

The Light company

Houston Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

February 10, 1994
ST-HL-AE-4695
File No.: G03.08
G02.05
10CFR50.54(f)

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

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response To Request For Additional Information Regarding
Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers"

Pursuant to 10CFR50.54(f), Houston Lighting & Power submits the attached response to the NRC request for additional information regarding Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers," dated December 22, 1993.

Houston Lighting & Power will utilize from the STP Probabilistic Safety Assessment (PSA) study, including plant-specific data, as a basis to show that upgrading the existing Thermo-Lag is not required in order to provide an adequate level of fire protection. The total core damage frequency for STP is approximately $4.4E-5$ with the contribution from a fire outside the control room accounting for approximately 1% of the total. The low sensitivity to fire is due to the high degree of separation of the three independent safety trains at STP. It should be noted that the PSA did not take credit for applied fire barriers such as Thermo-Lag. The NRC has evaluated the PSA and documented their findings in a Safety Evaluation dated January 21, 1992, which concluded that fires outside the control room contribute less than 1% to the overall core damage frequency at STP.

Houston Lighting & Power has maintained the STP licensing basis through appropriate assessment and compensatory action in accordance with our Fire Protection Program as described in the STP Updated Final Safety Analysis Report. Compensatory measures for inoperable fire barriers are in place and will remain in effect until an acceptable resolution to the Thermo-Lag issue is achieved.

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Project Manager on Behalf of the Participants in the South Texas Project

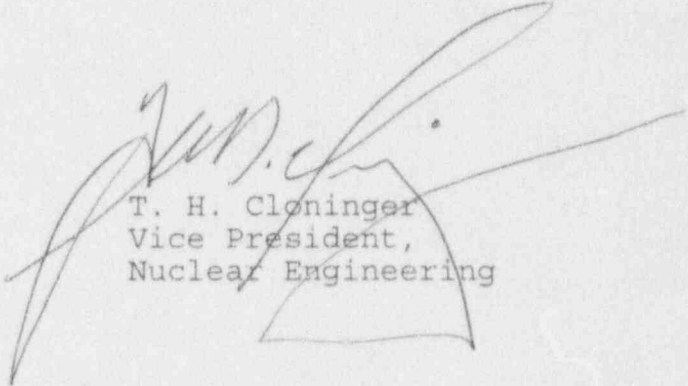
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Houston Lighting & Power Company
South Texas Project Electric Generating Station

ST-HL-AE-4695
File No.: G03.08
G02.05
Page 2

Houston Lighting & Power will supplement this response in July 1994 when more specific information is available.

If you should have any questions regarding this matter, please contact Mr. A. W. Harrison at (512) 972-7298 or me at (512) 972-8787.



T. H. Cloninger
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SAR/eg

Attachment: Response to 10CFR50.54(f) Request for Information

Houston Lighting & Power Company
South Texas Project Electric Generating Station

ST-HL-AE-4695
File No.: G03.08
G02.05

Page 3

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ATTACHMENT

RESPONSE TO 10CFR50.54(f) REQUEST FOR INFORMATION
REGARDING GENERIC LETTER 92-08, "THERMO-LAG 330-1 FIRE BARRIERS"

**RESPONSE TO 10CFR50.54(f) REQUEST FOR INFORMATION
REGARDING GENERIC LETTER 92-08, "THERMO-LAG 330-1 FIRE BARRIERS"**

I. Thermo-Lag Fire Barrier Configurations and Amounts

B. Required Information

1. Describe the Thermo-Lag 330-1 barriers installed in the plant to
 - a. meet 10CFR50.48 or Appendix R to 10CFR50,
 - 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).

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.

STP Response

- I.B.1. Thermo-Lag 330-1 fire barrier systems are used at STP to provide both 1-hour and 3-hour fire barrier separation of safe shutdown equipment outside containment and to provide separation as a radiant energy heat shield inside containment to meet STP's fire protection program as specified in 2.E. of each of the operating licenses. Thermo-Lag 330-1 is also used to achieve physical independence of electrical systems per NRC guidance provided in Regulatory Guide (RG) 1.75.

The Thermo-Lag provides protection for 12-inch-wide and 24-inch-wide steel cable trays, solid and ladder back, as well as 1-inch-diameter conduit up to and including 6-inch-diameter. Also protected are junction boxes and pull boxes which are a part of the protected raceways.

I.B.2. The following is an estimation of the total quantity of Thermo-Lag installed in both Units 1 and 2:

- a. Cable trays: 1-hour barriers: 2686 linear feet (8798 square feet)
 3-hour barriers: 1338 linear feet (5072 square feet)
- b. Conduits: 1-hour barriers: 2878 linear feet
 3-hour barriers: 1587 linear feet
- c. All other fire barriers:
 1-hour barriers: 731 square feet
 3-hour barriers: 305 square feet
- d. Radiant energy heat shields (inside containment):
 conduit: 3032 linear feet
 cable trays: 424 linear feet (1936 square feet)

II. Important Barrier Parameters

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

STP Response

II.B.1. STP plans to use its site-specific Probabilistic Safety Assessment (PSA) to demonstrate that upgrades to the Thermo-Lag barriers are not required to assure an adequate level of fire protection. In the event that any Thermo-Lag installations should be needed, STP will follow the plan described below.

Following NRC review, the NUMARC Application Guideline will provide final positions with respect to bounding parameters, and is expected to be issued in April 1994. Based on the testing to date, the draft application guideline would address parameters that would include the 24-point listing in the NRC letter. This listing is preliminary in nature and the planned NUMARC Phase 2 testing could identify further parameters of importance or demonstrate that some of the currently identified parameters are not significant. STP wants to avoid the need to conduct two walkdowns or reviews, one for the preliminary parameters and one for the final parameters. Therefore, as discussed in the response to Section II.B.2, STP does not plan to obtain and verify the as-built status of Thermo-Lag and cable parameters until the important parameters are finally identified.

- II.B.2. If, as a result of the PSA-based analysis, zones are identified for possible use of the NUMARC Application Guideline, STP will perform walkdowns to determine the parameters and configurations of the installed cable trays and conduits that are required to be protected. The Phase 2 testing and NUMARC Application Guide are scheduled to be completed and the results issued and available, with an identification of the significant parameters, for evaluation in April 1994.

The as-built status of important parameters will be identified by a variety of methods. For example, documentation of installation of Thermo-Lag will be reviewed to identify the as-built status of important parameters. For parameters that are external to the barriers and that were not documented during installation, walkdowns or reviews of work practices and procedures will be performed.

For identification of as-built information for parameters internal to the barriers that were not documented specifically during installation, e.g., internal bands in trays, pre-buttering of joints or panel rib orientation, the contractor work practices and procedures will be reviewed through documentation or interviews.

The 50.54(f) letter provides an eight item listing of parameters of importance concerning the cable protected by the fire barriers. To the extent that fire test results are satisfactory based on temperature, as provided for in the NRC draft test and acceptance criteria, we believe the NRC listing of cable performance parameters to be evaluated should be limited to the percentage cable fill in cable trays (item four of the NRC listing), which relates to enclosed thermal mass and barrier performance.

If fire tests demonstrate temperature criteria exceedances, one optional approach to resolution, as provided for in the NRC draft test and acceptance criteria, would be to evaluate cable functionality at the elevated temperatures. In this case, determination of cable performance at elevated temperature (item 8) would be necessary, using cable performance test data or information for specific installed cable types (items 1,2,3 and 7 of the listing). However, NRC has yet to finalize requirements for cable functionality evaluation, nor are tests available yet that would clearly indicate the scope of such evaluations. The degree and conservatism of cable functionality evaluation requirements implied by the NRC

listing of cable parameters, and discussed in proposed Supplement 1 to Generic Letter 86-10, significantly exceeds the original requirements of Generic Letter 86-10.

Items 4,5 and 6 of the NRC listing address issues relative to potential cable-to-barrier contact for cable trays. This is an unresolved issue at this time. Barrier contact would be most likely to occur in situations of large cable fills. However, the large cable fills also provide significant thermal mass that could improve barrier system performance and mitigate the effect of cables in contact with the barrier. At STP the percentage of cable fills is documented and part of the quality control program required in-process inspections that confirmed a minimum spacing of 1/2 inch between the protected cables and the Thermo-Lag material. NUMARC has agreed to provide additional thermocouples below the cable tray rungs in the Phase 2 cable tray tests to provide information to address NRC concerns relative to potential contact of cables with the cold side of the fire barriers. Further, note that a small piece of Sealtemp cloth (item 6) was used only in NUMARC Test Number 1-4 (24-inch-wide steel cable tray with air drop, three hour test), and did not influence performance or useability of the test.

- II.B.3. The type and extent of unknown parameters cannot be determined until the NUMARC testing is completed and the Application Guidelines is issued describing the significant parameters to be evaluated. These parameters will then be determined and evaluated for the installations determined to be required as a result of the reanalysis described in the response to Section VI.B.

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

B. 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.
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.
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.

STP Response

- III.B. In the fall of 1993, STP decided to eliminate unnecessary conservatism in the STP licensing basis to minimize the amount of Thermo-Lag required to protect the safe shutdown pathway. Soon after this decision, the NUMARC Phase 2 testing was delayed, which in turn delayed the response to Generic Letter 92-08 requiring a plan of action and implementing schedule. At that time the walkdowns scheduled to determine performance parameters of the installed Thermo-Lag were postponed until the second quarter of 1994 when the required circuits and barriers would be known from the reanalysis. Supporting this decision to defer the walkdowns to a later date is the low sensitivity to a fire due to the three trains and high degree of separation of those trains, of which only one is required for safe shutdown. The result of this approach is that the outliers to the NUMARC tests are not known at this time. However, the configurations tested by NUMARC should bound the installed 12-inch- to 24-inch-wide steel cable trays and 1-inch- to 6-inch-diameter steel conduits at STP.

STP subsequently decided to use the probabilistic approach to demonstrate adequacy of existing installations. Because of the small ($< 1\%$) contribution of fire to an already small core damage frequency ($4.4E-5$), STP expects to be able to show that few, if any, barrier requalifications are required.

It is not feasible at this time to determine which barriers will not be bounded by the NUMARC test program because NUMARC has not yet completed its tests nor issued its Application Guideline. Following completion of the test program and issuance of the Application Guideline, STP will conduct any necessary walkdowns and evaluations to identify any required barriers are not bounded by the NUMARC test program.

STP is still in compliance with the licensing basis by maintaining the compensatory measures implemented in response to NRC Bulletin 92-01, Supplement 1. These measures will remain in effect until an acceptable resolution to the Thermo-Lag issue is achieved.

A supplemental response will be provided to NRC in July 1994 after the conclusion of the walkdowns and evaluations should any be required. This will allow evaluation using the results of the NUMARC Phase 2 tests and the guidance provided by the NUMARC Application Guide.

IV. Ampacity Derating

B. 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.

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.
3. For the barrier configurations that you have determined will not be bounded by the NUMARC test program, describe your test plan for evaluating whether or not the ampacity derating tests relied upon for the ampacity derating factors used 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.
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.

Your response to Section IV.B may depend on unknown specifics of the NUMARC ampacity derating program (e.g., the final barrier upgrades). However, your response should be as complete as possible. In addition, your response should be updated as additional information becomes available on the NUMARC program.

STP Response

IV.B. STP site-specific ampacity derating tests were conducted by Underwriter's Laboratories (UL). Prior to the testing, HL&P prepared an ampacity derating test specification which specified test assemblies to be built using cables, cable fill, and cable tray and conduit types consistent with those installed in the plant. With minor exceptions, which were pre-approved by HL&P engineering staff and which did not impact test results, the UL tests were conducted in accordance with the test specification. Thermo-Lag barriers for the tests were selected and assembled in a manner consistent with configurations installed in the plant. All test enclosures were constructed by personnel employed to construct fire barriers at STP. Because HL&P conducted ampacity derating tests specifically for STP, we consider the test results to be applicable to the plant design. The derating factors resulting from these tests were used directly in the analyses which verify the acceptability of all Thermo-Lag wrapped power cable sizing in accordance with industry standards.

After the STP probabilistic review, it is possible that some upgrades of installed configurations may be required through the NUMARC testing program. These upgrades may involve the application of additional fire barrier material to the installed configurations, and as such, would require the use of NUMARC ampacity test results or analyses to extrapolate the results of ampacity testing on the upgraded configurations.

The schedule to address ampacity is dependent on the completion of the 3-hour fire duration tests and NRC acceptance of the initial Texas Utilities tests (and the IEEE P848 methodology). NUMARC will provide an update in May and STP will submit any required followup response accordingly.

V. Alternatives

B. 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.

STP Response

- V.B. Thermo-Lag 330-1 fire barrier systems are used at STP to provide 1-hour and 3-hour fire barrier separation of safe shutdown equipment, to provide separation as a radiant energy heat shield, and to provide RG 1.75 separation of trains inside containment.

The Thermo-Lag used as a radiant energy heat shield inside containment has been evaluated and determined to meet the requirements for non-combustibility required by Appendix R Section III.G.2.f. No further evaluation is expected with respect to this application.

A plan to address the Thermo-Lag fire barrier applications outside containment is being implemented. Houston Lighting & Power will utilize the STP PSA study, including plant-specific data, as a basis to show that upgrading the existing Thermo-Lag is not required in order to provide an adequate level of fire protection. The total core damage frequency for STP is approximately $4.4E-5$ with the

contribution from a fire outside the control room accounting for approximately 1% of the total. The low sensitivity to fire is due to the high degree of separation of the three independent safety trains at STP. It should be noted that the PSA did not take credit for applied fire barriers such as Thermo-Lag. The NRC has evaluated the PSA and documented their findings in a Safety Evaluation dated January 21, 1992 which concluded that fires outside the control room contribute less than 1% to the overall core damage frequency at STP. A large reduction in the requirement for Thermo-Lag is expected due to the re-evaluation and, consequently, it will not be known until the third quarter of this year which circuits and associated fire barriers will be required for a safe shutdown pathway.

Any required fire barriers will then be evaluated and alternatives considered. Three currently undefined factors must be considered in determining whether upgrades using additional Thermo-Lag materials are practical, and what alternatives would be most appropriate in case Thermo-Lag upgrades cannot be developed:

1. Test and acceptance criteria have not been finalized and issued by NRC. Proposed draft criteria contain new conservatism in fire test methods and acceptance criteria that could affect the scope and complexity of upgrades to the installed barriers. The content of the final criteria, and the resulting impact on our site-specific plan, is uncertain.
2. Complete Phase 2 test results will not be known until mid-March 1994. Results of the baseline (as installed) and upgrade test configurations from Phase 2 must be considered to determine appropriate update to our action plan to address the configurations of the required fire barriers. Also, further generic testing may be undertaken following Phase 2 tests.
3. The NUMARC Application Guideline, scheduled to be final by mid-April, will include a matrix of the important performance parameters and bounding conditions. Discussion with NRC will be necessary to reach an agreement on the selection of comparison parameters and bounding conditions. The results of these NRC interactions will define the final content and would directly impact the generic applicability of a given test to an installed configuration.

With these considerations in mind, there is a range of alternatives that would be considered based on the outcome of the above uncertainties. The resolution may consist of a combination of alternatives and may be considered for implementation even if upgrades have been successfully tested. In addition to the four examples of alternatives listed in the request for information, potential alternatives that will be considered to resolve the Thermo-Lag issue are:

1. Re-evaluate licensing commitments that may exceed the requirements of the regulations.

2. Evaluate the acceptability of deviations of barriers that have actual ratings less than the design ratings. For example, based upon the low fire loadings in some areas, barriers in these areas that have actual ratings less than the design ratings may still provide adequate protection of safe shutdown equipment.
3. Perform plant-specific or utility-shared testing.

VI. Schedules

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

STP Response

VI.B. The plan to resolve the Thermo-Lag issue was initiated in September 1993 with the decision to re-evaluate the safe shutdown pathways to minimize the amount of Thermo-Lag required to protect the safe shutdown pathways (primary and redundant). The effect of this reanalysis will be to reduce the quantity of required Thermo-Lag by a substantial amount. Proposals to perform this reanalysis have been available for technical review since late December 1993. Based on preliminary estimates of the time required to perform the reanalysis, the following preliminary implementation schedule is submitted:

ACTIVITY	SCHEDULED START
Initiate probabilistic reanalysis	February 28, 1994
Walkdown and review documentation of installations for performance parameters	April 18, 1994
Evaluate configurations to Application Guidelines and NUMARC test results	April 25, 1994
Determine resolutions	July 2, 1994
Complete reanalysis	August 22, 1994
Initiate implementation of required upgrades	August 29, 1994

VII. Sources and Correctness of Information

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

STP Response

The following documentation was used to provide the information in this response:

- As-built drawings
- Safe shutdown circuit listing
- Cable location listing (EE-580 program)
- Installation listing by application contractor
- QC documentation of in-process inspections
- Approved installation procedure
- Raceway location drawings
- Vendor tests
- Ampacity derating tests
- Surveillances of barriers (EL-1099)
- STP Probabilistic Safety Assessment