

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-254, 50-265

License Nos: DPR-29, DPR-30

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Licensee: Commonwealth Edison Company (ComEd)

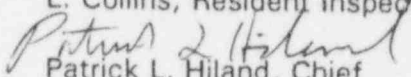
Facility: Quad Cities Nuclear Power Station, Units 1 and 2

Location: 22710 206th Avenue North  
Cordova, IL 61242

Dates: September 30 - November 26, 1996

Inspectors: C. Miller, Senior Resident Inspector  
F. Brown, Reactor Inspector  
K. Walton, Resident Inspector  
L. Collins, Resident Inspector

Approved by:

  
Patrick L. Hiland, Chief  
Reactor Projects Branch 1

## EXECUTIVE SUMMARY

### Quad Cities Nuclear Power Station, Units 1 & 2 NRC Inspection Report 50-254/96019, 50-265/96019

This inspection included aspects of licensee engineering and maintenance. The report covers a 8-week period of inspection from September 30 - November 26, 1996, by resident staff and region-based inspectors.

#### Engineering

- The licensee failed to establish appropriate instructions for controlling maintenance activities and for periodic inspection of the reactor building siding blow-out panels. This failure resulted in a number of damaged blow-out panel bolts existing for an extended period of time without being identified or corrected. The damaged bolts would have prevented the panels from performing the design function of containing a positive internal pressure during certain accidents. The inspectors identified this as an example of an apparent violation of 10 CFR Part 50, Appendix B requirements.
- The licensee failed to ensure that the design basis of the reactor building siding blow-out panels, part of the secondary containment boundary, were correctly translated into specifications, drawings, procedures, and instructions. This failure resulted in the installation of two rigid pipe supports on the reactor building siding blow-out panels without the appropriate analysis, procedures, or instructions which documented the pipe supports' effect on the secondary containment's design basis. The inspectors identified this as an example of an apparent violation of 10 CFR Part 50, Appendix B requirements.
- The inspectors concluded the licensee made changes to the facility without evaluating the changes to determine if an unreviewed safety question existed. The damaged bolts and the attached pipe supports allowed the blow-out panels to degrade into non-compliance with the design requirements described in the Updated Final Safety Analysis Report (UFSAR) prior to May 10, 1996. The licensee's failure to evaluate changes which effected the design function of the blow-out panels was considered examples of an apparent violation of 10 CFR 50.59.
- The licensee's initial safety evaluation to support a unit start up was inadequate in that it erroneously concluded that the blow-out panel's exterior siding were not an integral part of secondary containment. The licensee's failure to conduct an adequate evaluation to support changes to the facility as described in the UFSAR was considered an example of an apparent violation of 10 CFR 50.59.

### III. Engineering

#### E1 Conduct of Engineering

##### E1.1 Failure to Maintain the Design Function of the Reactor Building Siding

###### Background

On May 10, 1996, corrugated steel siding on the upper portion of the reactor building was damaged by high winds. Unit 1 was shutdown and in a refueling outage, and Unit 2 was operating at about 100 percent power when the event occurred. Wind speeds up to 76 miles per hour were measured at the site. The reactor building, which provided secondary containment, sustained damage when a substantial amount of outer sheet metal siding was blown off. In addition, some of the "explosion bolts" on the reactor building siding blow-out panels "failed," as designed.

Initially, the licensee repaired the inner panels and satisfactorily tested secondary containment differential pressure capability. The licensee then planned to start up a unit without completing repairs to the reactor building siding outer panels.

The inspectors reviewed the licensee's operability evaluation and questioned if reactor building integrity could be maintained during the design 100 year wind (110 miles per hour) without the exterior metal siding installed. Initially, the licensee informed the inspectors that the exterior siding was "cosmetic" in nature and was not required to be in place before unit startup. The licensee was unable to produce design calculations to support the operability evaluation. Also, the licensee initiated a 10 CFR 50.59 evaluation (Tracking No. 97-3) to revise the UFSAR to clarify the function and design requirements of the reactor building siding. The proposed change stated that the inner panel was the only siding component required for secondary containment.

After a second request by the inspectors to review the calculations which supported the operability evaluation, the licensee performed a design calculation. On June 1, the inspectors were informed that the reactor building exterior siding was integral to secondary containment. The planned unit startup was delayed until the reactor building exterior siding was repaired. Repairs were completed on June 9, 1996. (See Inspection Reports (IR) 50-254/265-96006 and 96008 for additional background information.)

##### a. Inspection Scope (37551, 92700)

The inspectors toured the refuel floor area of the reactor building; interviewed plant engineering staff; reviewed licensee records; and compared the results of the inspection to Sections 3.1, 3.2, 3.3, 6.0, 6.2, 15.6, and 15.7 of the UFSAR.

b. Observations and Findings

i. UFSAR Description of Reactor Building Siding

Upon review of the Quad Cities UFSAR, the inspectors noted that the reactor building siding, including the blow-out panels, was an integral part of secondary containment. The intent of the design was to contain radiological releases during some postulated accidents and to relieve interior building pressure. Failure of secondary containment to perform as designed could result in a significant release of radioactivity. The inspector's observations were based on the following:

- Section 3.1.2.5 stated that secondary containment was specifically designated as being an engineered safety feature designed to minimize releases of radioactive materials.
- Section 3.3.1.1.1 stated that the reactor building, including the steel superstructure, formed the secondary containment.
- Section 3.2.1 designated the reactor building as a Class I Structure whose failure could cause "significant release of radioactivity (i.e., calculated off-site doses in excess of 10 CFR Part 100)."
- Section 6.0.1.1 stated the secondary containment system limited the release of radioactive materials to the environs.
- Section 6.2 described how radioactive releases from refueling accidents; loss of coolant accidents; and high energy line breaks would be contained within the reactor building so that the stand-by gas treatment system could remove radioactive contamination and gases, and discharge the remaining radioactive constituents from the elevated release point at the top of the 310 foot chimney. (The inspectors noted that this containment function relied upon a building envelope consisting of metal siding on a structural frame. This observation was supported by Section 6.2.3.2.1 of the UFSAR, which specified that the reactor building's containment function was achieved through low leakage rates in the walls and roof.)
- Section 6.2.3.1 indicated the reactor building was designed to contain a positive pressure of 7 inches water-gauge without structural failure and pressure relief.

ii. Licensee's Design Control of Reactor Building Blow-Out Panels

During the repairs of the reactor building siding, the licensee informed the inspectors that the steel framework which supported the reactor building siding was considered safety-related, but the siding was not considered to be safety-related. The licensee's conclusion was based on Section 3.2.7 of the UFSAR, which stated that safety-related systems and structures, as defined by Generic Letter (GL) 83-28, "Required Actions Based on Generic Implications of Salem ATWS Events," were

identified in the Master Equipment List (MEL). The licensee's MEL identified the steel framework which supported the siding as safety-related, and the reactor building siding, including blow-out panels, as nonsafety-related.

On June 28, 1996, Problem Identification Form (PIF) 96-2223 was issued to review the safety classification of work already performed and in progress on the reactor building siding blow-out panels. In response to the PIF, Engineering acknowledged the accident mitigation function of the secondary containment siding and acknowledged the Technical Specification requirement that the containment function be operable. However, Engineering relied upon the MEL which listed the reactor building siding, including the blow-out panels, as nonsafety-related when reaching the conclusion that repairs to the reactor building blow-out panels were nonsafety-related. The PIF was closed without further action.

The inspectors noted that the plant on-site review committee (PORC) had approved the use of nonsafety-related procedures and calculations for the work already performed or in progress. In addition, the licensee described the procedures and calculations used for the repair of the reactor building blow-out panels as being commensurate with the requirements of 10 CFR Part 50, Appendix B.

Based on reviews of GL 83-28 and the UFSAR Section 3.2.1, the inspectors concluded that the reactor building blow-out panels met the licensee's criteria for safety-related classification. In addition, the inspectors determined the licensee had not applied the requirements of 10 CFR Part 50, Appendix B, to the reactor building blow-out panels because of the sidings' classification as nonsafety-related in the MEL.

### iii. Non-Compliance with 10 CFR Part 50, Appendix B Design Requirements

#### Damaged Reactor Building Blow-out Panel Bolts

During inspections and repairs of the reactor building siding following the May 10 event, the licensee identified numerous (270 out of 1496) reactor building blow-out panel bolts that were broken. These specially notched bolts with a necked down shank, referred to as "explosion bolts," were designed to "fail" at a predetermined differential pressure across the panels to protect the reactor building superstructure. Problem Identification Form 96-2056 was initiated on June 9, 1996, to document the "as found" condition and to document the results of the root cause investigation. The licensee determined the apparent cause of the broken bolts was from accidental bumping of the bolts during maintenance near the reactor building wall. During the PIF investigation, it was observed that a number of "explosion bolts" had been damaged prior to the May 10 event. Bolt remnants which had been painted over were identified during the investigation.

The inspectors considered that opportunities to promptly identify and correct conditions adverse to quality had been missed when bolt remnants were painted over. Further, the inspectors concluded that the licensee failed to establish



appropriate instructions for controlling maintenance activities and for periodic inspection of the reactor building siding blow-out panels.

Appendix B, 10 CFR Part 50, Criterion III, "Design Control," required, in part, that the design basis of structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions. The licensee's failure to establish appropriate instructions for controlling maintenance activities and for periodic inspection of the reactor building siding blow-out panels was **an example of an apparent violation** of 10 CFR Part 50, Appendix B, Criterion III (50-254/265-96019-01a). Specifically, specially notched bolts on the reactor building siding blow-out panels were found to have been damaged. A number of damaged bolts existed for an extended period of time without being identified or corrected. The damaged bolts would have prevented the panels from performing the design function of containing a positive internal pressure during certain accidents.

#### Pipe Supports Installed on Reactor Building Siding Blow-out Panels

On October 4, 1996, the inspectors identified two pipe supports that were rigidly attached to the reactor building siding blow-out panels. These pipe supports attached approximately 1.5 inch nominal diameter air piping to the blow-out panels. The pipe supports were installed in a manner which appeared to impede the design function of the reactor building siding blow-out panels. The licensee stated that the installation of these pipe supports was performed without using procedures or instructions which correctly translated or controlled the design basis of the reactor building blow-out panels.

The licensee's failure to ensure that the design basis of the reactor building siding blow-out panels (part of the secondary containment boundary) were correctly translated into specifications, drawings, procedures, and instructions was **an example on an apparent violation** of 10 CFR Part 50, Appendix B, Criterion III (50-254/265-96019-01b). Specifically, two rigid pipe supports were installed on the reactor building siding blow-out panels without the appropriate analysis, procedures, or instructions which documented the pipe supports' effect on the secondary containment's design basis.

#### iv. Non-Compliance with 10 CFR 50.59 Requirements

##### Modifications to Blow-out Panels Prior to May 10, 1996

As stated above, the licensee failed to ensure that the reactor building siding blow-out panels were maintained in accordance with the design requirements of the UFSAR. This resulted in: (1) a number of damaged bolts that existed for an extended period of time prior to the May 10, 1996, event without being identified or corrected; and (2) modifications were made to the blow-out panels by attaching pipe supports without appropriate evaluations. The damaged bolts and the attached pipe supports allowed the blow-out panels to degrade into non-compliance from the design requirements described in the UFSAR prior to the May 10, 1996 event. Both the damaged bolts and the pipe supports would have impeded the

panels from performing the design function during certain accidents. The damaged bolts and attached pipe supports were changes to the facility as described in the UFSAR and subject to the evaluations required by 10 CFR 50.59. The licensee's failure to evaluate changes which effected the design function of the blow-out panels was **an example of an apparent violation** of 10 CFR 50.59 (50-254/265-96019-02a).

#### Inadequate Safety Evaluation

In mid-May 1996, the licensee intended to start up a unit without repairing the reactor building exterior siding. Initially, the licensee reviewed the UFSAR and concluded that the inner panel was the only siding component required for secondary containment. In addition, the licensee initiated a 10 CFR 50.59 evaluation (Tracking No. 97-3) to revise the UFSAR to clarify the function and design requirements of the reactor building siding. The proposed change stated that the inner panel was the only siding component required for secondary containment.

The inspectors requested the licensee's engineering calculations which supported the conclusion that the inner panel was the only siding component required for secondary containment. The licensee notified the NRC on June 1, 1996, that the reactor building blow-out panel's exterior siding were integral to secondary containment. Subsequently, the licensee canceled the UFSAR change package and delayed unit startup until the exterior siding was repaired. The licensee's initial safety evaluation to support a unit start up was inadequate in that it erroneously concluded that the blow-out panel's exterior siding were not an integral part of secondary containment. The licensee's failure to conduct an adequate evaluation to support changes to the facility as described in the UFSAR was **an example of an apparent violation** of 10 CFR 50.59 (50-254/265-96019-02b).

#### c. Conclusions

Engineering displayed a lack of rigor in evaluating the reactor building siding design basis and in performing a quantitative assessment of the capability of the degraded exterior panels. Inspector intervention was necessary before the licensee recognized that the integrity of the reactor building exterior paneling was required before reactor startup. Also, the licensee, especially Engineering and PORC, had opportunities to identify and resolve the safety aspects of the reactor building blow-out panels but failed to do so.

The failure to ensure that the design basis of the reactor building siding blow-out panels were correctly translated into specifications, drawings, procedures, and instructions resulted in: (1) a number of damaged blow-out panel bolts existing for an indeterminate period of time and (2) installation of pipe supports without adequate evaluations. These failures were examples of an apparent violation of 10 CFR Part 50, Appendix B, Criteria III, "Design Control."

The inspectors concluded the licensee made changes to the facility without evaluating the changes to determine if an unreviewed safety question existed. In one example, the damaged bolts and the attached pipe supports allowed the blow-out panels to degrade into non-compliance with the design requirements described in the UFSAR prior to the May 10, 1996. In the other example, a 10 CFR 50.59 evaluation was performed but the evaluation had no technical merit. These were considered examples of an apparent violation of 10 CFR 50.59.

#### V. Management Meetings

##### **X1 Exit Meeting Summary**

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on November 26, 1996. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

C. Peterson                      Regulatory Affairs Manager  
B. Fairbanks    Executive Assistant to the Site Vice President



## LIST OF ACRONYMS USED

|        |                                      |
|--------|--------------------------------------|
| ATWS - | Anticipated Transient Without Scram  |
| GL -   | Generic Letter                       |
| MEL -  | Master Equipment List                |
| PIF -  | Problem Identification Form          |
| PORC - | Plant Onsite Review Committee        |
| SQV -  | Site Quality Verification            |
| UFSAR- | Updated Final Safety Analysis Report |