

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

REPORT NOS. 50-237/96005(DRS); 50-249/96005(DRS);
50-254/96005(DRS); 50-265/96005(DRS)

FACILITY

Dresden Nuclear Station, Units 2 and 3
Quad Cities Nuclear Station, Units 1 and 2
License Nos. DPR-19; DPR-25; DPR-29; DPR-30

LICENSEE

Commonwealth Edison Company
Opus West III
1400 Opus Place - Suite 300
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DATES

February 14 through April 1, 1996

INSPECTORS

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APPROVED BY



M. A. Ring, Chief
Lead Engineers Branch

4/4/96
Date

AREAS INSPECTED

A routine, unannounced inspection of engineering was performed using Inspection Procedures 37551 and 92903. Specifically, an expanded inspection was conducted following NRC concerns with resolution of nonconforming conditions during the preceding inspection period.

EXECUTIVE SUMMARY
Dresden and Quad Cities Nuclear Power Stations
Report No. 96005

ENGINEERING

The inspectors identified two apparent violations involving untimely corrective actions and reporting deficiencies for design and licensing basis nonconforming conditions. Specific examples concerned a failure to meet the low pressure coolant injection (LPCI) corner rooms' structural steel design margins for Dresden and Quad Cities and a reactor protection system (RPS) single failure vulnerability for Dresden. A third apparent violation identified by the licensee involved previous design control weaknesses which resulted in these nonconforming conditions.

The apparent corrective action and reporting violations reflected an inadequate licensee safety focus regarding prompt analysis and correction of facility design deficiencies that conflicted with the facility licensing basis. This inadequate safety focus caused the licensee to consider these issues to be of low safety significance, adversely affecting the thoroughness of the technical approach and licensee management decisions.

The results of a broader inspection of the licensee's approach to licensing and design basis issues at Dresden, including additional observations supporting the above conclusions, will be discussed in Inspection Report 50-010/237/249/96004.

Summary of Open Items

Violations: Three apparent violations identified (Section 3.0)

Non-cited Violations: None

Unresolved Items: One identified (Section 2.1.3)

Inspector Followup Items: None

Inspection Details

1.0 Inspection Objectives

An unresolved item (50-237/249/95015-05) identified at Dresden by an NRC inspector involved untimely resolution to a nonconforming condition. Specifically, LPCI corner rooms' structural steel design margins were not met. This inspection focused on a more detailed technical review of that issue at Dresden and Quad Cities, as well as expanded reviews to evaluate licensee safety focus on resolution of other identified licensing and design basis discrepancies.

Broader related issues involving the licensee's emphasis on resolving operability evaluations, licensing and design basis nonconforming conditions, and Updated Final Safety Analysis Report (UFSAR) deviations at Dresden will be discussed in Inspection Report 50-010/237/249/95004.

2.0 Untimely Resolution of Licensing and Design Basis Nonconforming Conditions Addressed in Open Operability Evaluations (OEs)

2.1 LPCI Corner Room Structural Steel Failure To Meet Applicable Design Margins

2.1.1 Dresden History Surrounding Issue

In 1991, the licensee's architect engineer (AE) identified undocumented load changes on the LPCI corner rooms' structural support steel for the LPCI heat exchangers and LPCI and core spray piping at Dresden. The licensee indicated that undocumented changes in structural steel attached loads resulted from failures to account for load changes during previous pipe support modifications. The licensee's AE performed walkdowns in 1993, and identified to the licensee in January 1994, that the corner room structural steel did not meet the allowable design margins stated in UFSAR Section 3.8.4.1.4 and Table 3.8-11 for Category 1 structural steel. This affected all four corner rooms (two for each unit).

The licensee's AE also indicated, based on previous experience with similar conditions, that more refined and extensive calculations would likely show the structural steel to be within the UFSAR allowables. These calculations were never performed. A qualitative operability assessment conducted for both units on January 6, 1994, concluded that the structural steel was operable based on the steel condition noted during the walkdowns and assumed conservatism in the methods used to calculate piping loads on structural steel. Although the structural steel condition was calculated to be outside the design basis of the plant, the licensee did not submit a licensee event report (LER) to the NRC.

Originally in 1994, the licensee planned to address this structural steel concern in a timely manner; however, licensee management postponed actions in mid-1994 to redirect resources to the core shroud cracking issue and other emergent activities. On September 20, 1995, engineering personnel raised the corner room structural steel issue to the

licensee's Business Review Committee (BRC), recommending modifications to the plant. The BRC consisted of senior plant management who allocated resources and funding to plant activities. Modifications to the structural steel were recommended in lieu of more refined calculations due to lower cost and increased flexibility for future piping support changes. On October 20, 1995, the BRC approved engineering design work to begin in the last quarter of 1995 with modification installation during 1996.

The October 1995 BRC presentation package informed senior plant management of NRC expectations with regard to timeliness of resolving this issue. The package stated that Dresden was operating outside of NRC's expectations for timely resolution of design discrepancies as described in NRC Generic Letter 91-18, "Information To Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions On Operability," and the NRC's Safety Evaluation Report (SE) dated September 27, 1991, regarding Dresden and Quad Cities piping system operability criteria.

When the inspector raised this issue in February 1996, engineering design work had not yet begun due to the extended Unit 2 refuel outage and the engineers did not expect installation to be complete until 1997, if the modifications could be done during facility operation. In a subsequent letter to the NRC dated March 4, 1996, the licensee described revised plans to perform some modifications during the current Unit 2 refuel outage (D2R14). However, complete modifications to restore UFSAR stress margins were not planned until the following refuel outage (D2R15), three years after problem identification. Subsequently, the licensee decided to perform modifications to restore full UFSAR margins during D2R14 for Unit 2 and the next refuel outage (D3R14) for Unit 3.

2.1.2 Quad Cities History Surrounding Issue

Quad Cities' history regarding this matter was similar to Dresden's. In December 1991, the licensee's AE identified several corner room beams that did not meet UFSAR design allowables. In 1992, two design change notices were prepared to reinforce two of the deficient beams identified in 1991. No additional actions were taken. After the issue was raised again at Dresden in 1995, a quantitative operability evaluation for Quad Cities was completed on August 25, 1995. Quad Cities personnel did not submit an LER on this issue to the NRC.

Quad Cities personnel had not planned to perform modifications to address the nonconforming condition during the current Unit 1 refuel outage. In March 1996, Quad Cities management decided to perform Unit 1 modifications prior to startup. Unit 2 modifications are planned for its next refuel outage.

2.1.3 Dresden Unit 3 and Quad Cities Unit 2 Operability Concerns

At the end of the inspection period, NRC specialist inspectors were reviewing licensee operability evaluations regarding the corner rooms' structural steel for Dresden Unit 3 and Quad Cities Unit 2. Operability for these units is considered an unresolved item (50-249/265/96005-01) pending completion of this NRC review.

2.2 Reactor Protection System (RPS) Single Failure Vulnerability (Applicable to Dresden Only)

2.2.1 History Surrounding Issue at Dresden

A General Electric 10 CFR Part 21 report dated December 3, 1993, informed the licensee of an inadequate separation problem in the RPS at Dresden. A 1975 modification added scram pilot solenoid valve indicating lights to the back panels in the control room. Corresponding current limiting isolation resistors for all four scram solenoid groups had been mounted next to each other on a single "breadboard" for each RPS division. This configuration resulted in the possibility of a hot short simultaneously across all four solenoid groups causing the scram solenoids to remain energized for multiple or all control rod groups. A December 23, 1993, licensee operability evaluation concluded both units remained operable due to adequate backup systems and operator actions. Although this single failure vulnerability was outside the design basis of the plant, the licensee did not submit an LER to the NRC.

A planned modification to resolve this issue involved minimal rewiring in control room panels to house the indicating light resistors in existing separate scram contractor boxes. This modification, although relatively simple and approved management for implementation, was not scheduled to be completed during the current Unit 2 refuel outage. Modifications were scheduled for the next refuel outages on both units (D3R14 and D2R15). Subsequent to the inspectors' discussions, the licensee decided to perform modifications in the current Unit 2 outage and the next Unit 3 refuel outage.

2.2.2 Design Basis

This vulnerability to a postulated single failure was contrary to the design specification. General Electric Design Specification 22A2501, "Separation Requirements For Reactor Safety and Engineered Safeguards Systems," dated January 28, 1969, stated that:

- Single failure criteria were defined in accordance with Paragraph 4.2 of IEEE 279, "Proposed IEEE Criteria for Nuclear Power Plants Protection Systems," Revision 10, dated March 4, 1968.
- Design basis events included gross failure of electrical equipment in any single compartment of instrument or control panels that could result from a short circuit.
- No single design basis event was permitted to disable an essential automatic protective function such as RPS.

Deviation from the design specification also constituted a condition contrary to the licensing basis described in the UFSAR. Standard IEEE-279-1968, Revision 10, stated that a specific protection system design basis shall be provided that documents the range of conditions throughout which the system must perform. This document also stated that any single failure within the protection system shall not prevent proper protection system action when required, including shorting or

open circuiting of interconnecting signal or power cables and single credible malfunctions or events that cause a number of consequential component failures. UFSAR Section 7.2 indicates through various statements that circuit isolation and single failure criteria in IEEE-279-1968 were met.

3.0 Apparent Violations

Inadequate design controls which allowed conditions contrary to the design and licensing basis for both the corner room steel design margins and RPS single failure vulnerability are examples of an apparent violation of 10 CFR Part 50, Appendix B, Criterion III (50-237/249/254/265/96005-02a and 50-237/249/96005-02b).

Failure to take prompt corrective actions for the corner rooms' structural steel design margins and RPS single failure vulnerability nonconforming conditions is an apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI (50-237/249/254/265/96005-03a and 50-237/249/96005-03b).

Undocumented and unanalyzed structural steel load changes were known to exist since 1991 and the structural steel design margins were known to be exceeded since at least January 1994. Existing plans would not have resolved these nonconforming conditions until approximately six years after initial identification.

The failure to meet RPS design specifications was known since December 1993. Existing plans would not have resolved that nonconforming condition until four years after discovery.

Ample opportunity had existed to resolve these problems. Refuel outages had been conducted on Dresden Unit 3 during the Summer 1994 and on Dresden Unit 2 from June 1995 through March 1996 (current). Several forced outages had also occurred during those time periods.

Failures to submit LERs for both the corner rooms' structural steel design margins and RPS single failure vulnerability nonconforming conditions are examples of an apparent violation of 10 CFR Part 50.73(a)(2)(ii) (50-237/249/254/265/96005-04a and 50-237/249/96005-04b).

4.0 Safety Significance of Apparent Violations

The structural steel issue represented a common vulnerability to all the low pressure emergency core cooling systems on both units in the event of an earthquake. Licensee calculations indicated operating basis earthquake (OBE) criteria were significantly exceeded.

The RPS single failure vulnerability, could have prevented the scram solenoids for multiple control rod groups from de-energizing preventing shutdown of the reactor. Backup methods including the alternate rod insertion system and manual operator actions remained available to shut down the reactor.

The failures to submit LERs were missed opportunities to provide greater visibility and earlier resolution of these issues.

5.0 Inadequate Licensee Emphasis On Licensing and Design Basis

The apparent corrective action and reporting violations reflected an inadequate licensee safety focus regarding prompt analysis and correction at facility design deficiencies that conflicted with the facility licensing basis. This inadequate safety focus caused the licensee to regard these issues to be of low safety significance, adversely affecting the thoroughness of the technical approach and licensee management decisions. Inspector interviews of licensee staff identified several considerations which may have governed licensee decisions:

- The licensee's AE contended that more extensive calculations alone would show adequate margin for the structural steel. However, the licensee failed to perform such calculations to verify this conclusion. The inspector reviewed other cases involving nonconforming structural steel and piping supports that had been reported and corrected in a timely manner. In those cases, however, the AE had not taken any written position with respect to the adequacy of design margins.
- Licensee staff believed there was a low probability of occurrence of events or conditions for which these particular nonconforming conditions would become important.
- These were older issues, first identified prior to the current senior management being assigned to Dresden and Quad Cities.

In both cases, the fact these issues were nonconforming conditions with respect to the licensing and design basis and possible margin reductions increasing the probability of structural failure did not cause sufficient concern to result in timely action. The licensee did not plan to perform 10 CFR 50.59 safety evaluations to determine whether these nonconforming conditions were unreviewed safety questions or to perform modifications prior to startup from refuel outages.

6.0 Persons Contacted and Management Meetings

The inspectors contacted various licensee personnel throughout the inspection period. Senior personnel are listed below.

6.1 Public Technical Meeting

A public meeting was conducted on March 5, 1996, in the NRC Region III Office, to discuss licensee calculations involving the LPCI corner room structural steel issue at both Dresden and Quad Cities.

6.2 Exit Meeting

After the conclusion of the inspection period, the inspectors met with licensee representatives at Dresden (denoted by *) on March 29, 1996, and by telephone with Quad Cities licensee representatives (denoted by +) on April 1, 1996, and summarized the scope and findings of the inspection activities. The licensee did not identify any of the documents or processes reviewed by the inspectors as proprietary.

- S. Perry, Acting Site Vice President, Dresden
- *J. Heffley, Units 2 and 3 Station Manager, Dresden
- *R. Kundalkar, Site Engineering Manager, Dresden
- *F. Spangenberg, Regulatory Assurance Manager, Dresden
- *R. Freeman, Plant Engineering Superintendent, Dresden
- *E. Connell, Design Engineering Superintendent, Dresden
- +B. Pearce, Station Manager, Quad Cities
- +S. Eldridge, Design Engineering Supervisor, Quad Cities
- +N. Chrissotimos, Regulatory Assurance Supervisor, Quad Cities
- +B. Ryback, Licensing, Quad Cities
- +I. Johnson, Licensing, Quad Cities