



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO LPCI AND CORE SPRAY PUMP CASING FRACTURE TOUGHNESS

COMMONWEALTH EDISON COMPANY

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-237 AND 50-249

1.0 INTRODUCTION

By letter dated February 18, 1997, the Commonwealth Edison Company (ComEd, the licensee) provided an analysis of the fracture toughness of materials in the Low Pressure Coolant Injection (LPCI) and core spray pump casings. The analysis was performed to update the licensee's analysis performed as part of Systematic Evaluation Program (SEP) Topic III-1, "Classification of Structures, Components, and Systems (Seismic and Quality)." The purpose of SEP Topic III-1 is to compare the classification of structures, systems and components of the as-built plants to the requirements in later editions of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code). As part of SEP Topic III-1, the staff requested that licensees demonstrate that components could meet the fracture toughness requirements of editions of the ASME Code subsequent to the as-built purchase requirements. The later editions of the ASME Code contained requirements for fracture toughness testing of ferritic components similar to those in the LPCI and core spray pump casings. However, the later editions of the ASME Code also eliminated these requirements if it could be demonstrated that the service temperature was high enough or the connecting pipe diameter small enough to preclude brittle fracture of the component. The ASME Code precludes testing of these materials if all pipe connections are 5/8 inch nominal wall thickness and less; or if the materials listed in Table NC-2311(a)-1 for which the listed values of the nil-ductility transition temperature (T_{NDT}) is lower than the Lowest Service Temperature (LST) by an amount established by the rules in Appendix R of the ASME Code.

In a letter dated January 6, 1989, the licensee indicated that the minimum design temperature for the LPCI and core spray systems was 60 degrees Fahrenheit and that in accordance with ASME Code requirements the materials were exempt from fracture toughness testing. The February 18, 1997, analysis indicates that the minimum design temperature as reported in the January 6, 1989, letter was incorrect and that the correct value was 40 degrees Fahrenheit.

2.0 EVALUATION

The licensee determined the T_{NDT} for these materials to be 10 degrees Fahrenheit and indicated that the ferritic materials in the LPCI and core spray pump casings would have adequate fracture toughness if the LST is greater than

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the T_{NDT} by 30 degrees Fahrenheit. Since the licensee has designated the LST for these components as 40 degrees Fahrenheit, the licensee concluded that the LST is 30 degrees Fahrenheit higher than the T_{NDT} and the materials have adequate fracture toughness.

The LPCI and core spray pump casings are fabricated from A216 grade WCB ferritic material. Table NC-2311(a)-1 of the ASME Code indicates a T_{NDT} value of 30 degrees Fahrenheit for this material. This T_{NDT} value was established from data on heavy section steel (thickness greater than 2 1/2 inches). The LPCI and core spray pump casings are less than 1-inch thick. NUREG/CR-3009 contains data from A216 grade WCB material that is 1-inch thick and greater than 1-inch thick. The thinner material has greater fracture toughness. Table 4.4 of NUREG/CR-3009 indicates that the mean value and standard deviation value of the T_{NDT} is -6 degrees Fahrenheit and 12 degrees Fahrenheit, respectively, for A216 grade WCB material. The mean plus 1.3 standard deviation value would be 10 degrees Fahrenheit. This value would provide a conservative estimate of the T_{NDT} value for A216 grade WCB material less than 1 inch thick.

Appendix R of the ASME Code indicates that for materials less than 2 1/2 inches thick, the LST should be 30 degrees Fahrenheit greater than the T_{NDT} value. Since the mean plus 1.3 standard deviation value for the LPCI and core spray pump casings is 30 degrees Fahrenheit less than the LST, the LPCI and core spray pump casings meet the limits of Appendix R of the ASME Code, need not be fracture toughness tested to ASME Code requirements, and have adequate fracture toughness.

The licensee indicates that the largest connecting pipe to the LPCI and core spray pump casings is 3/8 inch. Since the connecting pipe is less than 5/8 inch nominal wall thickness, the ASME Code does not require fracture toughness testing of the materials in these components.

3.0 CONCLUSIONS

The licensee has provided sufficient information to determine that the T_{NDT} for the ferritic materials in the LPCI and core spray pump casings are 30 degrees Fahrenheit less than the LST.

Based on the previous conclusion and that the largest connecting pipe is 3/8 inch, it is determined that the ferritic materials in the LPCI and core spray pump casings need not be fracture toughness tested to the later requirements in the ASME Code and that they have adequate fracture toughness.

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Dated: September 30, 1997