

August 15, 2003

MEMORANDUM TO: File

FROM: Darl S. Hood, Senior Project Manager, Section 1 /RA/
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DUANE ARNOLD ENERGY CENTER-TRANSMITTAL OF DRAFT
REQUEST FOR ADDITIONAL INFORMATION ON PROPOSED
AMENDMENT TO CHANGE PRESSURE-TEMPERATURE LIMIT
CURVES (TAC NO. MB8750)

On July 1, 2003, I transmitted, by electronic mail, a draft request for additional information (RAI) regarding an application for amendment, dated May 2, 2003, as supplemented June 30, 2003. The proposed amendment, submitted by Nuclear Management Company, LLC (licensee), would revise the pressure-temperature curves in the Technical Specifications for Duane Arnold Energy Center. Because the draft RAI was based upon a report that General Electric (GE) asserted to be proprietary, and the Nuclear Regulatory Commission staff's review of the report and GE's accompanying affidavit had not been completed, the draft RAI was withheld from public disclosure and handled in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.790, pending further review of the affidavit and report. On July 14, 2003, I added two additional requests (Nos. 2.3 and 2.4) to the draft RAI (Attachment 1) and e-mailed it, again in accordance with 10 CFR 2.790.

By letter dated July 30, 2003, the licensee responded to the draft RAI, providing both proprietary and non-proprietary versions of the requests and responses. In Attachment 2, the proprietary information identified in the licensee's letter of July 30, 2003, is deleted and, therefore, Attachment 2 is a non-proprietary version of Attachment 1.

Attachments: 1. Draft Proprietary RAI
2. Draft Non-proprietary RAI

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Attachment 1: ML032190011 (Proprietary)

Memo: ML032190006

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NRC Staff Request for Additional Information Regarding
Proposed License Amendment To Change Pressure-Temperature Limit Curves
Duane Arnold Energy Center
TAC NO. MB8750

The Nuclear Regulatory Commission (NRC) staff has determined that certain information below inside double square brackets is proprietary to General Electric (GE) and, therefore, it has been deleted in this non-proprietary Request for Additional Information. When needed, non-proprietary and underlined text is added inside the double square brackets for clarity.

References:

- (1) GE Report GE-NE-A22-00100-08-01-R1, Revision 1, September 2002 (Attachment 5 of NMC's letter dated May 2, 2003).
- (2) GE Report GE-NE-A22-00100-08-01, Revision 0, September 2000 (Attachment 6 of NMC's letter dated October 16, 2000).

By letter dated May 2, 2003, Nuclear Management Company, LLC (licensee) submitted information (including Reference 1 above) and requested a revision of the pressure-temperature (PT) limit curves in the Technical Specifications for the Duane Arnold Energy Center (DAEC). The propose change would extend the period of applicability to 32 effective full power years (EFPY) of operation.

1.0 FLUENCE CALCULATIONS

Reference 1 includes the results of the fluence calculations used for the revision of the PT curves. The plant operating period is divided into pre- and post-extended power uprate (EPU) at 18.18 and 13.82 EFPY respectively. The pre-EPU peak flux is 3.86×10^9 n/cm²sec and the post-EPU flux is 4.16×10^9 n/cm²sec, including a [] bias adjustment. The 32 EFPY fluence is then calculated by adding the two parts of the operating phases. Then a [] bias factor is applied to the total. The GE report states (page G-9) that the [] bias is not applicable to the pre-EPU phase. In this context, please provide the following additional information:

- 1.1 The EPU provides for a power level increase up to 1912 megawatt thermal (MWt) (corresponding to 20 percent of the original rated thermal power of 1593 MWt, or 15.3 percent of the previous limit of 1658 MWt). This level of increase is based on increased power in the lower part of the core and the outer fuel assemblies. This should result into a disproportionate increase in neutron leakage and resulting peak of the inside-radius vessel flux. This is not reflected in the calculated values shown in the General Electric report. If the bias adjustment is divided out from the post-EPU peak, the value is the same as the pre-EPU. Please explain.
- 1.2 Reference 1 states (page G-9) that "Due to conservatism inherent in the pre-EPU calculation, the addition of the [] bias is not necessary." Please demonstrate why this statement is true.
- 1.3 The post-EPU value includes the [] bias and then the total again includes the bias. Thus, the post-EPU portion is twice biased. Why is this considered to be appropriate?

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ATTACHMENT 2

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- 1.4 The Nuclear Regulatory Commission (NRC) staff estimates that the post-EPU peak value is about 5.0×10^9 n/cm²sec. Please explain the proposed value in terms of the calculation performed and the value of the leakage source, in physical terms.
- 1.5 The fact that you added the pre-EPU and post-EPU peak fluxes indicates that your calculations show that the peak does not appear at a lower location as expected. Please define the location of the peaks at pre-EPU and post-EPU operations.
- 1.6 Please redefine your EFPYs in view of the power uprate and state your projected load factor to the end of the current license.
- 1.7 Please provide a copy of Reference 5 of Appendix E to Reference 1 above.

2.0 MATERIAL CONSIDERATIONS

- 2.1 In Reference 2, the limiting material for the PT curve was vessel nozzle N16. In Reference 1, the limiting material changed to vessel nozzle N2. What is the technical explanation for this change in the limiting material?
- 2.2 In Reference 2, copper content for vessel nozzle N16 was 0.2, but in Reference 1, its copper content is 0.18. What is the basis for the change to 0.18?
- 2.3 In Reference 1, Section 4.3.2.1.2, "Core Not Critical heatup/Cooldown - Non-Beltline Curve B (Using Bottom Head)," presents (on page 28) a comparison between the stresses which result in the vessel bottom head from two transient conditions versus [those generated for the CRD curve.

] Provide additional information regarding your analysis of the identified transient conditions which demonstrates that the results summarized in Section 4.3.2.1.2 are directly comparable [] when all vessel and penetration geometry correction factors have been applied equivalently.

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- 2.4 The information presented in Reference 1, Sections 4.3.2.2.2, "Calculation for Beltline Region - Pressure Test," and 4.3.2.2.4, "Calculations for Beltline Region Core Not Critical Heatup/Cooldown," appears to be inconsistent with conclusions stated elsewhere in the report. The report frequently notes that beltline nozzle N2 is the limiting material/location for analysis of DAEC's beltline; yet, the sample calculations only represent the most limiting beltline plate.

In order for the NRC staff to confirm the PT limit curves submitted for DAEC's beltline region, provide sample calculations for the beltline N2 nozzle which have a level of detail consistent with what was provided for the analysis of DAEC's feedwater nozzle/upper vessel region in Reference 1 Section 4.3.2.1.4.

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