February 24, 1997

Mr. James Knubel, Vice President
and Director - TMI-1
GPU Nuclear Corporation
P.O. Box 480
Middletown, PA 17057

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE RESOLUTION OF UNRESOLVED SAFETY ISSUE (USI) A-46 (GENERIC LEETER 87-02) AT THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1 (TAC NO. M69486)

Dear Mr. Knubel:

By letter dated May 17, 1995, GPU Nuclear Corporation (GPUN), submitted a plant-specific summary report documenting the results of the seismic walkdown evaluation performed to address USI A-46 at TMI-1. We have reviewed the summary report and determined that additional information is necessary in order to continue our review of your A ittals. Enclosed is the request for additional information.

Sincerely,

(Original Signed By)

Bart C. Buckley, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: As stated

cc w/enclosure: See next page

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

February 24, 1997

Mr. James Knubel, Vice President
and Director - TMI-1
GPU Nuclear Corporation
P.O. Box 480
Middletown, PA 17057

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE RESOLUTION OF UNRESOLVED SAFETY ISSUE (USI) A-46 (GENERIC LEETER 87-02) AT THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1 (TAC NO. M69486)

Dear Mr. Knubel:

By letter dated May 17, 1995, GPU Nuclear Corporation (GPUN), submitted a plant-specific summary report documenting the results of the seismic walkdown evaluation performed to address USI A-46 at TMI-1. We have reviewed the summary report and determined that additional information is necessary in order to continue our review of your A-46 submittals. Enclosed is the request for additional information.

Sincerely,

Bart C. Buckley

Bart C. Buckley, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

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Enclosure: As stated

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Three Mile Island Nuclear Station, Unit No. 1

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REQUEST FOR ADDITIONAL INFORMATION
Resolution of USI A-46 (Generic Letter 87-02)
Three Mile Island Unit 1

REFERENCE: Letter from T. Broughton (GPUN) to NRC, dated May 17, 1995, "Three Mile USI A-46 Seismic Evaluation Report, (EQE Report No. 42105-R-002, dated May 11, 1995)."

1. On Page 10, the report* mentions that the SSEL [Safe Shutdown Equipment List] contains 679 components of which 658 components were evaluated during the walk down to verify their seismic adequacy. Provide information to show how the remaining 21 components were verified for seismic adequacy.

2. On Page 13 of the report, it is stated that as a deviation from the GIP, the TMI Seismic Capability Engineers (SCEs) did not sign the Screening Verification Data Sheets (SVDS) but signed a cover sheet with a statement that "they agree with the data in the SVDS package that they prepared." But, the SVDS included in Appendix H does not have a signature on any page. Submit the missing signed cover sheet(s) that would show the SCEs agreement on SVDS.

3. Item 9 on Page 21 of the report did not include in the SSEL those equipment items which (if failed during and after an SSE), were postulated to fail in the desired position. However, a malfunction of the control devices of such equipment can fail the equipment in an undesirable state. Therefore, show with examples that the control devices of such equipment were included in the SSEL.

4. In reference to Item 4, Section 2.1.1.2, Page 22 of the report, the structural integrity of equipment was not considered as a failure mode (e.g., rupture of a valve). Since this assumption was TMI plant-specific, provide a list of all cases where the structural integrity was not considered as a failure mode, and explain how the equipment functionality was verified for those cases so that the impact of this assumption can be evaluated.

5. Item 5 on Page 23 indicates that "inherently rugged" equipment types include "pressure and temperature gauges, flow elements and other items defined in the GIP." However, the GIP (Section 3.3.5) does not include the temperature gauges and flow elements, nor does it list any items other than the valves already included in the TMI report. List all equipment types that were considered "inherently rugged," and for those items which were not listed in the GIP, provide information to show the seismic adequacy of equipment including their mountings.

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*Unless otherwise noted, "the report" means the "Reference" described above.

6. Regarding operator action, very high reliance has been placed on operators' ability for recovery of many seismically vulnerable items within a short period of time. Examples are spread throughout the report, of which the following are a few:

   - Page 25, Section 2.2.1, Second Paragraph
     "Breakers to the control rods can be tripped from the control room or locally [underline added] at the switchgear."

   - Page 39, Last Sentence
     "The control room operators can manually align NSCCW cooling..."

   - Page 41
     "Doors will be opened and diesel radiator fans will be used ... within 25 minutes of loss of ventilation."

   - Page 67, Fourth Bullet
     "Resetting seal-in relays."

   Any one or a few of these operations may easily be performed; but, it is questionable whether all of the cited operator actions can be performed reliably within the short available period of time *given* the potential for absence of electrical light and egress that could have been created after an SSE-type earthquake as a result of falling or failure of non-seismic components on seismic components. Provide information to show that the assumed recovery of all malfunctions/ damages within the needed period can be accomplished in the plant condition after an SSE-type earthquake (see also Item Nos. 9 and 10).

7. Regarding the normal make-up flow path, the report on Page 26 states that "since make-up pump MU-P-1B is selected for *normal* plant operation, the make-up pump MU-P-1B and valve MU-V-16B are selected as the *primary* path for long-term reactivity control function." Then it states, "the *normal* plant make-up path is through the normally closed make-up valve MU-V-217 ..." and further continues, "the *normal* make-up flow path is designated as the *optional* path ..." Clearly state which one of the two is the normal make-up flow path (i.e., through MU-V-16B or MU-V-217) and whether the normal make-up flow path is primary or optional. Verify and confirm with explanation that this clarification will not alter equipment selection on the SSEL.

8. Regarding the 4160-volt system, the report on Page 35 states that only buses 1D and 1E are Class 1E implying that the other buses were probably not verified for seismic adequacy. If so, provide information to show how potential electrical and structural interaction among these adjacent class 1E and non-class 1E buses during a seismic event were considered (e.g., falling or failure of non-seismic components on seismic components causing structural damage, electrical short, etc.).

9. In Section 2.2.5.7 on Page 40 and Section 2.2.5.11 on Page 42 of the report, it was assumed that portable components would be available for use following an SSE. Provide information to demonstrate that the

portable components (i) will not be damaged during the SSE in their respective locations and (ii) would be available within the required duration (e.g., four hours in one case) in the aftermath of a major earthquake (see also Item No. 6).

10. In Section 2.4 on Page 52, the report states that the operator "will eventually be directed to the use of equipment and instruments on the SSEL even though the operator may have first tried to shut down using equipment not included in the SSEL." This may delay the operator action further if ultimately the A-46 shutdown path is to be followed. Provide information to demonstrate that this delay in operator action will not compromise safety and was considered toward on time recovery from potential malfunctions, especially, in light of RAI Item No 6.

11. For cabinets and panels containing relays, the report in Section 3.5.1 on Page 65 states that "a relay evaluation of these cabinets and panels is not required." It is not clear what is meant by "a relay evaluation" of a cabinet. Have the safety-significant relays been evaluated? Have the cabinets containing these relays been evaluated? If both of these answers are affirmative, clarify what "is not required" then. If any of the answers are negative, provide information to show how the seismic adequacy of relays including the housing cabinets was verified.

12. The report on Page 74, second paragraph states that "anchor bolt tightness checks were performed in accordance with the GIP where tightness checks were determined to be required." This implies that the GIP criteria were used to perform the bolt tightness check and prior to that another set of criteria was used to determine whether such a check is required. Specify the criteria that were used to determine whether an anchor bolt tightness check is required and who made the determination.

13. Regarding analysis of outliers for 43 mechanical and electrical components on Page 74, fourth paragraph, the report mentions that as of the report issue date, 10 calculations [were] still in progress. Confirm that all calculations have been completed and the outliers (43) are all resolved and found acceptable.

14. Regarding the Third Party Review, the report on Page 82, Section 4.6 states that "the balance of Dr. Stevenson's comments were ... satisfactorily resolved by further analysis." Did Dr. Stevenson concur with the resolution of his comments? Provide a more-descriptive response to Dr. Stevenson's observations in Appendix L so that an independent evaluation can be made.

15. Regarding the small, wall-mounted boxes identified on Page 82 (Item 5) clarify whether these are needed for safe shutdown. If so, justify why they were not included in the safe shutdown list.

16. For the SSEL items that were judged to be strong enough to not require a seismic verification (e.g., manual valves), confirm that there was a site inspection performed (on all of them) to verify their availability.

This question is asked in light of the missing hand wheel for a valve (e.g., Page B4 of the report, Item 3).

17. The integer designation of functional class provided on Page B8 in Appendix B of the report, does not seem to be consistent with the decimal designation on the tables (Column 17) in Appendices C and D. Provide clarification or missing information.

18. In Appendix F, Page 9 the report mentions that for relay EHC-LV (Contact VCS 840), the manufacturer/model number was not available. Provide the missing information or show how the relay was evaluated without the model number.

19. The following questions pertain to Appendix J on meeting the intent of caveats:

    a) It is not clear from the description provided in the report as to what the deviations were in definitive terms (e.g., size, distance, configurations, loading, stresses, etc.) that did not meet the words of the caveats, and what justifications were used in definitive or quantitative terms that met the intent of the caveats. In order to establish an understanding of the pervasiveness (roughly about three hundred caveats for which wordings were not met) and the severity of this issue, it is requested that adequate data be provided for the following sample equipment items identified in Appendix J to the report (called "Line Number" in the report) that will enable a complete understanding of the deviations and justification for their acceptance: Line Numbers: 1114, 1192, 1281, 1525, 1680, 1756, 1838, 1970, 2013, 2089, 2121, 2129, 2332, 2452, 2496.

    b) The GIP caveats require verification of anchor bolt tightness check in applicable and selected cases, not withstanding the presence or absence of a QA program at the site. Explain why the caveats on anchor bolt tightness were judged to have met the GIP for TMI just because there is a QA program at TMI (Page J15, Justification Code 11) even though no site verification of anchor bolt tightness was made for certain items.

    c) From the information provided in the report, it appears that in some cases the TMI equipment conditions do not meet the caveats although additional data, such as analysis and testing data, modifications of equipment, or other means can very well demonstrate adequacy of the particular equipment item. However, according to GIP-2, in such a case, an item should be considered an "outlier" for not satisfying the caveats. Provide justification as to why equipment items requiring additional analysis or data, or modifications were not listed as outliers. For example, potential candidates are the description codes 6, 19 and 22, and justification codes 3, 18 and 26 for equipment items in Appendix J.

d) Explain how the description code 21 (i.e., "Pump has radial bearing") applies to I&C devices (e.g., Line Numbers 2255 and 2256).

20. The following questions pertain to the outliers discussed in Appendix K:

a) The brief discussion of the description and resolution of outliers included in Appendix K does not provide adequate information in characterizing the deficiencies and for evaluating acceptability of the proposed/implemented modifications. This observation is applicable to over 400 caveats listed in Appendix K. As described in the GIP, it is expected that the deficiencies and modifications have been *thoroughly* documented to allow an independent review. To illustrate thoroughness of such documentation, submit complete information that led to the resolution of the outliers for the following equipment items (called "Line Numbers"). Any deficiencies including field information (e.g., configuration, size, design, etc.) and analysis/testing data should also be included. Line Numbers: 1001, 1010, 1032, 1043, 1045, 1051, 1060, 1098, 1114, 1324, and 1383, and Raceways CB-338-1, CB-338-6 and TB 355-1.

b) For Line Number 1007, the outlier resolution code (No. 3) refers to the relay report. However, the relay list included in Appendix D does not include Line Number 1007 (Page 1). Provide the missing information or explain how the essential relays in Line Number 1007 were evaluated.

c) For Line Numbers 2371 through 2385, no resolution approach was identified. Explain how these outlier items were or will be resolved.

d) For several outlier relays, the outlier code (R3) specified: "To be resolved or replaced during 12R." For relays that are not being replaced, the resolution code does not provide useful information (i.e., the resolution is to resolve). Explain what actions are being taken to resolve those outlier relays.

e) For Line Number 2177, the observation is that the relay was upside down, and for resolution, the report refers to the relay report which does not seem to include any further information on the subject. Provide the missing information or explain how the outlier was resolved.

21. The report mentions that data outside the GIP were used to evaluate the GIP items (e.g., Page J15, Item 3) and items outside the GIP (i.e., Equipment Class O). Describe these data and how they were used for seismic verification of TMI equipment.

22. Section 4.3.2 of the report states that the safety related vertical tanks are as follows: 3 large flat-bottom vertical tanks, 8 vertical tanks with legs, and 4 vertical tanks on steel base skirts. Provide

screening evaluation work sheets (SEWS-Form similar to those on pg.G.21-1 of GIP-2) for these 15 tanks, and a detailed analysis of the condensate storage tank (CST, 1A) to illustrate how the outlier evaluation was performed for the vertical tanks.

23. Section 4.3.3 relating to the review of cable and conduit raceways, states (middle of page 79 of 84), "anchorage is judged acceptable for the 'other' seismic performance concerns." Provide a summary description of how the raceway support anchorages were sampled and judged acceptable. Provide typical work sheets (similar to Tables 8-1, 8-2, 8-3 of GIP-2) for the raceway runs in containment building, diesel generator building and auxiliary building (one run in each of the buildings).

24. The fire barriers attached to the essential raceway systems contribute appreciably to the vertical and horizontal loadings on the raceways, their supports, and anchorages under seismic events. Provide information related to the inclusion of the fire barrier weight in the seismic calculations of the raceway systems. This information may be provided on the relevant work sheets requested in question 23.

25. Provide information related to the method of resolving comments from the third party inspection, specifically, the concerns related to item (5) in Appendix L regarding Waste Evaporator Cooler, and Dr. Stevenson's "Summary Remark" regarding the determination of response frequencies of components.

26. *Referring to the in-structure response spectra provided in your 120-day-response to the NRC's request in Supplement No. 1 to Generic Letter (GL) 87-02, dated May 22, 1992, the following information is requested*:

    a. Identify structure(s) which have in-structure response spectra (5% critical damping) for elevations within 40-feet above the effective grade, which are higher in amplitude than 1.5 times the SQUG Bounding Spectrum.

    b. With respect to the comparison of equipment seismic capacity and seismic demand, indicate which method in Table 4-1 of GIP-2 was used to evaluate the seismic adequacy for equipment installed on the corresponding floors in the structure(s) identified in Item (a) above. If you have elected to use method A in Table 4-1 of the GIP-2, provide a technical justification for not using the in-structure response spectra provided in your 120-day-response. It appears that some A-46 licensees are making an incorrect comparison between their plant's safe shutdown earthquake (SSE) ground motion response spectrum and the SQUG Bounding Spectrum. The SSE ground motion response spectrum for most nuclear power plants is defined at the plant foundation level. The SQUG Bounding Spectrum is defined at the free field ground surface. For plants located at deep soil or rock sites, there may not be a significant difference between the ground motion amplitudes at the

foundation level and those at the ground surface. However, for sites where a structure is founded on shallow soil, the amplification of the ground motion from the foundation level to the ground surface may be significant.

c. For the structure(s) identified in Item (a) above, provide the in-structure response spectra designated according to the height above the effective grade. If the in-structure response spectra identified in the 120-day-response to Supplement No. 1 to GL 87-02 was not used, provide the response spectra that were actually used to verify the seismic adequacy of equipment within the structures identified in Item (a) above. Also, provide a comparison of these spectra to 1.5 times the Bounding Spectrum.