



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EQUIVALENT MARGINS ANALYSIS

PECO ENERGY COMPANY

LIMERICK GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-352 AND 50-353

1.0 INTRODUCTION

In a letter dated May 17, 1994, PECO Energy Company (the licensee) submitted for staff review and approval its assessment of the applicability to the Limerick Generating Station (Limerick), Units 1 and 2, reactor vessels 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." As part of the submittal, the licensee provided plant-specific worksheets to demonstrate that the Limerick reactor vessel materials are bounded by the analysis provided in the GE topical report.

Appendix G of 10 CFR Part 50, requires that reactor vessel beltline material must maintain a Charpy upper-shelf energy (USE) of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, 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 contains 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, BWR Owners Group, from J. T. Wiggins, U.S. Nuclear Regulatory Commission, the staff reviewed 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 the end of their licenses (32 EFPY) for level A, B, C, and D conditions, and meet the criteria of ASME Code Case N-512. Individual licensees that reference the topical report as the basis for addressing the USE requirements of 10 CFR Part 50, Appendix G, were requested to confirm the plant-specific applicability of the report by comparing the predicted percentage of decrease in the USE to the allowable decrease in the USE from the topical report.

2.0 EVALUATION

Methods acceptable to the staff for determining the percentage of decrease in USE are documented in Regulatory Guide (RG) 1.99, Revision 2. Figure 2 in the RG indicates that the percentage of decrease in USE increases with increasing

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amounts of copper and neutron fluence. However, the percentage of decrease in USE could be affected by surveillance test results. If surveillance data indicates that the percentage of decrease in USE is greater than the amount predicted by Figure 2 in this RG, the percentage of decrease in USE for the material must be increased. If surveillance data indicates that the percentage of decrease in USE is less than the amount predicted by Figure 2 in the RG, the percentage of decrease in USE for the material may be decreased from the amount predicted by Figure 2.

As a result of the information provided by the licensee in their responses to information requested in Generic Letter (GL) 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)," the staff has determined that insufficient information existed for all beltline plates and welds to determine that they will have USE greater than 50 ft-lb at expiration of the Limerick license. Since Limerick has not withdrawn the first capsule from its surveillance program, the percentage of decrease in USE must be determined based on the amount of copper and neutron fluence.

The limiting plate and weld in unit 1 have 0.12% and 0.09% copper, respectively. The limiting plate and weld in unit 2 have 0.15% and 0.09% copper respectively. The percentage of decrease in USE for the beltline plate with the greatest amount of copper is projected to be 15% and the percentage of decrease in USE for the beltline weld with the greatest amount of copper is projected to be 14.2%.

The allowable decrease in USE from the topical report is 21% and 34% for plate and weld material, respectively. Since the allowable decrease in USE is greater than the values projected for the beltline materials, the conclusions of the topical report are applicable to the Limerick reactor vessels.

### 3.0 CONCLUSIONS

Since the projected decrease in USE for the beltline plates and weld is less than the allowable decrease in USE from the topical report, the conclusions of the topical report are applicable to the Limerick reactor vessels.

The Limerick reactor vessels satisfy the criteria in ASME Code Case N-512, will provide margins of safety against fracture equivalent to those required by Appendix G of the ASME Code at the expiration of its license, and meet the requirements of Appendix G, 10 CFR Part 50 for reactor vessels with USE less than 50 ft-lb.

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