August 3, 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: DEGRADED GRID UNDERVOLTAGE RELAY SETPOINT CALIBRATION FREQUENCY (TAC NO. MA6312)

Dear Mr. Warner:

The Commission has issued the enclosed Amendment No. 224 to Facility Operating License No. DPR-50 for the Three Mile Island Nuclear Station, Unit 1, (TMI-1) in response to your application dated August 20, 1999, as supplemented by letters dated February 18, April 19, and May 22, 2000.

The amendment revises the calibration frequency of the 4kV (kilovolt) Engineered Safeguards Bus Undervoltage Relays (Diesel Start) (item 43.a of Table 4.1-1 of the Technical Specifications (TSs)) from a refueling interval to annually. The TS Bases have also been changed to reflect that the degraded voltage relay setpoint tolerance is being changed from an “as left” to an “as found” reading. Additionally, the amendment approves a revision to the Updated Final Safety Analysis Report (UFSAR) to allow for manual operator action for voltage protection rather than full automatic voltage protection. These changes are reflected in the revised UFSAR pages 8.2-3 and 8.2-5.

The amendment also adds new TSs 3.7.2.a(ii) and 3.7.2.h to address voltage on the 230 kV grid as a precondition of criticality and to provide a time limit for when the 230 kV grid voltage is found to be insufficient to support loss-of-coolant accident electrical loading during power operation. Various minor editorial changes have also been made. The Bases have also been changed to reflect the addition of the two new TSs and to provide clarification of the components to which surveillance is applicable.

The staff notes that the proposed revised Technical Specification pages 3-37a and 4-7 submitted with your August 20, 1999, application did not accurately reflect the existing TMI-1 Technical Specifications. Some minor differences were noted which were not identified by margin bars and which were not intended changes. While your staff promptly corrected these errors when notified of them, this is not an isolated occurrence of this problem. We understand from discussions with Mr. George Rombold of PECO that your staff is working to prevent recurrence of this problem. By copy of this letter, this information is being forwarded to Region I for consideration as a Plant Issues Matrix entry item as part of its 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 by Alexander W. Dromerick for/

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. 224 to DPR-50
2. Safety Evaluation

cc w/encls: See next page

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 by Alexander W. Dromerick for/

Timothy G. Colburn, Senior Project Manager, Section 1
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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. 224
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, August 20, 1999, as supplemented by AmerGen letters dated February 18, April 19, and May 22, 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. 224 , are hereby incorporated in the license. AmerGen Energy Company, LLC, shall operate the facility in accordance with the Technical Specifications.

3. Also, accordingly, changes to the Updated Final Safety Analysis Report (UFSAR) to allow for manual operator action for voltage protection rather than full automatic voltage protection as set forth in the application for amendment by GPU Nuclear, Inc., et al. (the then-licensee), dated, August 20, 1999, as supplemented by AmerGen letters dated February 18, April 19, and May 22, 2000, are authorized. These changes are reflected in the revised UFSAR pages 8.2-3 and 8.2-5.

4. 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

/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: August 3, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 224

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
3-37a	3-37a
3-42	3-42
3-43	3-43
3-43a	3-43a
4-7	4-7

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 224 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 August 20, 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, has since adopted this license amendment request and supplemented the August 20, 1999, application by letters dated February 18, April 19, and May 22, 2000. The February 18, and April 19, 2000, letters 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 notice (64 FR 67334).

Subsequent to these letters and following further discussions with the staff, the licensee revised its initial submittal in a letter dated May 22, 2000. The staff's proposed no significant hazards consideration determination for this supplement was published in the Federal Register on June 2, 2000 (65 FR 35404).

The requested changes would change the calibration frequency of the 4 kV Engineered Safeguards (ES) bus degraded voltage relays from a refueling outage interval to an annual interval. They would also add a requirement that the voltage on the 230 kV grid be sufficient to power the safety-related ES loads, and provide the actions to be taken when a trip of the TMI-1 generator, in conjunction with loss-of-coolant accident (LOCA) loading, will result in a loss-of-offsite power to ES buses.

The TS Bases are being revised to state that the minimum and maximum degraded voltage setpoints are "as found" readings, in lieu of the currently indicated "as left" setting. The Bases also provides a discussion of the TMI-1 generator trip provision that is newly addressed by the TS.

2.0 BACKGROUND

TMI-1 redundant ES buses 1D and 1E are each provided with three degraded voltage relays, one per phase. The simultaneous occurrence of a degraded voltage (inadequate safety equipment voltage) below the relay setpoint on two-out-of-three relays will initiate a 10-second timer. If the voltage on at least two of the relays does not recover to the pickup setpoint before the time delay relay times out, the affected bus will be disconnected from its offsite power source and transferred to the emergency diesel generators. The relays thus provide

undervoltage protection to ensure that redundant safety system components will not be subjected to voltage conditions for which they are not designed and qualified. They monitor voltage and initiate the transfer of safety system components from their common offsite power supply to independent onsite power supplies (i.e., the emergency diesel generators). This protection ensures the continued availability and thus the independence of redundant safety system components in accordance with the requirements specified by Criterion 17 of 10 CFR Part 50, Appendix A.

In addition to their protective function, the relays must not inhibit the availability (or cause loss) of the offsite power supply following a LOCA. This availability requirement is conveyed as part of Criterion 17 of 10 CFR Part 50, Appendix A. Criterion 17 requires that one of the offsite circuits be designed to be available within a few seconds following a LOCA to ensure that core cooling, containment integrity, and other vital safety functions are maintained.

As a result of the above, it is necessary to set the relay reset setpoint low enough to avoid premature tripping of the relay when the offsite power supply (switchyard) is operating in the lower region of its normal operating voltage band. However, it is also necessary that the relay dropout setpoint be at least high enough to protect the safety-related loads.

3.0 EVALUATION

3.1 Dropout Setpoint

The licensee indicated in his August 20, 1999, request that calculation C-1101-700-510-010, "TMI-1 AC Voltage Regulation Study," was issued to replace a previous calculation, Technical Data Report (TDR) 995, Revision 3. Although the new calculation retained the existing relay nominal dropout setpoint of 3760 V, the licensee indicated that the calculation employed a more rigorous methodology to determine undervoltage relay tolerances and included analyses of previously unconsidered loads and non-motor loads. As a consequence of these differences, a tighter degraded voltage relay as-left tolerance is needed to achieve better relay accuracy and a reduction in the possibility of separation of the ES buses from the offsite power source. Therefore, the licensee is changing the relay setpoint tolerance (-0.53%, +0.35%) currently described in the TMI-1 TS Bases as an "as left" setting, to an "as found" reading; and is adopting the tighter minimum "as left" tolerance specified by the relay manufacturer of ±0.1%.

Specifying the relay tolerance given in the TMI-1 TS as an "as found" reading is similar to specifying the setpoint "allowable value" of the relay. Specifying the setpoint allowable value of instrumentation has been adopted in the Improved Standard Technical Specifications which are the most recent version of Standard Technical Specifications. The setpoint allowable value of the degraded voltage relay is an appropriate parameter to be specified in the TSs because it is the parameter that is used to verify that the relay would have tripped at an acceptable voltage after having been in service for some period of time. The "allowable value," or the similar "as found" value, is therefore an acceptable parameter to be used to verify the required capability of the degraded voltage protection consistent with the requirements of General Design Criterion 17.

3.2 Calibration Interval

Calculation C-1101-700-E510-010 also employed a more restrictive calibration interval (annual versus 2-year refueling outage) in the calculation of the degraded voltage relay tolerances. Consistent with this the licensee is requesting a change to Table 4.1-1 of the TMI TSs to specify an annual calibration interval for the degraded voltage relays, replacing the currently specified refueling outage interval. This change is necessary and acceptable because it ensures that the uncertainties used in the setpoint determination that are associated with the calibration interval are consistent with the actual calibration interval of the relay.

3.3 Operator Action

The more rigorous methodology used in calculation C-1101-700-E510-010 to calculate the degraded voltage relay tolerances has resulted in a lower minimum actuation point (3727 V) for the degraded voltage relay than used in the previous calculation (3741 V). This has resulted in a lower minimum 4160 V ES bus voltage that requires additional operator action under certain circumstances to ensure adequate voltage is maintained at the terminals of some safety equipment. However, the licensee has stated that manual operator action is not required to provide adequate voltage to important core cooling loads that start automatically at the onset of an accident. He has indicated that motors running during the early stages of an accident either pass the established voltage criteria or are considered to have sufficient thermal margin to operate until operator action is available to improve voltage.

The staff has reviewed the information provided by the licensee in the August 20, 1999, and February 18, 2000, letters and agrees with the licensee that this equipment will operate until operator action is available to improve voltage. Manual operator action, however, may be required to restore or maintain voltage in the long-term post-LOCA scenario, since the degraded voltage relays may not be adequate to protect the safety-related equipment if a degraded grid voltage event occurs while 480 V buses are heavily loaded with automatic plus manually applied loads.

In this regard alarms exist at the 480 V level to alert operators of low voltage conditions. The licensee states that Alarm Response Procedure B-2-4, “480 V ES Bus UV/OV,” and Abnormal Procedure 1203-41, “Low System (Grid) Voltage,” direct operators to take measures to improve voltage and ultimately directs them to transfer safety loads to the diesel generators if voltage cannot be improved. In the February 18, 2000, response to staff questions the licensee provided additional details regarding the compensatory measures operators are instructed to take to improve voltage in Abnormal Procedure 1203-41. The licensee also provided additional information in that letter regarding the capability of the 480 V alarm setpoint to alert operators to a low voltage problem. The staff has reviewed this information and finds that the 480 V low voltage alarms and operator responses are adequate to provide acceptable voltage to safety-related equipment in the long-term post-LOCA situation.

3.4 Reset Setpoint

The reset setpoint of the degraded voltage relays must be set so that it does not prematurely separate safety equipment from offsite power when the switchyard voltage is operating in the lower region of its normal range. The staff reviewed the treatment and discussion of this

subject in calculation C-1101-700-E510-010. Additional information on this subject was also provided by the licensee in the February 18, 2000, response to staff questions.

In this regard, the licensee has assumed two different switchyard minimum voltage values, depending on whether one or two offsite transformers are in service. When two transformers are in operation a switchyard voltage of 224.3 kV is used. This voltage is termed the "single contingency minimum expected voltage" and is the minimum grid voltage expected under a single contingency condition such as loss or unavailability of the TMI-1 generator. Calculation C-1101-700-E510-010 actually used a more limiting voltage of 223.3 kV in the two transformer cases in order to accommodate future changes in the single contingency minimum grid voltage. The Two Transformer Case 5 in the calculation demonstrated that a switchyard voltage of 223.3 kV was adequate to start and run all required motors during LOCA block load sequencing, and that final recovery voltage after sequencing was adequate to prevent separation of the 4 kV ES buses from offsite power. This is acceptable because the calculation demonstrated that the voltage would recover above the reset setpoint of the degraded voltage relays and would not separate from offsite power. The staff notes that the steady state running voltages for certain motors after the completion of block load sequencing was below the 90 percent terminal voltage screening criteria established by the licensee. This aspect of the calculation is acceptable because it is bounded by the manual operator action issue discussed above.

With regard to single transformer operation (one offsite power auxiliary transformer out of service) the licensee has assumed a minimum switchyard voltage value of 232 kV. This voltage is termed the "minimum expected voltage" and is used to define the lower limit of the normal operating range. The licensee states that it is based on the observation that voltages lower than this occur less than 1 percent of the time. The Single Transformer Case 6 in Calculation C-1101-700-E510-010 demonstrates that, with a switchyard voltage of 232 kV, ES bus voltage will recover and remain above the maximum degraded voltage relay reset setting following LOCA block load sequencing. This is acceptable because separation of offsite power will not occur for this accident scenario. The staff notes that the steady state running voltages for certain motors after the completion of block load sequencing was below the 90-percent terminal voltage screening criteria established by the licensee. This aspect of the calculation is acceptable because it is bounded by the manual operator action issue discussed above.

Calculation C-1101-700-E510-010 evaluated an additional case relative to a minimum switchyard voltage of 232 kV. Case 3 in the calculation determined the maximum balance of plant (BOP) and ES bus loading permissible during normal plant operation with a switchyard voltage of 232 kV; such that, following a loss of one auxiliary transformer, the resulting fast transfer of BOP loads to the remaining auxiliary transformer will not cause actuation of the degraded voltage relays (which would otherwise separate the ES loads connected to that transformer from offsite power). In addition to the maximum permissible loading at a switchyard voltage of 232 kV, the calculation also determined the maximum permissible loading at switchyard voltages of 228 kV, 230 kV, and 232.4 kV. The values were plotted on a chart which has been included in abnormal procedure 1203-41. The procedure directs operators to the chart when they have an alarm or indication of switchyard voltage less than 232.4 kV. If the operators determine that plant loading is in the unacceptable region of the chart, they are directed to reduce loading. If they are unsuccessful in reducing loading to within the acceptable region, the procedure ultimately directs them to the TMI TSs. The staff finds these controls acceptable given that they will minimize the likelihood that a loss of a single auxiliary

transformer will result in total loss-of-offsite power to the safety loads due to the actuation of the degraded voltage protection.

At TMI-1, the transformer taps on the two offsite power auxiliary transformers are manually changed for shutdown in order to avoid the overvoltage conditions that could potentially occur during lightly loaded plant shutdown modes. During these operations the entire plant auxiliary load is placed on a single transformer to permit the tap change on the unloaded transformer. Case 9 in Calculation C-1101-700-E510-010 demonstrated that grid separation could occur during tap change operations with the simultaneous occurrence of maximum positive degraded voltage relay error, low switchyard voltage (232 kV), and plant loading above 41,876 kW. The staff asked the licensee what controls were in place during the tap change evolution to control plant loading. The licensee responded in its April 19, 2000, letter, that operating procedure OP-1102-2, “Plant Startup,” Enclosure 1, “Plant Precritical Check List,” requires that the tap be set for power operation before the reactor start-up criticality. He indicated that this ensures that the secondary load will not include the secondary pumping power and ensures that the electrical system is ready to support criticality and power operations. For the opposite evolution, the licensee stated that operating procedure OP-1102-11, “Plant Cooldown,” begins the process of changing taps to the shutdown position about the time the plant is going on Decay Heat Removal (240F). He stated that at this point electrical load has significantly reduced such that over-voltage conditions are of greater concern than undervoltage conditions. The staff finds these controls acceptable since they require the tap change during periods of relatively low plant electrical loading.

3.5 Post-trip Switchyard Voltage

An accident event at a nuclear plant will result in tripping and separation of the plant generator from the surrounding electrical grid. If the generator was supporting the voltage in the area, and no additional voltage support is immediately available, the loss of the generator will result in a reduction of voltage at the switchyard to which the generator was connected. The plant offsite power sources connected to the switchyard will see this voltage reduction and if it is low enough, the combination of the low voltage and plant electrical loading associated with the event could cause actuation of the degraded voltage protection and transfer of the safety loads from offsite power to the emergency diesel generators. Cases 5 and 6 in Calculation C-1101-700-E510-010 discussed above calculated that, for two-transformer operation and single-transformer operation at TMI-1, degraded voltage actuation might occur for such a case at a switchyard voltage less than 223.3 kV and 232 kV respectively.

The staff questioned the licensee about how the plant operators would normally determine whether the plant were operating in a region of post-trip acceptable switchyard voltage, since this cannot be determined from a simple reading of switchyard voltage when TMI-1 is helping to support that voltage. The licensee responded in its letter dated April 19, 2000, that a protocol has been established with PJM (Pennsylvania, Jersey, Maryland) Interconnection, LLC, which established a calculated post contingency (unit trip or loss of other major grid facility) low limit voltage alarm of 223.3 kV. The licensee stated that the GPUE (GPU Energy) Transmissions Systems Operations Dispatcher will notify the TMI-1 control room operators if this alarm condition occurs.

The licensee also indicated that the TMI-1 Low System (Grid) Voltage Procedure (1203-41) will be revised to provide appropriate TMI-1 operator response for the Post Contingency (TMI-1 trip only) low limit alarm.

The staff indicated to the licensee that, in addition to the 223.3 kV post-contingency alarm which is appropriate for two-transformer operation, an alarm should also be established at 232 kV when TMI-1 is being operated with only one transformer. The licensee indicated that this would be done, and the staff subsequently reviewed the revised version of abnormal procedure 1203-41 and found that it does refer to a PJM post contingency alarm setpoint of 232 kV for single auxiliary transformer operation. This aspect of the post-trip switchyard voltage issue is therefore, acceptable.

The staff also spoke to the licensee about the need to establish TMI-1 TS requirements and associated actions for the post-contingency alarm condition. The TS is necessary because the TMI-1 TSs do not currently have an action that addresses the inoperability of both required offsite power sources (the case for the post-contingency alarm condition). In a typical plant TS, if a limiting condition of operation such as this is not met and there is no associated action statement that addresses it, a separate TS requirement (typically TS 3.0.3) requires that the plant begin to be shut down within an hour. The comparable TMI-1 specification requirement (TS 3.0.1), however, states that: “Applicability of these requirements is stated in the individual specifications.” The licensee’s interpretation of this statement is that TS 3.0.1 only applies when it is specifically stated in the individual specifications. Because the electrical section of the TMI-1 TSs contains no such statement, the plant could be operated indefinitely with both offsite power sources inoperable as the result of inadequate post-trip switchyard voltage, without violating a TS requirement.

The licensee submitted the requested TS revision in a letter dated May 22, 2000. The revised TS submittal includes an additional requirement (TS 3.7.2.a(ii)) for the reactor to remain critical that: “The voltage on the 230 kV grid is sufficient to power safety-related ES loads, except as specified in Specification 3.7.2.h below.” Specification 3.7.2.h is a new specification that states:

“If it is determined that a trip of the Unit 1 generator, in conjunction with LOCA loading, will result in a loss-of-offsite power to Engineered Safeguards buses, the plant shall begin a power reduction within 24 hours and be in HOT SHUTDOWN in an additional 6 hours, except as provided in Specification 3.7.2.e above.”

Specification 3.7.2.e is an existing specification that requires separate actions (starting an emergency diesel generator) from those specified in 3.7.2.h, when Unit 1 is separated from the system while carrying its own auxiliaries, or if only one 230 kV line is in service.

A revised TS Bases was provided that discusses the relationship of the new specifications to plant conditions and the post-contingency voltage alarms, and discusses the responsibilities of the transmission system operator and TMI-1 operator. Additional minor editorial changes were also included with the revised submittal.

The 24-hour allowed action time in the new specification, before beginning a plant shutdown, is consistent with current TSs for loss of both offsite circuits and will allow sufficient time to re-configure the 230 kV system for improved voltage support consistent with the risk of this condition. The staff, therefore, finds this addition to the TMI-1 TSs to be 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. 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 67334) and (65 FR 35404). 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.

Principal Contributor: J. Lazevnick

Date: August 3, 2000

Three Mile Island Nuclear Station, Unit No. 1

cc:

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