December 26, 2000

Mr. Mark E. Warner
Vice President - TMI Unit 1
AmerGen Energy Company, LLC
P.O. Box 480
Middletown, PA 17057

SUBJECT: TMI-1 - AMENDMENT RE: MAKE-UP AND PURIFICATION SYSTEM/HIGH PRESSURE INJECTION LICENSE CHANGE APPLICATION NO. 287 (TAC NO. MA7024)

Dear Mr. Warner:

The Commission has issued the enclosed Amendment No. 227 to Facility Operating License No. DPR-50 for the Three Mile Island Nuclear Station, Unit 1 (TMI-1), in response to your application dated October 29, 1999, as supplemented June 21, and September 8, 2000.

The amendment revises the Technical Specifications (TSs) to include: 1) the addition of operating limits for make-up tank (MUT) level and pressure; 2) the addition of surveillance requirements for the MUT pressure instrument channel; and 3) the revision of the calibration frequency for the MUT level instrument channel, the high- and low-pressure injection flow instrument channels, and the borated water storage tank instrument channel from “Not to exceed 24 months” to “Refueling interval.” Minor editorial changes and associated Bases changes are also made. Camera-ready TS pages for this change were provided in your letters of November 16, and December 11, 2000, which also reflected the changes approved by the Nuclear Regulatory Commission (NRC) staff in Amendment No. 225 issued on September 25, 2000.

As discussed with your staff, and as discussed in the safety evaluation, the commitment in your September 8, 2000, letter to ensure that the acceptance criteria for the daily check of the make-up tank pressure instrument will be maintained within the error used to develop the plant operating limit has been included in the license amendment.

The NRC staff also notes that your June 21, 2000, response to the NRC staff’s request for additional information was particularly comprehensive and detailed. By copy of this letter this information is being forwarded to Region I for consideration in their next plant performance review of your facility.

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

Enclosures: 1. Amendment No. 227 to DPR-50
2. Safety Evaluation

cc w/encls: See next page

December 26, 2000

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
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Docket No. 50-289

Enclosures: 1. Amendment No. 227 to DPR-50
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AMERGEN ENERGY COMPANY, LLC

DOCKET NO. 50-289

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 227
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. (the then-licensee), dated October 29, 1999, as supplemented June 21, and September 8, 2000, 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, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.c.(2) of Facility Operating License No. DPR-50 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 227, are hereby incorporated in the license. AmerGen Energy Company, LLC, shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 30 days of issuance including the licensee's commitment to ensure that the acceptance criteria for the daily check of the make-up tank pressure instrument will be maintained within the error used to develop the plant operating limit as described in the staff's safety evaluation dated December 26, 2000.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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

Attachment: Changes to the Technical Specifications

Date of Issuance: December 26, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 227

FACILITY OPERATING LICENSE NO. DPR-50

DOCKET NO. 50-289

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
vii	vii
3-21	3-21
3-22	3-22
3-23	3-23
3-24	3-24
--	3-24a
4-2	4-2
4-5a	4-5a
4-6	4-6

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 227 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 October 29, 1999, GPU Nuclear, Inc. (the then-licensee), submitted a request for changes to the Three Mile Island Nuclear Station, Unit 1 (TMI-1), technical specifications (TSs). AmerGen Energy Company, LLC (the licensee), has since adopted this license amendment request and supplemented the application by letters dated June 21, and September 8, 2000. The June 21, 2000, letter provided additional information in response to the Nuclear Regulatory Commission's (NRC's) request (discussed in conference calls on March 9, 2000, and May 5, 2000). This additional information included changes to Figure 3.3-1, "Makeup Tank Pressure vs Level Limits," provided in the original submittal and the inclusion of one additional instrument where the same calibration frequency extension is appropriate. The September 8, 2000, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination or expand the amendment beyond the scope of the original notices (64 FR 70090) and (65 FR 43042).

The requested revisions to the TSs include: 1) the addition of operating limits for make-up tank (MUT) level and pressure; 2) the addition of surveillance requirements for the MUT pressure instrument channel; and 3) the revision of the calibration frequency for the MUT level instrument channel, the high- and low-pressure injection flow instrument channels, and the borated water storage tank instrument channel from "Not to exceed 24 months" to "Refueling interval." Minor editorial changes and associated Bases changes are also made.

2.0 BACKGROUND

TMI-1 had previously been configured with three high-pressure injection/make-up (HPI/MU) pumps aligned to two separate and independent piping trains. One HPI/MU pump was generally in operation performing the reactor coolant system (RCS) make-up function taking suction from the MUT. However, operational concerns associated with the one normally idle train and the one normally operating pump performing the make-up function were identified. Some of the concerns included over-pressurization of the idle HPI/MU pump line due to leaking valves and the potential to damage the normally idle pump due upon an injection signal due to slow acting valves. As a result, to address the operational identified concerns associated with the system, the licensee chose to cross-connect the system at the suction of the pumps. Although this fix addressed some of the operational concerns, it created the possibility that all the HPI trains could be damaged if the hydrogen gas in the MUT were to enter the suction of

the HPI/MU pumps. The licensee has done an analysis to demonstrate that hydrogen from the MUT will not enter the HPI/MU pump suction for all design basis events.

3.0 EVALUATION

To support the proposed changes, the licensee has done an analysis to justify the allowable temperature and pressure ranges for different conditions to assure continued availability of HPI for all design-basis events.

3.1 Analysis

To assure that the hydrogen from the MUT does not enter the HPI/MU pump suction, the licensee has established limits in the TSs on the water level and pressure in the MUT. The limits on the MUT water level and pressure assure that for all design-basis events, without operator action, assuming the most limiting single failure, and allowances for maximum expected instrument uncertainty that the MUT would not go empty, allowing hydrogen to enter the HPI/MU pump suction. An additional set of limits was established that assure no hydrogen is introduced into the pump suction, without accounting for a single failure. A 72-hour limiting condition for operation (LCO) is established for this condition. The short time-period is appropriate and consistent with other TSs that consider single failures.

The licensee has performed a single-failure analysis to assure that no single failure could result in loss of all HPI. Additionally, the licensee has researched operational events to assure that there are no additional vulnerabilities at TMI-1. Additional procedural precautions will be adopted by the licensee, including isolating any sources of gas to the tank, adding gas through controlled batch additions, and performing regular consistency checks with other instruments. The adequacy of the instrumentation and the surveillance intervals is reviewed below.

The licensee's analysis used RELAP5 to develop the MUT limits. RELAP5 is an appropriate system code for this type of application. The analysis considered a full spectrum of RCS breaks and identified the limiting conditions. Actual plant data was used to benchmark the flow resistance and other aspects of the dynamic modeling. Additionally, the licensee was able to demonstrate adequate conservatism through the analysis assumptions, including overestimating the total system flow. As a result, the NRC staff has determined that the proposed TSs, including the MUT operating restrictions, and procedural administrative controls adopted by the licensee are adequate to prevent hydrogen from damaging both trains of HPI.

3.2 Adequacy of Instrumentation and Surveillance Intervals

There are redundant MUT level indicators consisting of a recorder and a digital indicator in the control room to protect against common-cause failures. These instruments are independently powered from vital bus power supplies. Both instrument loops are indicated and recorded on the plant process computer. The high-pressure sensing line comes from a common level tap on the side of the tank. The instruments are calibrated such that when the level is at the lower tap, the indicated level is zero. The low-pressure sensing line comes from a single vent line on the top of the tank. The licensee will perform daily operability checks by comparing the two control room indications.

An indicator for MUT gas pressure is also located in the control room. This instrument loop is also powered from a vital power supply. MUT pressure indication from this instrument loop is indicated, recorded and alarmed on the plant process computer. The daily operability check will be performed by comparing the control room indication with the local indications of the HPI/MU pump suction header pressure.

The MUT level and pressure instruments are used to maintain MUT conditions within the acceptable region. If MUT conditions are within the acceptable region when a loss-of-coolant accident occurs, then the MU pump net positive suction head will remain adequate throughout the transient and the MUT gas overpressure will not be drawn into the HPI/MU pump suctions.

MUT pressure and level instruments are maintained with the licensee's Appendix B quality assurance program. MUT level is categorized by Regulatory Guide (RG) 1.97 as a Type D, Category 2, instrument. The MUT level instruments meet the requirements for a Category 2 instrument. MUT pressure is not identified as a RG 1.97 parameter. The transmitters for MUT pressure and level are classified as nuclear safety-related in the TMI-1 Quality Classification List.

The addition of surveillance requirements for the MUT pressure instrument and the addition of LCO limits on MUT level and pressure along with appropriate action statement and allowed outage time will ensure that gas entrainment of the HPI/MU pumps does not occur. The proposed change in instrument calibration frequencies will continue to maintain the required accuracy of the MUT level, HPI flow, and low-pressure injection (LPI) flow instruments.

The NRC staff finds the existing instrumentation acceptable for the proposed application.

The licensee proposed to revise surveillance Item No. 27 in Table 4.1-1 for the MUT instruments. The pressure channel is proposed to be added as part of this amendment. The level and pressure channel calibration frequencies were proposed to change from F (every 24 months) to R (refueling intervals). The licensee also proposed to revise Item Nos. 29 and 30 in Table 4.1-1 to change the flow channel calibration frequency for high- and low-pressure injection systems, and the borated water storage tank level indicator from F (every 24 months) to R (refueling intervals).

The licensee performed an overall instrument loop error analysis for each MUT instrument loop. The analysis considered the hardware installed, calibration methodology, accuracy of the test equipment, effects on electronics from variations in power supplies and ambient temperatures, systematic measurement errors (elevation of the transmitter, water temperature variation, boron concentration), indicator resolution, and loss of accuracy over time (i.e., drift). The analysis assumed a 30-month period between calibrations to determine the overall loop accuracy and acceptable as-found tolerances. NRC Generic Letter (GL) 91-04, "Changes in Technical Specification Intervals to Accommodate A 24-Month Fuel Cycle," identifies the issues that should be addressed to provide an acceptable basis for increasing the calibration interval for instruments that are used to perform a safety function. The licensee has addressed each of seven issues:

1. Confirm that instrument drift as determined by as-found and as-left calibration data from surveillance and a maintenance record has not, except on rare occasions, exceeded acceptable limits for a calibration interval.

   The licensee reviewed the history of instrument performance for the MUT level, HPI flow, and LPI flow instruments. On occasions, the instrument calibration was found outside the tolerance required by procedure. However, the licensee identified no incidents where drift or time-dependent variability made the instrument inoperable.

2. Confirm that the values of drift for each instrument type (make, model, and range) and applications have been determined with a high probability and a high degree of confidence. Provide a summary of the methodology and assumptions used to determine the rate of instrument drift with time based upon historical plant calibration data.

   The licensee compared the historical data on instrument drift for the MU tank level, HPI flow and LPI flow instruments with the published manufacturer's specifications. In each case, the historical data were similar to or better than the published rate of drift.

3. Confirm that the magnitude of instrument drift has been determined with a high probability and a high degree of confidence for a bounding calibration interval of 30 months for each instrument type (make, model, and range) and application that performs a safety function. Provide a list of channels by TS section that identifies these instrument applications.

   The licensee determined the overall loop accuracy for each instrument loop (MU14-LT, MU-LT-778, DH-DPT-0802, DH-DPT-0803, MU-FT-1126, MU-FT-1127, MU-FT-1128, and MU-FT-1129) assuming a 30-month period between surveillance checks. The overall loop error was determined based on a maximum as-left error and drift for 30 months. The licensee has revised the safety analyses that assume these instruments use a 30-month interval to calculate the overall loop error. These instruments must be calibrated in accordance with TS Table 4.1-1, Items 27 and 29; however, there are no explicit operability requirements in TS Section 3 for any of these instrument loops.

4. Confirm that a comparison of the projected instrument drift errors has been made with the values of drift used in the setpoint analysis. If this results in revised setpoints to accommodate larger drift errors, provide proposed TS changes to update trip setpoints. If the drift errors result in a revised safety analysis to support existing setpoints, provide a summary of the updated analysis conclusions to confirm that safety limits and safety assumptions are not exceeded.

   The licensee has compared the projected instrument drift errors with the values of the drift used in the setpoint analysis for MUT level, HPI flow, and LPI flow instruments and determined that the setpoints or margins in the TSs are not affected by these surveillance extensions.

5. Confirm that the projected instrument errors caused by drift are acceptable for control of plant parameters to affect a safe shutdown with the associated instrumentation.

   The licensee determined that the critical instrument accuracy requirements for LPI flow and HPI flow are based on post-accident control functions. The MUT level instruments do not have a required post-accident control function.

6. Confirm that all conditions and assumptions of the setpoint and safety analyses have been checked and are appropriately reflected in the acceptance criteria of plant surveillance procedures for channel checks, channel functional tests, and channel calibration.

   The licensee determined the overall instrument loop accuracy from the as-left tolerance requirements in the surveillance procedure. The surveillance procedure as-found tolerance is based on the same methodology used to determine the "overall" loop accuracy. The licensee has verified the consistency of the instrument accuracy analysis and the surveillance procedures.

7. Provide a summary description of the program for monitoring and assessing the effects of increased calibration surveillance intervals on instrument drift and its effect on safety.

   The licensee's instrument surveillance program triggers evaluations of the instrument performance whenever the instrument is found outside the as-left tolerance. The maintenance assessment program records these events and repetitive occurrences are identified for further evaluation.

The licensee also performed an analysis to determine the operating limits for the pressure and level in the MUT. The curves in Figure 3.3-1 for MUT pressure and level are based on analysis of the full spectrum of RCS breaks including an HPI line break. The new Figure 3.3-1 is not corrected for instrument errors. The plant operating limits, as implemented in alarms and procedures, will include margins for instrument error. Corrections for instrument errors were not incorporated in the TSs to permit the use of alternate instruments where appropriate margins are supported by calculation.

The NRC staff expressed a concern during the conference calls on March 9, 2000, and May 5, 2000, that the TS values do not include instrument uncertainties; however, the procedures used by the operator would include instrument uncertainties, allowing operation outside the TS curve for safe operation. The allowable values in the TSs should consider uncertainties (e.g., calibration tolerances, instrumentation uncertainties, instrument drift) and should be modified. The NRC staff had a telephone conversation with the licensee about this concern. The NRC staff required that the licensee's methodology conform to the methods and requirements of ISA-S67.04 and RG 1.105. By letter dated June 21, 2000, the licensee responded to the NRC staff's concern as follows:

> Instrument errors are not included in Figure 3.3-1 because instrument errors have been incorporated within the applicable plant operating procedure, and the determination of these errors meets the requirements of RG 1.105. The operating crew utilizes the limits provided in the operating procedure to evaluate and control the MUT conditions. The

> TS curve has been annotated to clarify that instrument errors are not included and to ensure that values taken from the curve will not be used directly. Including multiple limits in TSs that are instrument loop dependent could unnecessarily limit the licensee's ability to use new or alternate instrumentation. Operating limits implemented by plant procedures include instrument uncertainties supported by calculations. These calculations were performed in accordance with AmerGen Nuclear Engineering Standard ES 002, "Instrument Error Calculation and Setpoint Determination." This standard is consistent with the methods and requirements of ISA-S67.04-1982, "Setpoints for Nuclear Safety-Related Instrumentation Used in Nuclear Power Plants," and in accordance with the clarifications and exceptions defined by RG 1.105, "Instrument Setpoints for Safety-Related Systems," Revision 2 (February 1986).

The NRC staff agrees with this response.

Based on the instrument loop error analysis performed by the licensee for each of the MUT instrument loops and acceptable responses to the issues identified in GL 91-04, the NRC staff concludes that increasing the calibration frequency for instruments from every 24 months to every refueling outage is acceptable.

3.3 Specific TS Changes

TS 3.3, Emergency Core Cooling, Reactor Building Emergency Core Cooling and Reactor Building Spray Systems

Specification 3.3.1.1.g and associated Figure 3.3-1 are being added to require the MUT pressure and level be maintained within certain operating pressure and level bands. As discussed earlier in Section 2.1 of this safety evaluation, the NRC staff believes the operational bands are adequate to prevent hydrogen from entering the pump suction. The 72-hour time period for the condition where analysis shows that hydrogen will not enter the pump suction, without considering a single failure, is consistent with the standard TS philosophy and is acceptable. Additionally, requiring the entrance of TS 3.0.1 for the condition where hydrogen entering the pump suction can not be precluded is also consistent with the standard TS philosophy and is acceptable.

Additional related editorial changes and conforming changes to the TS bases describing the operational limits and the analysis were also included in the amendment. The NRC staff found the proposed changes acceptable, although it should be noted that the NRC staff does not evaluate the TS bases changes.

TS 4.1, Operational Safety Review

The licensee provided a written commitment which is reflected in the proposed Bases changes requiring that the acceptance criterion for the daily operational checks of the MUT pressure instrument be maintained within the error used to develop the MUT operational limits. This is to assure that the accuracy of the single MUT pressure instrument will not drift to the point where hydrogen could be drawn into the suction of the pump. Single failure considerations require that the potential for excessive drift of the pressure instrument be eliminated. The NRC staff found the proposed changes acceptable, but has determined that this commitment should be

enforceable and after discussions with the licensee, has captured this commitment in the license amendment.

TS Table 4.1-1, Items 27 and 29

As discussed previously, the licensee added a surveillance requirement for the MUT pressure instrument and revised the surveillance interval for the MUT instrument channels and high- and low-pressure injection system flow channels from F (not to exceed 24 months) to R (refueling interval). These changes are acceptable.

The NRC staff has reviewed the licensee amendment request, the revised TSs, and the supporting technical justification. The NRC staff finds that the analysis performed to support the amendments are adequate to demonstrate continued availability of the HPI for all design-basis events. As a result, the NRC staff finds the proposed changes acceptable.

4.0 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.

5.0 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 and changes the surveillance requirements. 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 70090) and (65 FR 43042). 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.

6.0 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.

7.0 REFERENCES

7.1 Letter from J. W. Langenbach, GPU Nuclear Inc., to U.S. Nuclear Regulatory Commission, Attention: Document Control Desk, Subject, "Three Mile Island Nuclear Station, Unit 1, (TMI-1), Operating License No. DPR-50, Docket No. 50-289, License Change Application (LCA) No. 287," dated October 29, 1999.

7.2 Letter from J. B. Cotton, AmerGen Energy Company, LLC, to U.S. Nuclear Regulatory Commission, Attention: Document Control Desk, Subject, "Three Mile Island Nuclear Station, Unit 1, Operating License No. DPR-50, Docket No. 50-289, License Change Application (LCA) No. 287, Revision 1," dated June 21, 2000.

7.3 Letter from M. E. Warner, AmerGen Energy Company, LLC, to U.S. Nuclear Regulatory Commission, Attention: Document Control Desk, Subject, "Three Mile Island Nuclear Station, Unit 1, Operating License No. DPR-50, Docket No. 50-289, License Change Application (LCA) No. 287, Supplement 1," dated September 8, 2000.

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Date: December 26, 2000

Three Mile Island Nuclear Station, Unit No. 1

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