



**ENTERGY**

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**C. R. Hutchinson**

Vice President  
Operations  
Grand Gulf Nuclear Station

February 14, 1994

U.S. Nuclear Regulatory Commission  
Mail Stop P1-37  
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station  
Docket No. 50-416  
License No. NPF-29  
Response to NRC Letter Requesting Additional  
Information Regarding Generic Letter 92-08,  
"Thermo-Lag 330-1 Fire Barriers," Pursuant To  
10CFR50.54(f)

GNRO-94/00015

Gentlemen:

In your letter dated December 21, 1993, you requested additional information on the configurations and amounts of Thermo-Lag fire barriers installed in the plant and the cable loadings within particular Thermo-Lag configurations. You indicated that this information is necessary for the Staff's review of the NUMARC guidance for applying the test results to plant-specific barrier configurations and to identify configurations that are outside the scope of NUMARC's test program. Furthermore, you requested plans and schedules for resolving technical issues associated with Thermo-Lag configurations which are outside the scope of the NUMARC test program or found to be impractical to upgrade.

The enclosure to your letter consisted of seven sections requiring a written response within 45 days from receipt of the letter. The responses to these sections are provided by Entergy Operations, Inc. for the Grand Gulf Nuclear Station in Attachment 2.

Our letter dated June 22, 1993 "Response to NRC Generic Letter 92-08, Thermo-Lag 330-1 Fire Barriers Additional Information", stated our commitment to provide plans and a schedule for corrective actions, within 30 days of the completion of the NUMARC testing program. Due to the need to address schedules for corrective actions for configurations which are bounded and not bounded by the NUMARC test program and in addition, those corrective actions requiring a plant outage, this commitment is being superceded.

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Note that while the general scope of the NUMARC test program is known, what will ultimately be bounded is a function of the outcome of the tests and the final content of the Application Guide.

For those in-plant assemblies bounded by the NUMARC testing, Grand Gulf will implement non-outage corrective actions within 24 months from receipt of the necessary documentation.

NUMARC plans to establish the final scope of the generic test program by April 1, 1994. Within 60 days of receipt of this information, Grand Gulf will provide a description of the selected corrective action(s) and a schedule of implementation for barriers outside the scope of the NUMARC program.

As permitted by your letter dated December 21, 1993, our schedule information will be updated as necessary once additional information becomes available on the results of the NUMARC Program, including schedule information for corrective actions required to be performed during a plant outage.

As requested, this information is being submitted under affirmation in accordance with 10CFR50.54(f) (Attachment 1). Please contact Charles Brooks at (601) 437-6555 should you have any questions, or require additional information regarding this matter.

Yours truly,



CRH/CEB/egr

attachments: 1) Affirmation per 10CFR50.54(f)  
2) Response to NRC Request For Additional  
Information

cc: (See Next Page)

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cc: Mr. R. H. Bernhard (w/a)  
Mr. D. C. Hintz (w/a)  
Mr. H. W. Keiser (w/a)  
Mr. R. B. McGehee (w/a)  
Mr. N. S. Reynolds (w/a)  
Mr. H. L. Thomas (w/o)

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Senior Project Manager  
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Attachment 1

to

GNRO-94/00015

Affirmation Per 10CFR50.54(f)

BEFORE THE  
UNITED STATES NUCLEAR REGULATORY COMMISSION

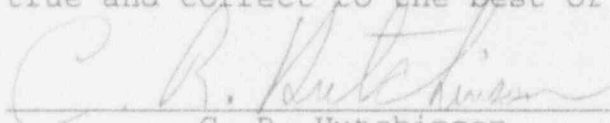
LICENSE NO. NPF-29

DOCKET NO. 50-416

IN THE MATTER OF  
MISSISSIPPI POWER & LIGHT COMPANY  
and  
SYSTEM ENERGY RESOURCES, INC.  
and  
SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION  
and  
ENTERGY OPERATIONS, INC.

AFFIRMATION

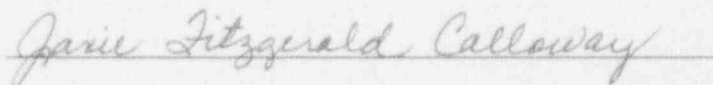
I, C. R. Hutchinson, being duly sworn, state that I am Vice President, Operations GGNS of Entergy Operations, Inc.; that on behalf of Entergy Operations, Inc., System Energy Resources, Inc., and South Mississippi Electric Power Association I am authorized by Entergy Operations, Inc. to sign and file with the Nuclear Regulatory Commission, this response to Generic Letter 92-08 Request for Additional Information for the Grand Gulf Nuclear Station; that I signed this response as Vice President, Operations GGNS of Entergy Operations, Inc., and that the statements made and the matters set forth therein are true and correct to the best of my knowledge, information and belief.

  
C. R. Hutchinson

STATE OF MISSISSIPPI  
COUNTY OF CLAIBORNE

SUBSCRIBED AND SWORN TO before me, a Notary Public, in and for the County and State above named, this 14th day of February, 1994.

(SEAL)

  
Notary Public

My commission expires:

My Commission Expires November 11, 1996

Attachment 2

to

GNRO-94/00015

Response to NRC Request

for

Additional Information

I.B. Thermo-Lag Fire Barrier Configurations and Amounts

Required Information

1. Describe the Thermo-Lag 330-1 barriers installed in the plant to:
  - a. meet 10CFR50.48 or Appendix R to 10CFR Part 50,
  - b. support an exemption from Appendix R,
  - c. achieve physical independence of electrical systems,
  - d. meet a condition of the plant operating license,
  - e. satisfy licensing commitments.

The descriptions should include the following information: the intended purpose and fire rating of the barrier (for example, 3-hour fire barrier, 1-hour fire barrier, radiant energy heat shield), and the type and dimension of the barrier (for example, 8-ft by 10-ft wall, 4-ft by 3-ft by 2-ft equipment enclosure, 36-inch-wide cable tray, or 3-inch-diameter conduit).

Response

In response to NUMARC's Thermo-Lag Fire Barrier Information Request, a walkdown of all Thermo-Lag fire barriers was completed to confirm and supplement information contained in plant design documents. A description of the Grand Gulf Thermo-Lag assemblies was provided to NUMARC by letter dated December 7, 1992. Generally, the Grand Gulf Thermo-Lag assemblies include 1-hour and 3-hour materials installed to protect electrical raceways and related components. Additionally, 3-hour Thermo-Lag materials are installed on two steel partitions which form a part of fire area boundaries. A more detailed description follows:

Grand Gulf utilizes 3-hour Thermo-Lag materials to protect two cable trays which contain safe shutdown circuits. These cable trays are 18 and 24 inches in width. Each tray is approximately 17 feet long. Approximately two thirds of the total tray length is in the vertical position and the remainder is horizontal.

Both 1-hour and 3-hour Thermo-Lag materials are used to protect conduit containing safe shutdown circuits. 1-hour material is installed on approximately 160 feet of conduit while 3-hour material is used to protect approximately 775 feet of conduit. The following table provides the distribution of conduit sizes protected with Thermo-Lag and the approximate total length of each size conduit protected.

Conduit Diameters	One Hour	Three Hour
¾"	NONE	NONE
1"	20 ft.	NONE
2"	20 ft.	60 ft.
3"	104 ft.	564 ft.
4"	NONE	125 ft.
5"	NONE	NONE
6"	16 ft.	26 ft.

Associated with Grand Gulf electrical raceways are numerous components protected with Thermo-Lag. Enclosures are provided for a variety of articles including junction boxes, pull boxes, condulets, terminal boxes, interfaces with fire barrier penetrations, and air drops. While detailed dimensioning of these enclosures is not yet complete, the greatest dimension of most is estimated to be 3 feet or less.

Thermo-Lag is also installed on all intervening components which could represent a thermal short to a raceway including supports, supplemental steel and/or other raceways. Both 1-hour and 3-hour barriers are required to have these items protected for at least 18 inches; however, the installers conservatively protected most for a distance of 24 inches. Raceways protected with 3-hour Thermo-Lag have their supports protected to the point of attachment. This includes complete encapsulation of the support, its base plate its supplemental steel.

Grand Gulf also utilizes Thermo-Lag in two non-raceway applications. A portion of the east wall and ceiling of Fire Zone OC217 (HVAC Chase) was closed with steel partitions because obstructions prevented complete construction using rated concrete masonry units. In order to provide the required fire rating for these fire area boundaries, 3-hour rated structural steel fire proofing was applied to one side of the steel



partitions (chase side) and the other side of the partitions was covered with 3-hour Thermo-Lag panels. The partition in the ceiling of the chase is approximately 28 inches wide and 7 feet long. The partition located in the east wall of the chase is approximately 6 feet high and 8 feet wide.

#### Required Information

2. For the total population of Thermo-Lag fire barriers described under Item I.B.1, submit an approximation of:
  - a. For cable tray barriers: the total linear feet and square feet of 1-hour barriers and the total linear feet and square feet of 3-hour barriers.
  - b. For conduit barriers: the total linear feet of 1-hour barriers and the total linear feet of 3-hour barriers.
  - c. For all other fire barriers: the total square feet of 1-hour barriers and the total square feet of 3-hour barriers.
  - d. For all other barriers and radiant energy heat shields: the total linear or square feet of 1-hour barriers and the total linear or square feet of 3-hour barriers, as appropriate for the barrier configuration or type.

#### Response

- a. As stated in response to Item I.B.1. above, Grand Gulf has two cable trays which contain safe shutdown circuits and are protected with Thermo-Lag. These trays are protected with 3-hour Thermo-Lag barriers and involve approximately 34 linear feet of tray containing 150 square feet of Thermo-Lag.
- b. Grand Gulf has approximately 160 linear feet of safe shutdown conduit protected with 1-hour Thermo-Lag. Approximately 775 linear feet of safe shutdown conduit is protected with 3-hour Thermo-Lag.
- c. Approximately 75 square feet of 3-hour Thermo-Lag is utilized on the fire area boundaries.

As stated in response to Item I.B.1, enclosures are provided for a variety of electrical raceway articles such as junction boxes, condulets, etc. While the determination of quantities of Thermo-Lag material for these enclosures is not complete, a program for collecting this information has been initiated.

- d. Grand Gulf does not use Thermo-Lag in Regulatory Guide 1.75 applications or as radiant energy shields.

## II.B. Important Barrier Parameters

### Required Information

1. State whether or not you have obtained and verified each of the aforementioned parameters for each Thermo-Lag barrier installed in the plant. If not, discuss the parameters you have not obtained or verified. Retain detailed information on site for NRC audit where the aforementioned parameters are known.

### Response

The Grand Gulf Thermo-Lag barriers were installed by Entergy Operations personnel in accordance with plant standards, based on installation instructions and training provided by Thermal Science Incorporated. The plant installation standards frequently allowed more than one option for certain parameters of the in-plant assemblies. However, current documentation does not identify which option was selected by the installers for use on a specific barrier. To better document the installation parameters, Grand Gulf is preparing isometric drawings of the Thermo-Lag barriers protecting electrical raceways. Validation methods include plant walkdowns and, when necessary, destructive examination of selected barriers. Completion of the improved documentation is being coordinated to coincide with key milestones of the NUMARC program.

**Required Information**

2. For any parameter that is not known or has not been verified, describe how you will evaluate the in-plant barrier for acceptability.

**Response**

Destructive examinations will be performed as necessary to identify any necessary parameters in support of fire testing, implementation of barrier upgrades, and/or support plant specific evaluations.

**Required Information**

3. To evaluate NUMARC's application guidance, an understanding of the types and extent of the unknown parameters is needed. Describe the type and extent of the unknown parameters at your plant in this context.

**Response**

As mentioned in response to Item II.B.1. above, plant installation standards frequently prescribed options for certain parameters with final selection left to the discretion of the installers. For example, the type of joint to be used on a Thermo-Lag barrier could have been selected from specified alternatives. In some cases, existing design documents do not specify which option was chosen and the selected option may not be obvious without destructive examination.

**III.B. Thermo-Lag Fire Barriers Outside the Scope of the NUMARC Program**

**Required Information**

1. Describe the barriers discussed under Item I.B.1 that you have determined will not be bounded by the NUMARC test program.

**Response**

Phases I and II of the NUMARC test program exclusively address electrical raceway applications. Although the general scope of the test program is known, what will ultimately be bounded is a function of the outcome of the tests and the final content of the Application Guide. Therefore, it is not possible at this time to

identify with certainty the Grand Gulf assemblies which will not be bounded by the NUMARC test program. However, some generalizations can be made. Based on the scope of Phases I and II, the steel partitions forming a part of fire area barriers described in response to Item I.B.1 above are not currently bounded by the NUMARC program. Grand Gulf also has various boxed enclosures and air drops which have not been specifically addressed by NUMARC.

Entergy Operations is proposing to NUMARC that testing in addition to Phase 2 is necessary and should include additional raceway and non-raceway applications. We anticipate a final decision from NUMARC with regard to the total scope of the test program by April 1, 1994. Concurrently, Entergy Operations is attempting to identify other utilities with similar configurations in order to perform joint testing in the event that NUMARC does not expand the test program.

#### **Required Information**

2. Describe the plant-specific corrective action program or plan you expect to use to evaluate the fire barrier configurations particular to the plant. This description should include a discussion of the evaluations and tests being considered to resolve the fire barrier issues identified in GL 92-08 and to demonstrate the adequacy of existing in-plant barriers.

#### **Response**

Our present objective is to select corrective actions based on a broad range of options as discussed in response to Item V.B. In those cases where justification of Thermo-Lag barriers is pursued, we plan to implement reasonable upgrades when necessary, based on successful fire testing, to ensure the performance of the existing barriers. In the event that rated performance can not be demonstrated for the in-plant assemblies, Grand Gulf will pursue development of exemptions which demonstrate the ability of these barriers to successfully withstand the effects of anticipated fire hazards. In this case the performance capability of each in-plant Thermo-Lag barrier will be weighed against the characteristics of its respective hazard area.

**Required Information**

3. If a plant-specific fire endurance test program is anticipated, describe the following:
  - a. Anticipated test specimens.
  - b. Test methodology and acceptance criteria including cable functionality.

**Response**

- a. In the event that site specific testing is required, the anticipated test specimen for our non-raceway application would be a steel partition of comparable size and configuration to the Grand Gulf wall assembly.

For a raceway application, the test assembly would be comparable to the specific in-plant configuration for which additional testing is needed.

- b. The acceptance criteria to be used in qualifying the Grand Gulf fire area boundary configurations would follow guidelines found in ASTM E119. Any fire testing of raceway applications would follow the acceptance criteria developed by NUMARC and approved by the NRC.

**IV.B. Ampacity Derating**

**Required Information**

1. For the barriers described under Item I.B.1, describe those that you have determined will fall within the scope of the NUMARC program for ampacity derating, those that will not be bounded by the NUMARC program, and those for which ampacity derating does not apply.

**Response**

Texas utilities performed ampacity derating tests on 1-hour Thermo-Lag assemblies using the methodology of IEEE P848 Draft 11, with some modifications. The testing performed by Texas Utilities provided preliminary ampacity derating factors of 32 percent for cable trays and 11 percent for conduits, which are consistent with previously reported values. The NUMARC program proposes to incorporate the Texas Utility data for

generic application to the industry and will perform ampacity testing of upgraded 3-hour Thermo-Lag assemblies. NUMARC also proposes to use the methodology of IEEE P848 for testing 3-hour assemblies. Based on NUMARC's proposed methodology, all of the Grand Gulf raceway applications are expected to be bounded by the NUMARC program.

The only Grand Gulf Thermo-Lag installation for which ampacity derating does not apply is the aforementioned fire area boundary partitions.

#### **Required Information**

2. For the barriers you have determined fall within the scope of the NUMARC program, describe what additional testing or evaluation you will need to perform to derive valid ampacity derating factors.

#### **Response**

NUMARC proposes to incorporate the Texas Utility ampacity testing to establish generic derating factors for 1-hour Thermo-Lag assemblies and will perform new ampacity testing on 3-hour Thermo-Lag assemblies. The Texas Utility testing and the proposed NUMARC testing both follow the guidelines IEEE P848. As stated in response to Item IV.B.1 above, the limiting derating factor will be applied to all combinations of raceway sizes and cable fills; consequently, we believe most if not all of the Grand Gulf assemblies subject to ampacity derating concerns, will be bounded by the NUMARC program. Based on this approach, Grand Gulf does not anticipate additional testing to be necessary.

The NUMARC tested configurations will be compared with the Grand Gulf in-plant configurations to ensure applicability of the generic derating factors.

#### **Required Information**

3. For the barrier configurations that you have determined will not be bounded by the NUMARC test program, describe your plan for evaluating whether or not the ampacity derating tests relied upon for the ampacity derating factors used for those electrical components protected by Thermo-Lag 330-1 (for protecting the safe-shutdown capability from fire or to achieve physical independence of electrical systems) are correct and applicable to

the plant design. Describe all corrective actions needed and submit the schedule for completing such actions.

**Response**

As stated in response to Item IV.B.1. above, Grand Gulf does not anticipate having configurations which are outside the scope of the NUMARC program.

**Required Information**

4. In the event that the NUMARC fire barrier tests indicate the need to upgrade existing in-plant barriers or to replace existing Thermo-Lag barriers with another fire barrier system, describe the alternative actions you will take (and the schedule for performing those actions) to confirm that the ampacity derating factors were derived by valid tests and are applicable to the modified plant design.

**Response**

The NUMARC test program proposes to conduct ampacity testing of the upgraded configurations; consequently, the NUMARC program will validate the ampacity derating factors for the upgraded configurations. In the event that alternative materials are selected for use in place of Thermo-Lag, Entergy Operations will evaluate the ampacity testing performed on the selected product to determine acceptability of the testing protocol and applicability to the Grand Gulf configurations. Any actions necessary to confirm that ampacity factors were derived by valid tests will be conducted in accordance with the schedules provided by Section VI.B.

**V.B. Alternatives**

**Required Information**

Describe the specific alternatives available to you for achieving compliance with NRC fire protection requirements in plant areas that contain Thermo-Lag fire barriers. Examples of possible alternatives to Thermo-Lag-based upgrades include the following:

1. Upgrade existing in-plant barriers using other materials.

2. Replace Thermo-Lag barriers with other fire barrier materials or systems.
3. Reroute cables or relocate other protected components.
4. Qualify 3-hour barriers as 1-hour barriers and install detection and suppression systems to satisfy NRC fire protection requirements.

#### Response

Entergy Operations is committed to a comprehensive evaluation to effectively resolve Thermo-Lag performance issues. Corrective action will be the result of a flexible approach that considers a broad range of options weighed on a case-by-case basis. Essential to the conduct of this evaluation is compilation and evaluation of the important elements affecting fire barrier performance and/or determining the viability of various fire protection alternatives. Elements important in the evaluation process include:

- confirmation and documentation of site specific barrier configurations
- test and acceptance criteria applicable to fire barrier materials
- test data of sufficient quantity and quality as to determine barrier performance limitations
- limitations for comparing tested to installed configurations
- conservatism of existing safe shutdown analyses
- area characteristics and respective fire hazards
- potential new hazards introduced by alternative fire protection measures

Much of this information has been compiled; however, important elements not yet available but necessary for identifying corrective actions include the test and acceptance criteria applicable to fire barrier materials protecting electrical raceways, NUMARC test data and the NUMARC Application Guide.

For Thermo-Lag applications not involving electrical raceways, Entergy Operations plans to weigh acceptability of testing based on the protocols applicable to the specific application (i.e., ASTM E119 for wall/ceiling applications). The results of the Phase 2 test program will provide information to facilitate an understanding



of Thermo-Lag performance capabilities and will be evaluated before corrective actions are identified. The test and acceptance criteria applicable to fire barrier materials protecting electrical raceways is necessary to evaluate alternative fire barrier materials in the event that a product substitution is desired. Entergy Operations expects NUMARC to perform additional testing to bound an even broader cross-section of the industry configurations which should also be considered before undertaking site specific testing. The NUMARC Application Guide is necessary for Entergy Operations to weigh the generic applicability of tested configurations to Grand Gulf's assemblies.

Upon review of all the pertinent criteria, Grand Gulf expects to utilize any one or combination of the following: 1) reevaluation of the safe shutdown analyses listing of components requiring protection under Appendix R, 2) Thermo-Lag upgrades, 3) exemptions to Appendix R in cases where it can be demonstrated that sufficient protection can be provided to achieve and maintain cold shutdown, 4) product substitution, 5) component relocation, and 6) alternative protection strategies which place less dependence on rated fire barriers.

## VI.B. Schedules

### Required Information

Submit an integrated schedule that addresses the overall corrective action schedule for the plant. At a minimum, the schedule should address the following aspects for the plant:

1. implementation and completion of corrective actions and fire barrier upgrades for fire barrier configurations within the scope of the NUMARC program,

### Response

Currently, the Grand Gulf approach for resolving NRC concerns regarding Thermo-Lag assemblies involves: 1) establish clear documentation which reflects Thermo-Lag installation parameters for use in comparing tested to installed configurations, 2) implementation of reasonable upgrades when necessary to ensure the performance of in-plant assemblies, based on generic or site specific fire testing, 3) demonstrate the adequacy of in-plant

configurations to provide rated performance or withstand anticipated fire hazards, and 4) preparation of exemption(s) for any Thermo-Lag assembly which is not demonstrated to provide rated performance but which is adequate to withstand anticipated fire hazards. In addition, corrective action may be selected from the options described in response to Item V.B above.

Note that while the general scope of the NUMARC test program is known, what will ultimately be bounded is a function of the outcome of the tests and the final content of the Application Guide. For those in-plant assemblies bounded by NUMARC testing, Grand Gulf will implement non-outage corrective actions within 24 months from receipt of the necessary documentation. The scope of corrective actions requiring a plant outage is believed to be minimal. A schedule for implementing corrective actions that require a plant outage will be provided when outage actions are identified through evaluation of NUMARC documentation. The documents necessary for Grand Gulf to implement corrective actions are the applicable fire tests, the NUMARC Application Guide and the ampacity test reports. NUMARC estimates that the ampacity test reports will be issued in August, 1994. Grand Gulf considers corrective action to be any of the following: completion of any evaluations, completion of modifications, or submittal of an exemption request.

#### **Required Information**

2. implementation and completion of plant-specific analyses, testing, or alternative actions for fire barriers outside the scope of the NUMARC program.

#### **Response**

NUMARC plans to establish the final scope of the generic test program by April 1, 1994. Within 60 days of receipt of this information, Grand Gulf will provide a description of the selected corrective action(s) and a schedule of implementation for barriers outside the scope of the NUMARC program. This should afford Grand Gulf the benefit of incorporating information gained from knowledge of the final scope of the NUMARC generic test program and provide sufficient time to identify utilities with unbounded configurations of comparable design for the purpose of conducting joint testing.

VII. Sources and Correctness of Information

Required Information

Describe the sources of the information provided in response to this request for information (for example, from plant drawings, quality assurance documentation, walk downs or inspections) and how the accuracy and validity of the information was verified.

Response

The information provided in this response was acquired from plant walkdowns and plant design documents. The accuracy and validity of the information provided in this response was confirmed in accordance with the Grand Gulf information certification/verification procedures. The following is a list of reference material used to prepare this correspondence:

- CEXO-92/00670, "Thermo-Lag Fire Barriers Information Request" (provided to NUMARC)
- NUMARC letter to APOC dated January 14, 1994, "NRC 50.54(f) Letter on Thermo-Lag Fire Barriers"
- NPE-ES-02, "Electrical Standard For Separation Fire Protection and Equipment Closures"
- DCP 83/4526, "Fireproofing of HVAC Chase OC 217"