

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-456/88012(DRSS)

Docket No. 50-456

License No. NPF-70

Licensee: Commonwealth Edison Company  
Post Office Box 767  
Chicago, IL 60690

Facility Name: Braidwood Station, Unit 1

Meeting At: Region III Office, Glen Ellyn, Illinois

Meeting Conducted: March 28, 1988

Approved By: *L. Robert Greger*  
L. Robert Greger, Chief  
Facilities Radiation Protection  
Section

4-4-88  
Date

Inspection Summary

Meeting On March 28, 1988 (Report No. 50-456/88012(DRSS))

Areas Discussed: An enforcement conference was conducted to discuss licensee errors associated with a design change in the electrical heaters in the Control Room Ventilation Systems.

## DETAILS

### 1. Meeting Attendees

#### Commonwealth Edison Company

T. Maiman, Vice President, PWR Operations  
K. Graesser, General Manager, PWR Operations  
B. Shelton, PWR Engineering Manager  
F. Lentine, PWR Licensing Supervisor  
S. Hunsader, Nuclear Licensing Administrator  
D. O'Brien, Services Superintendent  
M. Lohmann, Project Construction and Startup Superintendent  
L. Davis, Assistant Superintendent Technical Services  
P. Barnes, Regulatory Assurance Supervisor  
P. Holland, Regulatory Assurance Engineer  
R. Richard, Technical Staff Engineer  
T. Coomer, Technical Staff Engineer  
W. Paschal, Assistant Head HVAC Division, S&L  
D. Galanis, Senior Electrical Project Engineer, S&L

#### Nuclear Regulatory Commission - Region III

C. Paperiello, Deputy Regional Administrator  
C. Norelius, Director, Division of Radiation Safety and Safeguards  
W. Shafer, Chief, Emergency Preparedness and Radiation Protection Branch  
L. Greger, Chief, Facilities Radiation Protection Section  
J. Hinds, Chief, Reactor Projects Section 1A  
W. Schultz, Enforcement Coordinator  
C. Gill, Senior Radiation Specialist  
R. Lerch, Reactor Engineer  
C. Anderson, Enforcement Specialist

### 2. Enforcement Conference Details

The enforcement conference was held to discuss an event which is described in Inspection Report No. 50-456/88007(DRSS). This event involved operability problems with the Control Room Ventilation Systems resulting from electrical heater design change errors.

The NRC/Region III staff summarized the inspection findings, apparent violations of regulatory requirements, and other regulatory concerns. The concerns discussed by Region III personnel included:

- The heater interlock circuitry design and switch setpoint errors resulted in the Control Room Ventilation Systems not meeting system design requirements for an extended period of time (from May 29, 1987 until November 21, 1987). Although these problems were identified and corrected by the licensee, it was not done in a timely manner.

- The design errors were not identified during the design review process before installation.
- System operability was not adequately verified during the pre-service testing program subsequent to installation.
- The setpoints for the heater interlock switches used to tie heater operation to fan operation were not revised to reflect the circuitry design change. Although this error initially resulted in a higher probability of heater operability, it was a fortuitous set of circumstances, not the result of purposeful licensee action. (The setpoint error also hindered the design error from being detected by routine surveillance testing.)
- The NRC has noted over the last few years that, in general, control room ventilation systems are frequently neglected and often misunderstood by licensees. NRC efforts to inform licensees of concerns regarding the neglect of these important ESF systems is indicated by the issuance on August 28, 1986, of Information Notice No. 86-76, "Problems Noted in Control Room Emergency Ventilation Systems." Inadequate system understanding may have contributed to the failure to adequately test the systems after completion of the design changes, and probably contributed to the failure to identify the problem promptly when the startup test was conducted and to the failure to appreciate the significance of not having made the setpoint changes once it was recognized that they had not been made, including the apparent need to enter Technical Specification (T/S) 3.0.3 at that point.
- In addition to addressing the concerns associated with this event, the licensee had earlier been requested to provide assurance that similar problems associated with other design changes/modifications have not occurred. Specifically, that design changes/modifications made during or subsequent to applicable system preoperational tests have been adequately tested to ensure system operability, and that required setpoint revisions have been made.

In response to the Region III comments, the licensee stated that the NRC concerns would be addressed, and indicated that the design, design review, and testing program deficiencies were due to individual personnel judgment errors, not to program inadequacies or to a lack of Control Room Ventilation System familiarity. The licensee then provided their account of the event and event causation, which did not vary significantly from that provided in Inspection Report No. 50-456/88007(DRSS).

The licensee identified the following corrective actions and programmatic reviews:

- Initial actions were taken to correct the wiring and setpoint errors when they were discovered.
- Engineering Change Notice SECN 182 was issued on November 6, 1987 to correct the design changes.

- On December 4, 1987, at the Architect Engineer's (Sargent & Lundy) Biweekly Nuclear Projects Meeting, the design error was determined to be an apparent S&L nonconformance.
- The design error was reported to S&L QA on December 14, 1987 in accordance with S&L QA Procedure GQ-16-01.
- S&L Project Instruction PI-BB-210 was prepared on February 4, 1988, under which a random sample of Class 1E differential pressure switch applications were to be reviewed to determine whether the design error was of a recurring nature.
- The above review, completed on March 19, 1988, identified no other similar errors (100% review of Class 1E differential pressure switch applications was performed).
- A revision of S&L Mechanical Standard MES-3.8, which should prevent recurrence of the design error problem, is expected to be issued by May 2, 1988.
- The licensee stated that project startup test personnel misjudged the complexity of the design change and selected the incorrect type of verification test. Since no other similar errors have been identified to date, the licensee had felt that no pre-service testing program corrective actions were necessary; based on NRC comments, however, the licensee agreed to reevaluate this decision.
- The licensee stated that because the adequacy of the surveillance tests was questionable, the criteria for the minimum acceptable temperature rise across the filter units was changed from 5°F to 9°F, in part, to account for the  $\pm 4^\circ\text{F}$  accuracy of the temperature probes. If the temperature rise is less than 9°F, the current (amperes) output of the heater is to be measured to confirm heater operation.
- The licensee decision to dismiss contractor reviewers and process setpoint data sheets in-house created a significant (several months) backlog which was, responsible for the failure to reset the heater interlock logic switches in a timely manner. The licensee stated that a review for other incidents of design change setpoints not being reset before system operation revealed two similar errors, both of which involved of non-ESF systems. The licensee has reduced the setpoint data sheet review backlog from about 2,000 on November 6, 1987, to somewhat more than 400 currently, only a few of which are for Unit 1 systems.

The licensee presented a heater interlock circuitry design change history which compared design change milestone dates on Byron and Braidwood from initial design issuance to final change approval. The licensee stressed that Byron used the modification process because it was an operating plant and Braidwood used the design change process because it was still under construction. The initial design issuances for Byron and Braidwood were by PECN 705 on February 18, 1987, and ECN 34446 on December 16, 1986,

respectively. The design problem was identified at Byron during the modification package review on October 24, 1987, and independently at Braidwood by review of the Startup Test on November 6, 1987. The design change corrections were issued by PECN 705-1 on October 29, 1987, and by SECN 182 on November 6, 1987, for Byron and Braidwood, respectively. The changes were approved for Byron on November 3, 1987, and for Braidwood on December 1, 1987. Although there may not have been direct coordination between the operations personnel at both plants concerning the design error identification, the licensee stated that the fact that the design revision for Braidwood was issued on same day (November 6, 1987) that the design error was identified independently by Braidwood personnel indicates design engineering groups for the two plants were closely coordinated. The licensee also stated that Byron may have identified the problem earlier than Braidwood because the modification process includes a technical review of the modification package which the design change construction review process at Braidwood lacked.

The licensee's presentation of the safety significance stressed the licensee hypothesis that, although required by commitments to Regulatory Guide 1.52 and ANSI/ASME N509-1976, Control Room Ventilation System heater operation is not needed for LOCA conditions, the turbine building should be considered to remain intact post-LOCA, and that the heat sources in the turbine building would raise outside air to a temperature high enough to reduce atmospheric relative humidity from 100% to less than 70% (the control emergency makeup air intakes are in the turbine building and the heaters are required by Technical Specifications to reduce the relative humidity which impinges on the charcoal adsorbers to no more than 70%). The licensee also contended that the heaters were not needed for the main steam line break (MSLB) accident (makeup air in the turbine building would be at 100% relative humidity) because of a licensee analysis which indicates that only a fraction of a percent iodine removal efficiency for the makeup charcoal adsorbers is needed to reduce postulated control room operator thyroid doses below 10 CFR 50, Appendix A, GDC-19 guideline limits. The licensee claimed that the expected iodine removal efficiency under MSLB accident conditions would be in excess of that needed.

The NRC responded to the licensee's safety significance presentation by stating that regardless of accident analysis assumptions used to calculate postulated post-accident doses to control room operators, the fact remains that both independent Control Room Ventilation Systems would not have performed as designed and had remained in a degraded condition for five months because of the design errors and the failure of the licensee to identify and correct the errors in a timely manner. Subsequent to the enforcement conference, this matter was discussed further with the licensee by telephone on March 29 and 31, 1988. These discussions revealed that the licensee's analyses were based, in part, on the temperature differences between the outside atmosphere and the turbine building atmosphere on September 30, 1987, during the startup test on Train A of the Control Room Ventilation Systems while Unit 1 was operating at 49% of rated power. However, the temperature measurements were ad hoc measurements rather than statistically derived limiting

conditions and therefore cannot be relied upon generically. Also, contrary to the licensee analyses, under design basis accident (DBA) conditions the heat sources in the turbine building would soon dissipate. Thus, under DBA conditions, the air inside the turbine building should be assumed to be identical to the atmospheric conditions, including the relative humidity. It therefore appears that the safety significance presented in Inspection Report No. 50-456/88007(DRSS) is correct in that under certain conditions (DBA conditions with high relative humidity), the control room potentially could have been uninhabitable per GDC-19 criteria. If the control room was uninhabitable, a condition would exist which could prevent the fulfillment of the safety function of systems needed to shutdown the reactor and maintain a safe shutdown condition.

After the licensee gave a summary to close the presentation, the senior NRC representative expressed concern regarding the unknown number of plant systems that may be in a "window of vulnerability" in that they may be susceptible to the types of errors associated with this event because design changes occurred after completion of system preoperational testing but before the systems were released to the Operations Department. The senior licensee representative responded by stating that information on ESF and non-ESF systems that were in that category would be provided to Region III in the near future.

The senior NRC representative acknowledged the licensee's presentation and stated that the Region III recommendation concerning enforcement action for the event would be forwarded to the NRC Office of Enforcement for its concurrence. After review by that Office, the licensee would be notified in writing of the NRC's proposed enforcement action.