GPU Nuclear

GPU Nuclear Corporation
Route 441 South
P.O. Box 480
Middletown, Pennsylvania 17057-0480
(717) 944-7621
Writer's Direct Dial Number:

(717) 948-8005

May 25, 1995
C311-95-2226

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

Gentlemen:

Subject: Three Mile Island Nuclear Station, Unit I (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
10CFR50 Appendix R Sample Exemption Request
for Thermo-Lag Fire Barrier Raceway Systems

The purpose of this letter is to request an exemption from the provision of 10CFR50 Appendix R, subsection III.G.2.c that requires that an "enclosure and cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour fire rating" be provided.

This request applies specifically to the 15" long 9"x6" fire barrier raceway fabricated of Thermo-Lag 330 fire barrier material installed in Fire Zone 1 of the TMI-1 Intake Screen and Pumphouse (ISPH-FZ-1) to protect safe shutdown circuitry. Although the barrier under consideration is relatively small, its similarity to the more substantial and complicated barriers make it an appropriate choice for exercising the concepts and establishing the methodology to exempt additional barriers as warranted.

The enclosed exemption request (Enclosure A) and supporting fire hazards analysis were prepared by GPUN to justify use of this Thermo-Lag fire barrier with 48 minute fire rating as an acceptable alternate to the 1-hour rated barrier necessary to meet the requirements of Appendix R Section III.G.c. Special circumstances are present which allow Commission consideration of this request in that application of the regulation is not necessary to achieve the underlying purpose of the rule.

In developing this exemption request, GPUN compared installed plant barrier configurations with the industry tested configurations documented in the Nuclear Energy Institute (NEI) Application Guide. The results of the comparison were evaluated and barrier ratings were established for the Thermo-Lag fire barrier envelope configurations in this fire zone. The GPUN

A089
1/1

methodology for establishing barrier ratings has been documented in "Topical Report #94" which is provided as Enclosure B. Also contained in Enclosure B are the results of each fire barrier envelope review, the barrier rating determined and plans for modification to upgrade barriers. Upgrades will be effected on those barrier configurations where it has been determined through evaluation that compliance with Appendix R can practically be achieved. Following NRC review and approval of the exemption request, a schedule of necessary upgrades will be provided. Finally, Enclosure B identifies which barriers are the subject of an exemption request and the methodology used in performing a fire hazards analysis which serve as the basis for exemption request justification.

Although not employed by this submittal, future submittals addressing the remaining areas where Thermo-Lag is installed will make use of both the techniques used in justifying this initial submittal and the EPRI developed "Fire Hazard Tool" and "Performance Rating Tool". GPUN is a participant in the EPRI Tailored Collaboration effort which has developed the methods for evaluation of Cable Wrap Fire Barrier performance. GPUN representatives were in attendance at the detailed presentation made to the NRC staff on March 25, 1995 by Florida Power Corporation on the development and use of these tools. It is GPUN's opinion that these two EPRI tools provide an additional and quantifiable perspective to augment the basis for an exemption request and strengthen the basis for exemption requests where more complex fire hazard analysis problems exist.

GPUN does not consider use of the EPRI tools necessary to support the basis for this exemption since it does not present a complex analytical fire hazards problem. Thus, the exemption addressed by this submittal can be dealt with on the basis of a traditional qualitative approach. Effort on the GPUN submittal which will address the remaining Thermo-Lag installations at TMI-1 is proceeding. It will be based on this submittal and will incorporate use of the EPRI tools.

An expeditious review of this submittal is requested in order to support completion of the final submittal and initiation of detailed design work for modifications determined to be necessary to satisfactorily resolve the overall issue.

Sincerely,

T. G. Broughton
Vice President and Director, TMI

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

I. EXEMPTION REQUEST

The purpose of this submittal is to request, in accordance with the provisions of Title 10 of the Code of Federal Regulations section 50.12 (10CFR50.12), "Specific exemptions," an exemption for Three Mile Island Unit I (TMI-1) from provisions of subsection III.G.2.c of Appendix R to 10CFR50. The appendix sets forth certain fire protection features pertinent to satisfying Criterion 3 of Appendix A to Part 50. The subsection of Appendix R referenced above addresses specific requirements for the protection of safe shutdown capability against fire.

Subsection III.G.2.c requires that cables, equipment, and associated non-safety circuits of redundant trains of certain shutdown apparatus in the same fire area be enclosed in a 1-hour fire barrier and that, in addition, fire detectors and an automatic suppression system be installed. GPU Nuclear requests an exemption for TMI-1 from the requirements of subsection III.G.2.c utilizing Thermo-Lag as a barrier material for one 9" X 6" cable raceway detailed in Section II.D of this request currently requiring a 1-hour fire barrier as documented in GPU Nuclear Three Mile Island Unit No. 1 Fire Hazards Analysis Report (FHAR) No. 990-1745 Revision 15.

II. Basis

A. Background

Pursuant to 10CFR50.48(a), each operating nuclear power plant must have a plan to satisfy Criterion 3, "Fire Protection," of Appendix A to 10CFR50. Under the terms of 10CFR50.48(b), "Appendix R ... establishes fire protection features required to satisfy Criterion 3 of Appendix A ... with respect to certain generic issues. In particular, subsection III.G.2.c requires the following means of ensuring that one redundant train of a system necessary to achieve and maintain hot shutdown conditions is free of fire damage where both trains of that system are located in the same fire area:

"Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area".

B. Overview

Because of issues surrounding the validity of fire testing Thermo-Lag fire barriers for cable raceways, it has become necessary to re-establish the fire endurance rating of the aforementioned as installed 1-hour barriers. The methodology for establishing the fire endurance rating and the results are detailed in the attached Topical Report Number 94- Enclosure B. The barrier which does not have a 1-hour

fire endurance rating or Cable Qualification Rating as (defined in Enclosure B) is the subject of this exemption request.

The method for evaluating the acceptability of the barrier not having a 1-hour fire endurance rating is also detailed in Enclosure B.

C. Fire Area Description

Fire Zone ISPH-FZ-1

Features

Fire Zone ISPH-FZ-1 is located in the 1R Switchgear Area of the Intake Screen and Pump House at elevation 308'-0"(see Enclosure C). Zone dimensions are approximately 42 feet x 25 feet x 23 feet high. The zone boundaries consist of reinforced concrete walls, floor and ceiling. The north boundary adjacent to Fire Zone ISPH-FZ-2 is a 3-hour rated fire barrier with the exception of ventilated (passive) bus duct internals penetrating the barrier. All other penetrations in this wall are controlled and maintained with 3-hour rated fire seals. The roll-up door in this barrier is continuously maintained closed except when access is required. The east and south boundaries and the ceiling are not adjacent to any other plant areas. The floor is adjacent to the intake pit. The intake pit is not considered a fire zone or area as it is full of river water, has no combustible loading or potential ignition sources. The west boundary is adjacent to Fire Zone ISPH-FZ-3. Doorways have doors removed with exception of the roll-up door. The presence of an automatic wet pipe sprinkler system on both sides of boundaries adjacent to other fire zones is the basis for not maintaining these boundaries as full fire rated boundaries as documented in the TMI-1 FHAR. The aforementioned fire protection features are maintained by the TMI-1 Technical Specification surveillance program which means inoperability of any one feature (boundaries, detection, suppression) would require compensatory measures (ie. fire watches with frequency dependent upon the inoperable feature) until that feature is restored to an operable status.

Combustible Materials and Locations

The principal insitu combustible in this Fire Zone is cable insulation which is spread throughout the zone. Additional combustible materials contained within the zone include minor amounts of lube oil located in the area of the pumps plastics and normally present combustibles classified as transients as documented in the FHAR (ie. trash container in area is always assumed full).

The installed Thermo-Lag itself has been added to the combustible inventory in this Fire Zone. The overall fire loading is considered low, 14,755 BTU/Ft^2.

TMI-1 has administrative controls in place over transient combustibles and work in the plant in accordance with 10CFR50 Appendix R, Section III.K sections 1-8 as required by the NRC in the SER dated June 4, 1984. These controls require the total insitu plus allowable transient fire load in Fire Zone ISPH-FZ-1 (or cumulative load) to be half of that which would challenge the lowest rated fire barrier in the zone. For example, the allowable transient load is currently restricted to the difference between 40,000BTU/Ft^2 and the insitu load of 14,755 BTU/FT^2 or 25,245BTU/FT^2. 40,000BTU/FT^2 corresponds to a fire severity on the ASTM E-119 curve of 30 minutes or half of that which would be considered to challenge a one hour fire barrier.

The actual administrative limit on transient combustables in this zone will be based on the 48 minute (17,245BTU/FT^2) rating of the barrier which is the subject of this exemption. One half of the combustable fire loading (24 minutes) which would challenge this barrier will be used as the limit. This limit is documented in procedures that are both referenced in and implement the plant's fire protection program under a license condition. With a barrier rated at less than an hour, it will be necessary to lower the allowable transients to this fire zone in order to maintain compliance with Appendix R, Section III.K committments as discussed above. Additional compensatory measures would be required if transient loading exceeds the allowable load ie. fire watches, continuous manning, use of alternative materials.

Whether above or below the allowable transient load, consideration is given to the type of combustible material, the room's configuration and the location of the transient material in the room. Further, flammable liquids may not be left unattended and must also be in UL/FM approved containers. Combustible liquids must be in acceptable containers (UL/FM approved or original shipping containers such as a paint can which is DOT certified). TMI personnel perform frequent housekeeping inspections and any work involving combustibles is reviewed at daily meetings.

Fire Protection Features

Fire protection for this fire zone consists of an area wide automatic wet pipe sprinkler system and portable dry chemical and CO_2 extinguishers. In addition, a portable water extinguisher is located in adjacent fire zone ISPH-FZ-3 as shown on the attached Fire Area Layout Dwg. 1-FHA-046. Hose capability is also available from a yard hydrant located outside the building. An ionization smoke detection system will actuate alarms in the Control Room. Actual fire brigade drills allow a conservative

estimate of 25 minutes for the brigade to bring manual suppression to bear on a fire in this fire zone.

Safe Shutdown Circuits

The specific safe shutdown circuits protected by the Thermo-Lag fire barriers are not listed here but can be found in the TMI-1 FHAR. Since they have already been identified in the FHAR, they require fire barrier protection in order to insure that at least one redundant train of systems necessary to achieve and maintain hot shutdown conditions in Fire Zone ISPH-FZ-1 is protected to insure cable functionality in the event of a fire. Their function and TMI-1's safe shutdown path have already been identified as requiring protection by the TMI-1 FHAR. NRC review. Their specific function is not considered relevant to this evaluation.

D. Thermo-Lag Description

The following Thermo-Lag fire barrier is the subject of this exemption request.

Envelope No.	Type	Actual rtg	Cable Qual rtg	NEI Test
1SHD-FB05	9"X6" CABLETRAY	47 min	48 min	2-7

E. Evaluation

Fire Hazards Analysis

The fire loading in this fire zone of 14,755 BTU/Ft^2 corresponds to a fire severity on the ASTM E119 time-temperature curve of between 11 and 12 minutes assuming complete combustion of all combustibles in the fire zone. The cable qualification rating factor for the 9"x6" tray which considers the presence of an automatic suppression system ranges from 13 to 14. This fire barrier envelope is located on the south wall of this fire zone in a vertical cable tray. There are no cable trays located directly above or below this envelope; hence there is no exposed cable below the envelope to provide a sustained fire exposure to the envelope even if the automatic suppression system failed to function. It is reasonable to assume a lube oil fire due to lube oil leaking from a river water pump motor or a fire originating as a result of transients introduced into the zone could affect this envelope; however, a localized fire exposure of this nature is not judged to be any more severe than the conditions experienced in the ASTM E-119 test. This is derived from knowledge that the envelope is greater than 10 feet from the floor, the room height is approximately 23 feet and the overall volume of the room is substantial enough to dissipate the energy from a fire on the floor underneath the envelope. Therefore, the results of

the ASTM E-119 test have been used to assign a cable qualification rating of 48 minutes. The conditions of such a fire and its effect upon the envelope would not exceed the severity of an ASTM E-119 exposure on the same envelope. As stated previously, actual fire brigade drills provide a conservative estimate of 25 minutes upon detection of a fire to bring manual suppression to bear on a fire within this fire zone. This is significantly less than the rating of 48 minutes.

Because of the low fire loading and the presence of automatic suppression and detection, the rating factor is determined adequate to justify the fire endurance rating (Cable Qualification Rating) for the aforementioned raceway fire barrier. Further, the potential localized exposure to the barrier is not considered more severe than the exposure of the ASTM E-119 test if the automatic fire suppression system fails. The fire brigade can be expected to reach the zone and commence suppression activities within 25 minutes of detection of a fire. Therefore, a cable qualification rating of 48 minutes is adequate to protect the safe shutdown circuits inside the fire barrier envelope being evaluated.

GPU Nuclear concludes that the 9"X6" cable tray envelope with a fire endurance rating of 48 minutes (Cable Qualification Rating) is adequate given the fire hazards present in Fire Zone ISPH-FZ-1, control of transient combustibles and the "defense in depth" fire protection features in place. These include automatic fire detection and suppression as well as the ability of the plant fire brigade to bring to bear manual fire suppression in the fire zone. The safe shutdown circuits protected by the Thermo-Lag inside this raceway will therefore maintain their ability to perform their function in the event of a fire in Fire Zone ISPH-FZ-1.

F. Summary

The underlying purpose of the rule is to accomplish safe shutdown in the event of a single fire and maintain the plant in a safe condition. The TMI-1 FHAR requires fire barrier protection for the circuits currently protected by the 9"x6" cable tray in order to insure safe shutdown. This fire barrier has been evaluated to demonstrate that the protected circuits will remain functional for 48 minutes if subjected to fire conditions equivalent to that of an ASTM E-119 test. The fire hazards analysis results discussed above conclude that postulated fire severity is less than that experienced in an ASTM E-119 test. This, combined with adequate area wide detection, automatic suppression, fire brigade response and control of transient combustibles assure that the protected circuits will remain functional in the event of any single fire and therefore the plant will retain safe shutdown capability. Thus, the underlying purpose of the rule is satisfied. Therefore, the exemption from the requirement in 10CFR50 Appendix R, section III.G.2.c for the above mentioned fire barriers to have a fire endurance rating of 1-hour meets the special circumstances delineated in 10CFR50.12(a)(2) (iii), in that application of the regulation in this particular circumstance is

not necessary to achieve the underlying purpose of the rule since the above analysis demonstrates that a fire barrier rated less than 1-hour (48 minutes) meets the underlying purpose of the rule.