



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSAL FOR AN INSERVICE INSPECTION PROGRAM

ON REACTOR VESSEL HEAD CLOSURE STUDS

COMMONWEALTH EDISON COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

LASALLE NUCLEAR POWER STATION, UNIT 2

DOCKET NOS. 50-265 AND 50-374

1.0 INTRODUCTION

Commonwealth Edison Company (CECo) had discovered stress corrosion cracking in two reactor vessel closure studs at Dresden Unit 2 during a routine inservice inspection (ISI) in 1988. The root cause analysis proposed the cause of cracking was the exposure of overly hard studs that are pretensioned and exposed to a high oxygen, moist environment for several weeks after each outage between the time of pretensioning and full power operation. CECo, in its letter of August 3, 1991, had proposed an enhanced ISI on the closure studs that exceeds the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI. Our letter of November 8, 1991, approved the Dresden Unit 2 program. CECo has proposed the same program for Quad Cities Unit 2 and LaSalle Unit 2 in its letters of December 23 and 26, 1991. This ISI program on the closure studs also exceeds the recommendations by General Electric Nuclear Energy (GE) Rapid Information Communication Services Information Letter (RICSIL) 055, "Reactor Pressure Vessel Head Stud Cracking," dated February 1, 1991. The program further utilizes parts of Regulatory Guide 1.65, "Materials and Inspections for Reactor Vessel Closure Studs."

2.0 DISCUSSION

CECo has proposed an ISI plan that exceeds the requirements of the ASME Code in order to:

1. Provide data on incipient stud cracking;
2. Allow for additional metallurgical evaluation of cracking mechanisms and potential embrittlement phenomena, if additional cracked studs are discovered and removed; and
3. Provide a correlation between enhanced end shot UT, bore UT, and MT results.

The ASME Code, Section XI, Table IWB-2500-1 requires a volumetric inspection of the reactor vessel closure studs if left in place or a surface and volumetric inspection if the closure studs are removed from the flange during each inspection interval. There is no requirement to remove the closure studs from the flange and the studs are not normally removed from boiling water reactors (BWR) with the exception of the four cattle chute studs. However, Regulatory Guide 1.65 recommends the removal of the closure studs followed by surface examination during each inspection interval. IWB-2430 requires that additional examinations be conducted during the current outage if the inspection conducted according to IWB-2500-1 shows indications exceeding the acceptance standards of Table IWB-3410-1. If the expanded sample produces additional indications, IWB-2430 requires that all parts of similar design, size and function be examined during the current outage.

The ASME Code, Section XI, only requires normal sensitivity end shot UT and the RICSIL 055 only recommends enhanced end shot UT of five studs. The proposed ISI program exceeds the requirements of the ASME Code and exceeds the recommendations of RICSIL 055.

CECo is proposing 100% enhanced end shot UT of the closure studs followed by bore probe UT sizing of any indications. In addition, CECo is proposing to remove up to 16 of the closure studs for Quad Cities Unit 2 and 13 for LaSalle Unit 2 and to conduct a surface examination of these studs using wet fluorescent MT examination. CECo is requesting relief from the ASME Code, Section XI, requirements for sample expansion if the MT examination reveals crack indications. CECo is requesting relief from the expanded sample requirement because expansion of the sample would result in increased man rem exposure, UT is being conducted on 100% of the closure studs, and MT is not required in ASME Code, Section XI, for closure studs that are not removed from the flange.

CECo has completed the structural margin assessment for the closure studs, and the results have been reviewed by the NRC. The structural margin assessment was based on a fracture mechanics analysis and fracture toughness data generated using an actual low toughness closure stud from Dresden Unit 2. The acceptable flaw size is 0.57 inches in depth for Quad Cities Unit 2 and 0.48 inches in depth for LaSalle Unit 2. The enhanced end shot UT can detect a 0.3-inch deep crack. The acceptable flaw size is determined by subtracting the crack growth during one cycle of operation from the allowable flaw size divided by the square root of 2 as permitted by IWB-3613 of Section XI of the ASME Code. The critical crack depth is calculated from the critical stress intensity determined experimentally.

3.0 CONCLUSION

Based on a review of the information provided, the staff has concluded that there is reasonable assurance that the proposed ISI plan will assure that the Code structural margins will be satisfied. In addition, the acceptable flaw size can be detected using the enhanced end shot UT.

Pursuant to 10 CFR 50.55a(a)(3)(ii), the staff concludes that granting such relief for one refueling outage for Quad Cities Unit 2 and LaSalle Unit 2 will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Dated: March 20, 1992