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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF INTERGRANULAR STRESS CORROSION CRACKING REPAIRS

FALL 1990 REFUELING OUTAGE

COMMONWEALTH EDISON COMPANY

DRESDEN NUCLEAR POWER STATION UNIT 2

DOCKET NO. 50-237

1.0 INTRODUCTION

1.1 Purpose

To determine the acceptability of the licensee's intergranular stress corrosion cracking (IGSCC) inspections and overlay repairs during the Fall 1990 refueling outage of the Dresden Nuclear Power Station, Unit 2.

1.2 Background

In their submittals of December 17, 1990, and March 4, 1991, Commonwealth Edison Company (CECo) reported the results of inspections and overlay repairs performed during the fall 1990 refueling outage. The submittals presented the design and evaluation criteria to disposition 19 weldments with indications performed during the fall 1990 refueling outage. The welds are located in the following systems: recirculation, shutdown cooling, and reactor water cleanup (RWCU). Ultrasonic examinations of these welds since 1983 have identified flaws judged to be intergranular stress corrosion cracking. In the fall of 1990 new indications were found in four welds. Three were in the recirculation system and one in the shutdown cooling system. All four welds received overlays although one weld (PS2A-202-1B) was shown by analysis to be acceptable without repair. Three unflawed welds were overlay repaired as either a load balancing or contingency. Ten welds repaired in the fall of 1988 were built up to standard overlays. A weld repaired in the fall of 1988 with a leakage barrier was reevaluated and found to meet the requirements of a standard overlay. One weld was found acceptable by a flaw evaluation.

2.0 DISCUSSION

The licensee submitted a final report prepared by NUTECH engineers. It contained a detailed description of the overlay design and repair, as-built dimensions, axial shrinkage, and stresses on the piping resulting from the overlay. The staff reviewed the report for conformance with Generic Letter (GL) 88-01, "NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping."

The licensee designed the standard and design weld overlay repairs conservatively. It assumed the depth of circumferential flaws to be through wall or the depth associated with the smallest remaining ligament of the previously repaired welds, whichever was greater. It assumed axial flaws to be through wall with a length of 1.5 times the wall thickness or its measured length, whichever was greater.

The licensee applied liquid penetrant to examine the original pipe surface per the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, and repaired all revealed indications before overlaying. After repairs, it reexamined the final overlay surface by liquid penetrant and repaired all unacceptable indications per ASME V and XI. Electric Power Research Institute's (EPRI) qualified staff examined the completed overlay and part of the original wall by ultrasonic techniques developed by EPRI.

The licensee stated that the examination of weld 16-8 was incomplete. It could not inspect the entire width of the heat affected zone (HAZ) in the outer 25% of the original pipe wall thickness due to geometry, but it completely examined the volume of the weld overlay repair itself in at least one direction. The licensee should be able to examine the HAZ on the elbow side, lengthening the overlay if necessary. These activities should be done before the end of the next refueling outage.

The licensee stated that weld PS2A-202-1B received a stress improvement overlay. The NRC staff recognizes stress improvement processes but not a category of overlay called "stress improvement." From the details given in the report, the overlay appears to consist of two layers. It does not conform with the guidance in GL 88-01. However, since an evaluation that did not include the effects of the overlay showed the pipe was acceptable without repair, the disposition of this weld is acceptable until the next refueling outage. The licensee intends to classify this weld as Category E (reinforced by a weld overlay). Because this overlay is not a recognized type, the weld should be classified as Category F (inadequately repaired).

The overlays were of IGSCC resistant weld metal Types 309L and 308L. The licensee measured the delta ferrite and took credit for layers that had a minimum reading of 7.5 FN. If the ferrite level of the first layer was below this value the licensee assumed flaws extended through the first layer.

The licensee measured shrinkage and analyzed the shrinkage stresses by the NUTECH piping analysis code [PISTAR]. The licensee did not evaluate the cumulative shrinkage stresses at the weld locations in the affected piping systems nor perform walkdown inspections to verify that set points of pipe supports and pipe whip restraints are not exceeded. The licensee should complete these activities and report the results before the end of the next refueling outage.

The licensee should also inspect the heat affected zone of weld 16-8 from the elbow side, lengthening the overlay if necessary. These activities should be completed before the end of the next refueling outage.

The staff disagrees with the classification of weld PS2A/202-1B as Category E because a "stress improvement overlay" is not recognized in GL 88-01. This weld should be classified as Category F.

The staff concludes that the licensee's actions provide reasonable assurance that Dresden 2 can be safely operated in its current configuration until the next refueling outage.

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