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July 7, 1995  
C311-95-2265

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Dear Sir:

Subject: Three Mile Island Nuclear Station, Unit I (TMI-1)  
Operating License No. DPR-50  
Docket No. 50-289  
Response to the May 26, 1995 Response to the Follow-up to  
the Request for Additional Information Regarding Generic  
Letter 92-08 (TAC No. M85615)

The purpose of this letter is to submit, as Attachment 1, the GPU Nuclear response to the May 26, 1995 Response to the Follow-up to the Request for Additional Information Regarding Generic Letter 92-08 (TAC No. M85615).

Sincerely,

*T. G. Broughton*  
for T. G. Broughton  
Vice President and Director, TMI

WGH

Attachments

cc: Administrator, Region I  
TMI Senior Resident Inspector  
TMI Senior NRC Project Manager  
NEI - Alex Marion  
File 94032

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Response to the May 26, 1995 Response to the Follow-up to the  
Request for Additional Information Regarding Generic Letter 92-08

1. Section 1.0, paragraph 1 (all references to sections and paragraphs are to the May 25, 1995 NRC letter), requests that GPUN submit its schedules for completing corrective actions necessary for the resolution of the Thermo-Lag issues at Three Mile Island.

Response GPUN plans to make use of exemptions and install modifications to resolve the Thermo-Lag fire barrier issues. The NRC Integrated Schedule will identify schedules leading to completion of corrective actions expected to resolve the Thermo-Lag issues by the end of December 1999. This schedule is based upon submitting a description of planned modifications and exemption requests by December 1996 and obtaining NRC approval by mid-1997.

2. In section 1.0, paragraph 2, it was requested that "the licensee should submit additional information concerning the application of fire modeling and PSA to the resolution of the Thermo-Lag issue at TMI-1".

Response GPU Nuclear is a participant in the EPRI Tailored Collaboration effort which has developed methods for evaluating Cable Wrap Fire Barrier Performance. GPUN representatives were in attendance at the detailed presentation made to the NRC staff on April 25, 1995 by Florida Power Corporation on the development and use of these tools. GPUN intends to make use of two of the three tools (Fire Hazard Tool and Performance Rating Tool) to provide an additional and quantifiable perspective to augment the traditional qualitative approach for exemption requests and strengthen the basis for exemption requests where more complex fire hazards analysis problems exist. GPUN does not intend to use fire modelling as the sole basis for an exemption request. Fire modelling provides useful insights by creating localized fire scenarios because these types of scenarios are more realistic. When put into perspective with the traditional qualitative approach of assuming consumption of all combustibles in an area, fire modelling assists in judging the adequacy of fire protection features including Thermo-Lag cable raceways. The detailed methodology for use of fire modelling will be included as part of our planned submittals currently scheduled for December 31, 1996.

Note that GPUN is not currently planning to use PSA as a supporting basis for exemptions associated with resolution of the Thermo-Lag issue.

3. Section 2.0, paragraph 2, requests information describing the specific tests and analyses to be performed on the Thermo-Lag materials installed at TMI and submittal of the scheduled actions verifying those materials. In section 2.0, paragraph 5, the NRC staff requested that the licensee describe the methodology that will be used to determine the sample size of Thermo-Lag materials to be considered is sufficient to assess the total in-plant population.

Response The following discussion pertains to the two paragraphs identified above. GPUN is a participant in the NEI sponsored chemical test program which is intended to establish similarity between the materials previously tested as part of the NEI fire barrier test program and the materials installed at TMI-1. Since our last letter on this issue, we have submitted Thermo-Lag samples for analysis consistent with NEI's instructions. The preliminary analyses' results reported by NUCON show that the chemical composition of the TMI-1 samples are consistent with those materials tested and used in the NEI fire barrier test program. GPUN will submit a report addressing the significance of sample size and site specific results along with industry wide results being coordinated by NEI by November 1, 1995. This date is contingent on NEI releasing industry wide sampling results by end of July, 1995.

Knowledge of the industry wide results will provide a basis to confirm applicability of generic industry data with respect to fire endurance capability, combustibility and flame spread rating (see also our clarification with respect to combustibility and flame spread rating). In addition to the aforementioned characteristics, GPUN is currently independently evaluating the mechanical properties of Thermo-Lag. This evaluation will be included with the chemical test results in the November 1, 1995 report.

Based on the industry wide sampling conducted by NEI, GPUN expects that the consistency of the material's chemical composition will be established. The details will also be provided in the November 1, 1995 report.

4. Section 2.0, paragraph 3, reiterates that "In the RAIs the staff stated that some of the important installation parameters cannot be determined by plant walkdowns or by comparing installed barriers with installation records or procedures used to construct the barriers. These parameters can only be verified by detailed examination such as disassembling...."

Response The December 29, 1994 RAI stated that "on the basis of its inspections of Thermo-Lag fire barriers and industry experience finding installation defects during destructive examinations, the staff has concluded that some of the installation parameters ... cannot be verified or determined...." GPUN has concluded that, with the exception of one fire barrier parameter, the dimensional parameters of the materials and the construction parameters are verifiable through comprehensive receipt inspection and installation documentation.

GPU Nuclear established an Inspection/Surveillance Plan, R-6111-2075, for the receipt inspection of Thermo-Lag Insulation Preshaped Conduit Sections, Prefabricated Panels, Flexi-Blanket, and Trowel Grade Subliming Material. This plan was originally issued on June 26, 1986 to support the installation project. Subsequent revisions were made to refine the inspection requirements due to the unacceptable quality of material initially received. The Inspection/Surveillance Plan provided the On Site

GPU Nuclear Quality Control Receipt Inspector with inspection requirements pertaining to major issues. The major issues were 1) Physical Damage and Manufacturing Deviations, 2) Documentation, and 3) Sample Inspection. Each item is addressed below.

1. Physical Damage and Manufacturing Deviations:

a. The following criteria were used for Preshaped Conduit Sections and Prefabricated Panels.

- i. There was to be no crushing or separation of skin from the inner lining.
- ii. Coatings (on all surfaces) were not to appear to be chipped or peeling and were not to be separated from inner insulation. Coatings could be repaired in accordance with manufacturer's instructions. On site repair was performed if the repair was minor, otherwise the material was returned to the vendor.

For three hour rated conduit sections a split in the outside skin greater than 1" long was cause for rejection. A split in the outside skin less than this could and was repaired at TMI in accordance with manufacturer's instructions.

iii. Thickness was to be as follows:

- a. Half Hour Rated - 0.25" to 0.45"
- b. One Hour Rated - 0.625 +/- 0.125"
- c. Three Hour Rated - 1.250 +/- 0.250"

The measurements taken on all preformed conduit items were 3 measurements on each edge of the half round preshaped conduit and 3 measurements down the center (a total of 9 measurements). Thickness measurements for each panel were taken at 7 areas at each side and 6 measurements down the center (a total of 20 measurements per panel).

iv. Weight of material:

A maximum weight limit was applied to control barrier installation within the limits of seismic analyses and upgrades on raceway supports. The maximum weight of a 4' x 6.5' Panel was to be as follows:

- a. Half Hour Rated - 70 pounds
- b. One Hour Rated - 91 pounds
- c. Three Hour Rated - 182 pounds

Note that thickness and weight relate to density and the presence of voids. A maximum weight limit was used at TMI-1 to bound the seismic qualification of hangers supporting raceways to be protected by Thermo-Lag.

There was no minimum panel weight established by either Thermal Science Inc. or GPUN when the TMI-1 installation was performed in 1986. Provided no visible characteristic caused a panel to be rejected, it was weighed and measured. The weights as recorded by GPUN were found to be within a few pounds of the maximum allowed. Based on individual panel weights and dimensional measurements, distribution of the material (density) over an individual panel was found to be consistent; as it was when comparing panel to panel. Thus absent visible voids, panels with nominal weight and dimensional parameters were considered by GPUN to be within the limits of tested panels.

- v. Voids in exposed cross-sectional surfaces were not to result in the material being less than the minimum thickness in depth or the width of the void being one half the minimum thickness. To clarify this requirement, if the Thermo-Lag item was One Hour material, the thickness of the Thermo-Lag was required to be no less than 0.5". The void could not reduce the thickness of the material less than the 0.5". The Inspector also verified that the width of the void could not be wider than 0.25". Plant Quality Control Inspectors also verified the absence of voids during their inspection of the barrier installations. This verification is documented on the individual Quality Assurance Modifications/Operations Quality Control Plant Inspection Report for each Fire Barrier Envelop system.
- b. The following criteria were used for Trowel Grade Subliming Material.
  - i. A temperature strip chart recorder was sent with each shipment. Temperature readings were to be between 32 degrees F and 100 degrees F. If temperature limits were exceeded, a pH check was performed. An acceptable pH reading is 8.0 to 10.5.
  - ii. The 6 month shelf life was verified to ensure that once received, the trowel grade material could be installed in TMI.
- c. The following criterion was used for Flexi-Blanket (Thermo-Lag 330-660) Material.
  - i. There was to be no obvious physical damage - punctures, tears, etc.



2. Documentation:

- a. Verification that the documentation required by the Material Specification had been received and accepted by Engineering.
- b. Verification that the Manufacturer Application Procedures were included with the shipment and were acceptable to Engineering.
- c. Verification that the GPU Nuclear Manufacturing Assurance Inspector's report on Thermo-Lag items inspected at the TSI factory were included with the shipment.

3. Sample Inspection:

- a. Material that was inspected at the factory by GPU Nuclear Manufacturing Assurance Inspector, was checked by an initial 10% sample on-site inspection performed utilizing the Inspection/Surveillance Plan. If a sufficient confidence level was attained (100% acceptance) a receipt inspection for shipping damage and completion of purchase order requirements was adequate. This option was never implemented due to problems noted with the sampling, 100% on-site receipt inspection of the material was established and maintained for the duration of the project.

This Inspection/Surveillance Plan was established for the on-site GPU Nuclear Quality Control Receipt Inspector to use in inspecting shipments from Thermal Science Incorporated. When one of the first shipments that was received at TMI was returned due to inconsistent material quality, a GPU Nuclear Manufacturing Assurance Inspector was assigned to inspect Thermo-Lag material at the TSI factory. The Inspection/Surveillance Plan was then utilized by the Manufacturing Assurance Inspector also. The Manufacturing Assurance Inspector inspected the Thermo-Lag items prior to shipment to TMI. In addition, each Preshaped Conduit Section half was fitted to the corresponding conduit size to verify proper fit. Thermo-Lag item rejection was based on voids, excessive weight and/or thickness, improper shape (out of round), and improper fit up of Preshaped Conduit Sections. The rate of rejection of the Thermo-Lag panels was approximately 33% and the rate of rejection of the Preshaped Conduit Sections was approximately 30%. The rate of rejection of the Thermo-Lag material at the TSI factory was eventually reduced by the GPU Nuclear controls to less than 4%. At that point the GPU Nuclear Manufacturing Assurance Inspector was no longer required to inspect shipments at the TSI factory prior to shipment to TMI. The 100% On Site receipt inspection of Thermo-Lag items remained in effect by GPU Nuclear Quality Control Receipt Inspectors.

The controls established by GPU Nuclear on Thermal Science Incorporated (TSI) shipments and material ensured that only acceptable Thermo-Lag items were installed at TMI. The effort made assumed that if weight and thickness was acceptable, then material density was acceptable. An acceptable material density takes into account the presence of voids of

an acceptable quantity. During the fabrication of the Fire Barrier Envelop System in the plant, any voids that were exposed after cutting the Thermo-Lag material were repaired prior to assembly. GPUN has concluded that the presence of excessive voids, inadequate material thickness, or inadequate material weight or density has been precluded by the extensive receipt and installation checks employed by GPUN.

GPUN is confident in the installation process employed at TMI-1 since TSI personnel trained GPUN and Gilbert Commonwealth engineers, GPUN project managers, GPUN and Catalytic foremen, GPUN Quality Control and available GPUN and Catalytic craft personnel in the techniques used to assure quality barrier installation. GPUN handled the activity as a special process. Procedures for installation, repair, QC inspection and surveillance and joint design sketches were developed based on TMI and Oyster Creek experience and the manufacturer's requirements. Installation was performed with approved material by trained GPUN and Catalytic personnel under GPUN supervision and inspected by trained GPUN inspectors. No TSI personnel were involved in the design or installation of Thermo-Lag fire barriers at TMI-1.

It is GPUN's position that all but one of the barrier parameters can be determined by the use of the established quality control applied to both the procurement and installation of the fire barrier envelop systems. The one parameter that cannot be determined is the type of joint used and whether the joint was prebuttered during the installation of the envelop system.

As a result of the plant walkdown barrier inspections, personnel were not able to confirm the placement of bands relative to joints below additional preshaped conduit sections installed to overlap the joints of preshaped conduit sections covering conduit and conduit couplings. Some preshaped conduit sections installed over the conduit couplings will be removed to determine the proper spacing of bands to the joint prior to November 1995. This will be done at random on a number of samples to verify the conformance of the installation to the installation documents and procedures. Simultaneously, an inspection of the joint type will also be performed to verify that the joints were pre-buttered as required by the installation documents during the initial installation of the fire barrier envelop systems.

This action is appropriate and sufficient for verification of the important parameters which could not be verified by field walkdowns. GPUN has concluded that detailed examination of parameters which rely on existing procurement and installation records is a valid means of establishing the installed configuration of Thermo-Lag raceways at TMI-1 and that no additional examinations beyond those already noted above need to be performed.

5. Section 2, paragraph 4, requested information as requested in the December 29, 1994 RAI regarding items 1.a(6) and (7) combustibility and

flame spread rating respectively.

Response The NUMARC Fire Test Program included ASTM E1321 (lateral flame spread) and ASTM E1354 (heat of combustion) tests performed independently at Underwriter's Laboratories. The results of these tests were provided to the NRC as attachments to NUMARC's letter of October 12, 1993 as supporting documentation for the Thermo-Lag 330-1 Combustibility Evaluation Methodology Plant Screening Guide. The NRC has recently recognized and referenced the results of this testing in enclosure 2, to Attachment 1, of Information Notice 95-27; the NRC's review of the aforementioned guide. Although NRC has not endorsed the methodology presented in the NEI guide, neither the specific testing method nor the testing results have been in question. GPUN believes the combustibility and flame spread test results are adequate for establishing these two material properties. Assuming wide spread chemical testing provides assurance of chemical consistency, those test results can be applied to Thermo-Lag installed at TMI-1 and combustibility and flame spread need not be reconfirmed by plant specific testing.

GPUN will reassess the need for TMI-1 specific combustibility and flame spread testing should the NEI sponsored consistency program prove unsuccessful in demonstrating chemical consistency.

Note that GPUN recognized the combustibility of Thermo-Lag and in 1994 included the contribution of Thermo-Lag material as a portion of the combustible loading inventory maintained for the TMI-1 Fire Hazards Analysis Report. Thermo-Lag material is also considered as a combustible material for ongoing fire modeling evaluations where applicable.

6. Section 2.0, paragraph 6 referenced Section 2.d of the RAI and requested submittal "... of a written report confirming the completion of the verification effort and the results of the detailed examinations."

Section 2.d did not require a response within 90 days. Response to the section is dependent upon the completion of activities to gather and verify information prior to taking further actions.

In prior responses, GPUN has described its barrier parameter verification activities. The February 10, 1994 response to GL 92-08 stated that detailed walkdowns of installed Thermo-Lag barriers was being performed and that the walkdowns in 10 of the 19 fire areas containing 1 and 3 hour Thermo-Lag envelopes were complete at that time. That information was updated in the March 29, 1995 response to the RAI which stated that all fire zones have been walked down but Auxiliary Building Fire Zone 3 which is inaccessible during plant operation. Of the 900 elements to inspect, only six remain. Walkdown of this Fire Zone will be completed during an opportune outage period, no later than the completion date of the 11R outage (Fall 1995).



As a minimum, the actions requested in sections 1.d and 2.d of the December 1994 RAI will be taken to keep the staff informed. That effort will include: verification of TMI-1's Thermo-Lag material in the November 1, 1995 report and submittal of a written report confirming the completion of the verification effort regarding barrier parameters and the results of the detailed examinations of the barrier parameters which will be submitted in conjunction with our evaluation to demonstrate compliance with the regulations by December 31, 1996.