

May 3, 2006

Mr. Joseph E. Conen  
Chairman, BWR Owners Group  
DTE Energy - Fermi 2  
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6400 N. Dixie Highway  
Newport, MI 48166

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE BOILING WATER REACTOR OWNERS' GROUP (BWROG) TOPICAL REPORT (TR) SIR-05-044, "PRESSURE TEMPERATURE LIMITS REPORT METHODOLOGY FOR BOILING WATER REACTORS," REVISION 0 (TAC NO. MC9694)

Dear Mr. Conen:

By letter dated December 20, 2005, the BWROG submitted for Nuclear Regulatory Commission (NRC) staff review TR SIR-05-044, "Pressure Temperature Limits Report Methodology for Boiling Water Reactors," Revision 0. The NRC staff has identified a number of items for which additional information is needed to continue its review. The NRC staff requires responses to the enclosed RAI questions in order to continue the review.

In our acceptance letter for TR SIR-05-044, the NRC staff agreed to a review completion date of November 2006. To support the above completion date, in the telephone conversation held between the NRC staff and Fred Emerson, of your staff, it was agreed upon that the NRC staff will receive your response to the enclosed RAI questions by July 31, 2006. Please call me at 301-415-1774, if you have any questions on this issue.

Sincerely,

***/RA/***

Michelle C. Honcharik, Project Manager  
Special Projects Branch  
Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

Project No. 691

Enclosure: RAI questions

cc w/encl: See next page

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**Accession No.: ML061220553      NRR-088      \*No Substantial change from the Memorandum**

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REQUEST FOR ADDITIONAL INFORMATION

BOILING WATER REACTOR (BWR) OWNERS' GROUP

TOPICAL REPORT (TR) SIR-05-044, "PRESSURE TEMPERATURE LIMITS REPORT

METHODOLOGY FOR BOILING WATER REACTORS," REVISION 0

PROJECT NO. 691

All section, page, table, figure, or reference numbers in the questions below refer to items in TR SIR-05-044, unless specified otherwise.

1. The "Requirements for Methodology and PTLR [Pressure Temperature Limit Report]" table in Generic Letter (GL) 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits," identifies the minimum requirements to be included in the PTLR methodology and the minimum requirements to be included in the PTLR. Discuss how the proposed PTLR methodology and PTLR satisfy the minimum requirements identified in the GL 96-03 table. If the PTLR methodology or PTLR does not contain all the required information, revise the PTLR methodology and the PTLR to include the required information.
2. Section 2.5, "Pressure-Temperature Curve Generation Methodology," describes methodologies for calculating bending and membrane stresses using computer code finite element analyses (FEA). If these FEA are to be utilized by licensees to develop pressure-temperature (P-T) limits, provide the following:
  - a. Identify the computer codes that were used in the finite element stress analysis. How were the codes benchmarked?
  - b. Discuss briefly the assumptions and the inputs to the stress analysis.
  - c. Update the TR methodology to require licensees to identify the finite element codes used in the PTLR.
  - d. Verify that this process for determining bending and membrane stresses will result in the generation of P-T limits that are at least as conservative as those which would be generated using the procedures of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, Appendix G.
3. Section 2.5.3, "Thermal and Pressure Stress Intensity Factor Calculations for Discontinuity Regions," indicates that the thermal stress intensity factor,  $K_{It}$ , for P-T limits for nozzles is dependent upon the membrane correction factor for an inside surface axial flaw and the thickness (t). The thickness term is not defined. Define the thickness to be used in determining the membrane correction factor for the  $K_{It}$  analysis for nozzles.

ENCLOSURE

4. Section 2.5.3 indicates that the  $K_{It}$  for P-T limits for nozzles is dependent upon the a correction factor, R. This correction factor is used to correct the nonlinear effects in the plastic region based on the assumptions and recommendations of Welding Research Council (WRC) Bulletin 175, "PVRC [Pressure Vessel Research Committee] Recommendations on Toughness Requirements for Ferritic Materials." Describe how the methodology for analyzing nozzles (Equations 2.5.1-15 through 2.5.1-18) complies with WRC Bulletin 175.
5. Section 3.0, "Step-By-Step Procedure for Calculating P-T Limit Curves," indicates that P-T limits may also be developed for other reactor pressure vessel regions to provide additional operating flexibility. Either delete this statement from the PTLR methodology or provide the methodology for developing curves for the other regions and indicate that licensees will submit for review and approval methodologies for other regions that are not consistent with methodology discussed in the PTLR methodology.
6. Section 3.0 does not indicate surveillance data is to be evaluated in accordance with Appendix A, "Guidance for the Use of BWRVIP [BWR Vessel and Internals Project] ISP [Integrated Surveillance Program] Surveillance Data." Section 3.0 should be revised to indicate surveillance data is to be evaluated in accordance with Appendix A.
7. Pages A-8, A-9, and A-13 of Appendix A, state: "Revised best estimate chemistries for selected BWR welds and plates have been calculated by the BWRVIP. Calculation of the best estimate chemistries for all other vessel materials is the responsibility of the plant."

In order for this procedure to be utilized in the PTLR methodology, the staff must review the procedure for determining the best estimate chemistries for all beltline materials and the results from the data. Therefore, the PTLR methodology must be revised to document the BWRVIP procedure for determining the best estimate chemistries. If the best estimate chemistries are not performed in accordance with the approved procedure, then the PTLR methodology should indicate that the PTLR methodology will not be used in the PTLR process.

8. Appendix A, Procedure 1, Procedural Step 3, "Determine Credibility of Surveillance Data," states: "If the vessel wall temperature is an outlier, appropriate temperature adjustments to the surveillance data may be required."

In order for this procedure to be utilized in the PTLR methodology, the staff must review the procedure for determining the adjustments to the surveillance data. Therefore, the PTLR methodology must be revised to document a proposed procedure for adjusting the surveillance data if the vessel wall temperature is an outlier. If the adjustments to the surveillance data are not performed in accordance with the approved procedure, then the PTLR methodology should indicate that the PTLR methodology will not be used in the PTLR process.

9. Appendix A, Procedures 1 and 2, "Definitions and Background," states: "For generic values [of Initial  $RT_{NDT}$ ] of weld metal, the following generic mean values must be used unless justification for different values is provided...."

In order for other generic values of Initial  $RT_{NDT}$  to be utilized in the PTLR methodology, the staff must review the procedure for determining the best estimate Initial  $RT_{NDT}$ . Therefore, the PTLR methodology must be revised, either explicitly or by referencing a previously approved methodology, to document the BWRVIP procedure for determining the Initial  $RT_{NDT}$ . If the Initial  $RT_{NDT}$  are not performed in accordance with the approved procedure, then the PTLR methodology should indicate that the PTLR methodology will not be used in the PTLR process.

10. Appendix A, Procedure 1, Procedural Step 3, identifies information that the licensee should review to determine whether the data is "credible" or "not credible".

In accordance with Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," the following criteria should also be evaluated:

- a. Scatter in the plots of Charpy energy versus temperature for the irradiated and unirradiated conditions should be small enough to permit the determination of the 30-foot-pound temperature and the upper-shelf energy unambiguously.
- b. When there are two or more sets of surveillance data from one reactor, the scatter of  $\Delta RT_{NDT}$  values about a best-fit line drawn as described in Regulatory Position 2.1 normally should be less than 28 EF for welds and 17 EF for base metal. Even if the fluence range is large (two or more orders of magnitude), the scatter should not exceed twice those values.

These criteria should be added to Procedure 1, Procedural Step 3, of Appendix A.

11. To ensure that the P-T limits have been developed using the TR methodology, the following information should be included in the PTLR:
- a. The Initial  $RT_{NDT}$  for all reactor pressure vessel materials and the method of determining the Initial  $RT_{NDT}$  (i.e., ASME Code, Generic Communication, Branch Technical Position - MTEB 5-2 in Standard Review Plan 5.3.2 in NUREG-0800, or other NRC-approved methodologies),
  - b. The chemistry (weight-percent copper and nickel) and adjusted reference temperature at the 1/4 thickness location for all beltline materials,
  - c. The computer codes used in the FEA to determine for calculating bending and membrane stresses from Section 2.5, and
  - d. Identify whether "Procedure 1" or "Procedure 2" was utilized to evaluate the surveillance data. If surveillance data was utilized, provide the surveillance and the analysis of the surveillance data that was used to determine the adjusted reference temperature, ART. If surveillance data was not utilized, state why it was not utilized.