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6710-97-2260
Jun. 24, 1997

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
Response to the Request for Additional Information Regarding Thermo-Lag Related to Ampacity Derating Issues for Three Mile Island Unit 1

The purpose of this letter is to provide the response to the May 8, 1997 NRC request for additional information regarding Thermo-Lag related ampacity derating issues for Three Mile Island Unit 1. The attachment addresses the three questions identified as a result of your review of the October 22, 1996 GPU Nuclear response to questions related to Generic Letter 92-08.

Please contact William Heysek of the TMI Licensing & Regulatory Affairs Department at (717) 948-8191 regarding any additional concerns or questions on this issue.

Sincerely,

MJ Ross for

James W. Langenbach
Vice President and Director, TMI

WGH

Attachment
cc: Administrator, Region I
TMI-1 Senior Project Manager
TMI Senior Resident Inspector

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Question 1

Sandia National Laboratories (SNL) made the following finding after a review of the licensee's cable ampacity assessment method which is based on the random fill tray correction factors from IPCEA P-46-426:

> The methodology applied by the licensee was taken from IPCEA P-46-426, which in turn cites IPCEA publication P-33-440 as the basis for the cited ampacity correction factors for random fill trays. ICEA P-54-440 specifically states that the P-33-440 (a.k.a. P-46-426) methodology for random fill trays is superseded by the P-54-440 approach. Hence, SNL finds that the licensee has applied an outdated and inappropriate methodology to the analysis of its cable tray ampacity limits. While licensee approach may actually be conservative for some of the cases examined, SNL also demonstrated that the approach can lead to non-conservative results as well. SNL finds that the P-54-440 methodology is applicable to the licensee cases and should be included in the evaluation.

Given the above finding, the licensee is requested to provide an assessment of the applicable ampacity limits using the ICEA P-54-440 methodology for any cable in a cable tray with three or more cables and for those cables with an available ampacity margin (i.e. after the application of derating factors) of 30% or less including the following seven circuits recommended by SNL: LS6, ME1, ME2, MB11, (winter configuration only), MC12 (winter configuration only), CH61 and LS5.

Response to Question 1

The calculation is being revised to include an assessment of ampacity limits using the ICEA P-54-440 methodology. The analysis selects the P-54-440 evaluation as the most accurate evaluation for power cables installed in trays protected by Thermo-Lag fire barriers. The fire barrier tray derating factor of 32% determined by tests under the sponsorship of Texas Utilities is based on the ampacity of cables tightly packed in a tray with no air flow up through the tray. The tightly packed tray is considered to be the worst case configuration and bounds the configuration where cables are installed in trays without maintained spacing. The tightly packed tray is the configuration assumed by ICEA P-54-440 and is therefore consistent with the testing which determined the derating factor.

Question 2

It should be noted that the licensee response to the staff question regarding an assessment of overloaded cables as detailed in the Request for Information dated 7/5/96 may require reevaluation given satisfactory resolution for the concerns stated in Item 1 above.

Note: the 7/5/96 request item 11 states:

> The licensee needs to provide a definitive technical basis to support the assessment of cable ampacity for those cables which are overloaded over the equipment life cycle. The licensee should indicate what measures will be taken to monitor for signs of accelerated age-related degradation.

In addition, the licensee is requested to conservatively estimate the remaining cable life for any cables which may have operated under overloaded conditions.

Response to Question 2

The preliminary analysis using the P-54-440 methodology shows that one cable, LS6, is nominally overloaded. Because the cable is not continuously energized the conservative cable life analysis shows that there is sufficient life remaining in the cable well beyond 1999, although not enough to reach the end of plant life which is currently 2014. Condition monitoring and remedial modifications may be necessary for the portion of LS6 that is routed through tray 5.. and would be completed at the end of the 13R refueling outage, currently scheduled to end October, 1999. LS6 is not relied upon for Appendix R safe shutdown evaluation. The cable was protected as a result of being located in a raceway which required protection. The verified analysis is planned to be issued on or before July 31, 1997.

Question 3

Given that SNL noted apparent depth of fill and conductor discrepancies in the review of the Tray 531/533 case, the licensee is requested to document the applicable calculations to sufficient detail that both the depth of fill and ampacity limit calculations can be verified by SNL. (See Section 2.2.3 of the SNL Letter Report (Attachment 1(a)) for further details)

Note: SNL noted the following two discrepancies in Section 2.2.3 of their Letter Report:

> First the licensee's March 1995 submittal has cited a depth of fill of 2.6" for this tray [tray 551]. Given the information provided in the current [October, 1996] submittal, and assuming a 6" wide tray, SNL has calculated a depth of fill of 4.43". The basis for the licensee's assessment of a 2.6" depth of fill is unclear. However, it would appear that the licensee has only allowed for one 4/C 350 MCM cable in the tray rather than the two cables apparently present. Using this assumption SNL does get a depth of fill of 2.6" as cited by the licensee.
>
> Second, the licensee has cited in Table 5 of the current [October, 1996] submittal that the total conductor count for this case is 9. However, the information provided in Tables 3 and 4 of the current [October, 1996] submittal imply a conductor count of 11 should apply. In contrast, if there is only one 4/C 350 MCM cable and one 3/C 4/0 cable

consistent with the 2.6" fill assumption, then the conductor count of 9 is not consistent with either of these two interpretations of the cable loading.

Response to Question 3

The investigation of the first discrepancy noted by SNL revealed that there are discrepancies between references 3.5, "Kerite Cable Information", and reference 3.17, "Met-Ed Purchase Order 97099", in the October, 1996 submittal for overall cable diameter of Kerite cables. The October, 1996 submittal used the reference 3.5 diameters and the March, 1995 submittal used the reference 3.17 diameters. To resolve the discrepancies several diameters of Kerite cables installed in the field were measured. The measurements gave very close agreement with diameters from reference 3.17. The reference 3.17 cable diameters are uniformly smaller than the reference 3.5 cable diameters. Cable diameter is not used in the P-42-426 methodology and there is no effect on the P-46-426 calculations in the October, 1996 analysis. However, the P-54-440 methodology requires cable diameter and the correct cable diameters are used in the analysis planned for July, 1997.

As for 6" tray 551, the correct fill is:
$(2 * (2.40)^2 + (2.00)^2) / 6.00 = 2.58$" (as opposed to 4.43").

The fact that one 4/C 350 MCM and one 3/C 4/0 cable give a fill of 2.6" using the larger diameters is purely coincidental.

The investigation into the second discrepancy noted by SNL revealed that the October, 1996 submittal Table 5 "Current Carrying Conductors" neglected the neutral conductor of the two 4/C 350 MCM cables. Neglecting the neutral conductor is consistent with Note 10 of the 1996 National Electric Code's "Notes to Ampacity Tables of 0 to 2000 Volts." Note 10 allows the neutral conductor to be neglected when counting conductors for ampacity adjustment for more than three current-carrying conductors in the raceway. Thus, when the neutral conductors are neglected the conductor count changes from 11 to 9.

Please note that the analysis planned to be issued on or before July 31, 1997 will supersede the March, 1995 submittal and October, 1996 submittal analyses and will document the calculation in sufficient detail to allow verification by SNL.