hour, **until the Reactor Coolant System temperature decreases below the saturation temperature corresponding to the minimum pressure setpoint of the main steam line safety valves**.

e ~~d~~) After the Reactor Coolant System temperature decreases below the **saturation temperature of the** pressure set point of the main steam line safety valves, the **operator isolates the affected steam generator, terminating the release.** ~~secondary side will depressurize slowly and the main steam safety valves will dump steam to the atmosphere~~. Cooldown continues with the unaffected steam generator at ~~100F/hour~~ until the temperature is reduced to 250°F. Thereafter, cooldown to ambient conditions is continued using the decay heat removal system.

~~e) Following reactor trip, the turbine stop valves will close. Steam line pressure will increase, opening the steam bypass valves to the condenser. The bypass valves actuate at a lower pressure than do the steam safety valves. The reactor coolant that leaks as a result of the tube failure is condensed in the condenser. Only the fission products that escape from the condensate are released to the atmosphere.~~

Operator action**s are** assumed ~~to perform actions~~ to initiate and control the cooldown of the primary system by use of the turbine bypass valves, isolate feedwater and steam lines on the affected steam generator, throttle the HPI flow for inventory control on the primary side, and to cool and depressurize the primary system to put the DHRS into operation.

Calculations of the radiological doses for the steam generator tube rupture accident take as inputs the mass released to the SG secondary and assumed to pass to the condenser, the concentrations of radionuclides in the reactor coolant for 1 percent defective fuel, and atmospheric dispersion factors. The calculations ~~do not~~ account for any direct releases to the atmosphere through the main steam safety valves. Credit for dilution of the concentrations in the reactor coolant has been taken to reflect the diluting effects of the HPI with no additional significant amount of fission product releases from the fuel following the rupture of the steam generator tube.

The first radioactivity release path is through the main steam safety valves. No partitioning of noble gases or iodines is assumed.

The **second** ~~first~~ radioactivity release path during this accident is discharged through the turbine bypass to the condenser and then out the condens**er** vacuum pump exhaust. A gas-to- liquid partition factor of ~~10^{-4}~~ **100** is assumed for the iodine in the condenser ~~(References 10 and 11)~~, but noble gases are assumed to be released directly to the atmosphere.

The total dose to the body from all the Xenon and Krypton released is given in Table 14.1-21. The corresponding dose to the thyroid is also tabulated.

~~The second radioactive release path is through the main safety valves or through the emergency feed pump turbine atmospheric steam exhaust.~~

The atmospheric dilution is calculated using the dispersion factors developed in Section 2.5.

The above doses were calculated assuming isolation of the affected steam generator. ~~however,~~ The Abnormal Transient Procedure for OTSG Tube Leakage (ATP 1210-5) ~~may~~ allows cooldown with both steam generators to facilitate better accident management. Based on the allowable dose rates from the ATP (50 **mRem** ~~mr~~/hr whole body or 250 **mRem** ~~mr~~/hr thyroid), and a conservative cooldown period of 10 hours, would result in doses of 0.5 Rem whole body and 2.5 Rem thyroid. **Cooldown with both generators using this dose rate criteria** ~~This~~ was approved by the NRC in NUREG-1019, Supplement 1.

TABLE 14.1-21
(Sheet 1 of 1)

SUMMARY OF STEAM GENERATOR TUBE FAILURE ANALYSIS

Low pressure trip occurs at, min	8	
Time to isolation of affected OTSG ~~Total depressurization time of Reactor Coolant System~~, min	34	
Reactor coolant leakage during depressurization, ft^3	1977	
Activity Released to Atmosphere		
Noble gases, Curies	~~32,400~~	**33,000**
Iodine I-131 dose equivalent, Curies	~~3.06~~	**21**
Total Integrated Dose at Exclusion Distance		
Thyroid, REM	~~1.07~~	**9**
Whole body, REM	~~0.31~~	**0.4**

101. ANSI/ANS-56.5-1979, "PWR and BWR Containment Spray System Design Criteria."

102. Polestar Calculation No. PSAT 05656A.04, Rev. 0, "Calculation of TMI-1 Engineered Safety Feature Component Leakage Iodine Release," August 1998.

103. GPUN Calculation C-1101-900-E000-072, Rev. 1, "TMI-1 Dose Consequences from MHA with 15 gph ECCS Leakage," January 1999.

104. Letter T. Colburn to J. W. Langenbach, "Three Mile Island, Unit No. 1 – Issuance of Amendment Re: Engineered Safeguards Feature (ESF) System Leakage Limit and Control Room Habitability Evaluation (TAC Nos. MA4665 and MA0246)," August 24, 1999.

105. Letter T. Colburn to J. W. Langenbach, "Correction Letter – Amendment 215 Issued on August 24, 1999 Re: Engineered Safeguards Feature (ESF) System Leakage Limit – Errata to Safety Evaluation (TAC No. MA4665)," October 14, 1999.

106. Met-Ed/GPU letter TLL 637, H. D. Hukill to R. W. Reid, dated April 6, 1981, "Analysis of Boron Dilution Event."

107. GPUN Calculation C-1101-900-E610-041, Rev. 0, "TMI-1 Load Rejection Accident at 2772 MWt," October 1996.

Page 3-62f
INSERT

The in-plant testing for penetration and system bypass shall be performed in accordance with ANSI N510-1980. Charcoal samples shall be obtained in accordance with ANSI N509-1980. Any HEPA filters found defective shall be replaced with filters qualified according to Regulatory Guide 1.52, Revision 2. Any lot of charcoal adsorber which fails the laboratory test criteria shall be replaced with new adsorbent qualified in accordance with ASTM D3803-1989.

Laboratory testing of charcoal samples will be performed in accordance with the test methods prescribed by ASTM D3803-1989. **Testing of charcoal at 95% relative humidity will be required until such time that a surveillance to emonstrate operability of the heaters is incorporated by amendment into the specification.** The accident analysis in FSAR Chapter 14 (Reference 1) assumes the charcoal adsorber is 90% efficient in its total radioiodine removal. Therefore, using a Safety Factor of 2 (Reference 2), the acceptance criteria for the laboratory test of charcoal adsorber is set at greater than or equal to 95% [(100 – 90) / 2 = 5% penetration].