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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

APPLICABILITY OF NEDO-32205, REVISION 1

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT UNIT 2

DOCKET NUMBER 50-260

1.0 INTRODUCTION

By letter dated October 18, 1995, the Tennessee Valley Authority (the licensee) submitted for staff review and approval its assessment of the plant-specific applicability of General Electric Company (GE) topical report, NEDO-32205, Revision 1, "10 CFR 50, Appendix G, Equivalent Margin Analysis for Low Upper Shelf Energy in BWR/2 Through BWR/6 Vessels," for the Browns Ferry Nuclear Plant (BFN) Unit 2 reactor vessel. The submittal is a surveillance report augmented to include plant-specific worksheets regarding vessel material upper-shelf energy (USE) and supporting information to demonstrate that the reactor vessel materials are bounded by the analysis provided in the GE topical report. Only this augmented portion was reviewed by the staff.

Appendix G of 10 CFR Part 50 requires that reactor vessel beltline material must maintain a USE of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation (NRC), that lower values of USE will provide margins of safety against fracture equivalent to those required by Appendix G of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME) Code. ASME Code Case N-512 and Appendix K of the ASME Code contain analytic procedures and acceptance criteria for demonstrating that reactor vessel beltline materials with low Charpy USE will have margins of safety against fracture equivalent to Appendix G of the ASME Code.

In a December 9, 1993 letter to L.A. England from J.T. Wiggins (USNRC), the staff issued the safety evaluation report of the GE topical report NEDO-32205, Revision 1. The staff concluded that the reactor pressure vessels of the participating utilities should have margins of safety against ductile failure in low USE plates and welds until their end of licenses (EOL) of 32 EFPY, for level A, B, C, and D conditions, and meet the criteria of ASME Code Case N-512 and Appendix K. Individual licensees that reference the topical report as their basis for addressing the USE requirements of 10 CFR Part 50, Appendix G, were requested to confirm the plant-specific applicability of the topical report by comparing the predicted percentage decrease in the USE to the allowable decrease in the USE from the topical report.

ENCLOSURE

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2.0 EVALUATION

Methods acceptable to the staff for determining the percentage decrease in USE are documented in Regulatory Guide (RG) 1.99, Revision 2. Figure 2 of RG 1.99, Revision 2 indicates that the percentage decrease in USE increases with increasing amounts of copper and neutron fluence. However, the percentage decrease in USE could be affected by surveillance test results. If surveillance data indicate that the percentage decrease in USE is greater than the amount predicted by Figure 2 in this RG, the percentage decrease in USE for the material must be increased. If surveillance data indicate that the percentage decrease in USE is less than the amount predicted by Figure 2 in the RG, the percentage decrease in USE for the material may be decreased from the amount predicted by Figure 2.

The staff reviewed the information provided by the licensee in its responses to Generic Letter (GL) 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)," and determined that insufficient information existed for some beltline materials of the BFN Unit 2 reactor vessel to determine that it will have USE greater than 50 ft-lb at expiration of its license. The licensees that have plants with insufficient information for determining the EOL USEs for their reactor beltline materials are required to demonstrate the applicability of NEDO-32205 to their plants. In the current application, the licensee compared the USE decrease from the surveillance plates and welds to the amount of decrease predicted by RG 1.99, Rev. 2 and the allowable limits in NEDO-32205. The licensee reported that the percent decrease in USE of the surveillance plate is less than that from using Figure 2 in the RG and the predicted USE decrease of 13% for the limiting plate is less than the allowable limit of 21% for plates from NEDO-32205. As to beltline welds, the surveillance weld indicated essentially no change in the USE value and the predicted end-of-license USE decrease according to the RG for the 32 EFPY fluence of 4.2E17 n/cm^2 is less than the allowable limit of 34% for welds from NEDO-32205. Hence, both plates and welds meet the allowable limits of NEDO-32205.

3.0 CONCLUSIONS

Based on the evaluation, the staff verified the licensee's conclusion that the projected decreases in USE for the beltline materials are less than the allowable decreases in USE from the topical report. Consequently, the applicability requirements of NEDO-32205 have been satisfied and the conclusions of the topical report are applicable to the BFN Unit 2 reactor vessel. As a result, the BFN Unit 2 reactor vessel satisfies the criteria in ASME Code Case N-512 and Appendix K, and will have margins of safety against fracture equivalent to those required by Appendix G of the ASME Code at the expiration of its license, and therefore meets the USE requirements of Appendix G of 10 CFR Part 50.

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Dated: February 26, 1996