

May 12, 1997

Mr. John R. McGaha, Jr.
Vice President - Operations
Entergy Operations, Inc.
River Bend Station
P. O. Box 220
St. Francisville, LA 70775

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING THERMO-LAG-RELATED
AMPACITY DERATING ISSUES FOR RIVER BEND (TAC NO. M82809)

Dear Mr. McGaha:

By letter dated December 19, 1996, Entergy Operations, Inc. (EOI) submitted a response to the Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) related to Generic Letter (GL) 92-08, "Thermo-Lag 330-1 Fire Barriers," for River Bend Station, Unit 1. This office, in conjunction with our contractor, Sandia National Laboratories (SNL), has completed the review of the response submittal, and has identified a number of open issues and concerns (see enclosure) requiring clarification.

It is requested that EOI provide the information requested so that we can complete the review. If there are any questions in this regard, please let me know.

Sincerely,

Original signed by
David L. Wigginton, Senior Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-458

Enclosure: Request For Additional Information

cc w/encl: See next page

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

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Sincerely,

A handwritten signature in dark ink, appearing to read "D. Wigginton", is written over the typed name.

David L. Wigginton, Senior Project Manager
Project Directorate IV-1
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

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Mr. John R. McGaha
Entergy Operations, Inc.

River Bend Station

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REQUEST FOR ADDITIONAL INFORMATION (RAI)
RIVER BEND STATION, UNIT 1
THERMO-LAG AMPACITY DERATING ISSUES
(TAC NO. M82809)

1. The licensee has not yet identified what course of action will be taken to resolve those cables that were identified as overloaded for application in the plant. The staff agrees with the Sandia National Laboratories (SNL) assessment that the National Electric Code overcurrent protection provisions [i.e., Articles 240-3(b) and 240-6] as described in the licensee's submittal dated December 19, 1996, cannot be used as a basis for the resolution of the overloaded cable issue (see Section 4.1.3 of the SNL letter report [Attachment 1(a)] for details). In addition, the licensee is requested to estimate conservatively the remaining cable life for those cables that have operated under overloaded conditions.
2. SNL found that Calculation G13.18.14.0-178, which was included in the licensee submittal dated December 19, 1996, was significantly flawed in terms of the implementation of the thermal model. Please address the following points raised by SNL:
 - (a) SNL finds that the licensee has inappropriately applied convection coefficients for surface heat transfer in an unrestricted open (external) environment to the highly confined interior of the fire barrier systems analyzed. This observation applies to both the conduit and cable tray analyses. The licensee is requested to provide an explicit justification for any such cases that includes a discussion of item-to-item, item-to-barrier surface, and item-to-wall/ceiling clearances. (See Sections 3.2.1 and 3.2.2 of the SNL letter report [Attachment 1(a)] for details.)
 - (b) SNL finds that the licensee's treatment of external convection for cable tray systems is unnecessarily crude and does not adequately treat the differences associated with surface orientation. The licensee is requested to modify its thermal model so that more realistic external convective heat transfer coefficients are derived. (See Section 3.2.3 of the SNL letter report [Attachment 1(a)] for details.)
 - (c) SNL finds that the licensee treatment of internal heat transfer behavior within a conduit has not been adequately justified, appears to be inappropriate, and is likely non-conservative. The licensee is requested to modify its analysis methodology to conform to accepted practices for the analysis of cable-to-conduit heat transfer. (See Section 3.2.4 of the SNL letter report [Attachment 1(a)] for details.)

ENCLOSURE

- (d) SNL finds that the licensee has not calculated radiation view factors correctly, in particular, for those analyses involving multiple raceways in a common enclosure. The licensee is requested to correct its analysis in this regard. (See Section 3.2.5 of the SNL letter report [Attachment 1(a)] for details.)
- (e) SNL finds that the licensee comparison of clad case ampacity limit estimates derived from its own thermal model to tabulated base line ampacity limits is inappropriate. The licensee has failed to demonstrate that its thermal model is consistent with the thermal models used to develop the standard tables, and consistency between the clad case and base line case analyses is critical to the reliability and robustness of the calculations. The licensee is requested to explicitly determine base line ampacity limits using a thermal model consistent with that applied to the clad case analyses. (See Section 3.2.7 of the SNL letter report [Attachment 1(a)] for details.)
- (f) SNL finds that the ampacity correction factors associated with the number of current carrying conductors in a conduit have either not been properly calculated or are still based on the older pre-1990 National Electric Code (NEC) correction factors. This item was also a concern identified in SNL's earlier review, and the licensee response to the question in Section 2.3 of the NRC staff's October 16, 1996, RAI cited that the newer NEC correction factors would be used in all calculations. (See Section 3.2.6 of the SNL letter report [Attachment 1(a)] for details.)
- (g) SNL finds that for cases involving multiple raceways (trays and/or conduits) in a single enclosure, the licensee's independent treatment of convective heat transfer between each of the raceways and the inner surface of the fire barrier system is inappropriate. The licensee is requested to modify the thermal model to account for the simultaneous transfer of the total convective heat load from all sources. (See Section 3.2.8 of the SNL letter report [Attachment 1(a)] for details.)
- (h) SNL finds that the licensee calculations for single aluminum conduits may be unnecessary. The licensee could instead apply test data available from industry for steel conduits as conservative estimates of the ADF for an aluminum conduit (provided, of course, that the fire barrier configurations are roughly equivalent). While this may actually result in less conservative estimates of the derating impact as compared to the current licensee estimates, this would remove one significant source of uncertainty in the licensee assessments, and would simplify both this calculation and the overall licensee submittal. The licensee is requested to consider whether to abandon its calculations for single aluminum conduits and to instead rely on industry data for steel conduits in any case in which an appropriately tested configuration can be identified for River Bend plant installations.

3. It is noted that Calculation E-218 includes the use of ampacity derating factors derived from Calculation G13.18.14.0-178, which SNL has determined to be significantly flawed in terms of model implementation. The licensee should revise Calculation E-218 in light of any resolution for the concerns stated in Item 2 above.
4. The licensee has documented conduit cable fills as high as 124 percent in their December 19, 1996, submittal. It appears physically unrealistic to have a conduit load of greater than 100 percent. The licensee is requested to explain this apparent inconsistency.
5. In their December 19, 1996, submittal, the licensee has documented numerous conduits that appear to be loaded in excess of the loading limits established in the NEC (generally limited to 40-53 percent loads depending on the conductor count). The licensee is requested to explain these apparent violations of the NEC.

Attachment 1(a): Letter report to U.S. NRC, Rev. 0, dated March 21, 1997, prepared by Steve Nowlen of Sandia National Laboratories.