U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-237/94013(DRS); No. 50-249/94013(DRS)

Docket Nos. 50-237; 50-249 Licenses No. DPR-19; No. DPR-25

Licensee: Commonwealth Edison Company
Executive Towers West III
1400 Opus Place - Suite 300
Downers Grove, IL 60515

Facility Name: Dresden Nuclear Power Station - Units 2 and 3

Inspection At: Dresden Nuclear Power Station, Morris, IL

Inspection Conducted: June 24 through July 26, 1994

Inspectors: H. A. Walker 8/4/94
H. A. Walker Date

Approved By: W. D. Shafer 8/4/94
W. D. Shafer, Chief Date
Maintenance and Outages Section

Inspection Summary

Inspection conducted June 24 through July 26, 1994 (Reports No. 50-237/94013(DRS); No. 50-249/94013(DRS))
Areas Inspected: An inspection of engineering and technical support and related management activities affecting the HPCI room coolant fan problem. The inspection was conducted utilizing portions of inspection procedures 37700 and 92720 to determine if action by plant management, engineering and other organizations was adequate and accomplished in a timely manner.
Results: Based on the inspection, engineering performance was considered to be inadequate. The quality of engineering in the performance of calculations and the evaluations of the possible impact of identified deficiencies appeared to be lacking. The timeliness of action to determine the impact of known deficiencies was poor. Some systems engineers failed to question or respond to documentation identifying problems which could effect the operability of the assigned systems.

The apparent violation identified problems in corrective action and Technical Specification compliance. The failure to take timely and effective action to identify and correct documented problems under similar conditions had been previously identified. Untimely corrective action, as noted in this inspection, made Technical Specification required equipment inoperable under degraded voltage conditions.

DETAILS

1.0 Principal Persons Contacted

Commonwealth Edison Company

* R. Aker, Technical Services Superintendent
* H. Drumhiller, Systems Engineering Supervisor
* S. Elderidge, Modification Administrator
S. Gaconis, Electrical - Instrument and Control Engineer
* P. Holland, Root Cause Analyst
* S. Koenig, Regulatory Performance Administrator
* J. Purrazzo, Modifications Lead Engineer
* J. Ray, Modifications Supervisor
J. Shields, Regulatory Assurance Supervisor
* J. Smentek, Modification Design Engineer

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M. Leach, Senior Resident Inspector
P. Hiland, Chief, Projects Section 1B
C. Phillips, Resident Inspector
W. Shafer, Chief, Maintenance and Outage Section
* A. Stone, Resident Inspector

* Denotes those present at the exit meeting on July 22, 1994.

Other persons were contacted as a matter of course during the inspection.

2.0 Inspection Objectives

The objectives of the inspection were to determine the adequacy and timeliness of actions taken to address the problem identified by Inspection Follow-up Item 249/94013-03(DRS) from the engineering and technical support inspection conducted in March and April of 1994. This item noted that Calculation 8982-19-19-2, "Calculation for Contactor/Interposing Relay Coil Voltage at Pickup," Revision 1, dated December 22, 1992, indicated that further analysis was needed to determine if possible degraded voltage problems existed in the control circuits for six components. The inspection was accomplished by discussions with selected personnel and review of records, procedures, and associated documentation.

2.1 Description of Problem

On May 9, 1994, Commonwealth Edison submitted a licensee event report (LER) when personnel discovered that the minimum control voltage for the high pressure coolant injection (HPCI) room cooler fan was approximately 12 volts above the setpoint of the electrical bus minimum voltage relay setting. With this condition, there was no assurance that the fan would start under a degraded voltage condition and the HPCI system might not be available to perform its intended safety function.

The apparent cause of the problem appeared to be inadequate design calculations on the effects of degraded voltage on the HPCI room cooler fan. The inadequate design calculations had been identified by licensee personnel as early as January of 1992; however, additional calculations were not completed until after the calculations were requested by the NRC in April of 1994. The plant operated with the HPCI system in a possible degraded condition until the Unit 2 room cooler fans were placed in continuous operation on April 12, 1994.

2.2 Engineering Analysis

An engineering analysis, performed as a result of the inspection follow-up item, indicated no problem with five of the six circuits. The analysis indicated that possible degraded voltage problems existed for the HPCI pump room coolant fan control circuit. Under degraded voltage conditions, the fan might not start. The failure of the fan to start could result in the inability of the HPCI system to perform required Technical Specification functions. As a result of the analysis, an operability assessment was performed on the HPCI pump room coolant fan and LER 237/94-010 was issued on May 9, 1994.

2.3 Correction of HPCI Control Circuit Problem

On May 15, 1994, an exempt change was approved to change the breakers on both units to breakers which required lower pick up voltage and would not be affected by a degraded voltage condition. Nuclear work requests D25259 for Unit 2 and D25260 for Unit 3, were issued to correct the problem on the two units. On June 8, 1994, work was completed for Unit 2 and work was completed for Unit 3 on July 17, 1994. Completed work included replacement of the breaker and testing to verify fan operation. Inspection follow-up item 249/94013-03(DRS) will be closed.

2.4 Inadequate Long Term Corrective Action

On November 9, 1990, the Dresden Unit 2, Electrical Load Monitoring System (ELMS) Running Voltage Summary identified the potential for degraded voltage conditions on safety related motor control centers. No immediate action was taken. In August of 1991, an NRC Electrical Distribution System Functional Inspection (EDSFI) noted that action had not been taken and that there were possible problems with the function of some equipment due to uncorrected degraded voltage conditions.

In response to a commitment made during the EDSFI, a degraded voltage calculation review was completed in January of 1992. The HPCI room cooler fan control circuit and five other circuits were determined to need additional calculations. These circuits were placed on a punch list for additional analysis and were assigned a low work priority. Licensee personnel stated that the HPCI room cooler fan control circuit was included as a low priority because discussions with reactor operators indicated that the HPCI system was primarily a DC system and AC electrical components would not affect system operation.

The Dresden, Unit 2 and 3 Technical Specifications require that the HPCI system be operable whenever reactor pressure is greater than 150 psig and irradiated fuel is in the reactor vessel. In order for the system to be

considered operable, supporting subsystems or components necessary for the system to perform its required function must also be capable of performing the related support function.

Licensee personnel identified HPCI room cooler fan control circuit calculation problems in January of 1992. Plant records indicated that meetings were held or documents were issued that should have made licensee personnel aware of the potential problem and that prompt action was needed to assess the operability of the HPCI room cooler fan design. The need for additional calculations was identified at least twice by licensee personnel, once in January of 1992 and once in December of 1992. The fact that the HPCI room cooler fans were necessary for HPCI operation was identified on at least six occasions. The engineering review and operability assessment was completed in April of 1994 in response to NRC concerns. Following is a discussion of some of these items.

a. On September 22, 1992, a Nuclear Engineering Department letter was issued documenting the results of a September 15, 1992 meeting between Nuclear Fuel Services, Nuclear Licensing Department and the NRC to discuss the need for the ECCS room coolers. The letter identified that the HPCI room cooler fan would be required to function in the event of a design basis loss of coolant accident to prevent high temperature areas in the HPCI room. Although the letter was distributed to a number of plant personnel, no action was taken to complete the detailed calculation for the HPCI room cooler fan control circuit; the punch list priority was not changed.

b. On November 3, 1992, NFS Calculation # RSA-D-92-06, "HPCI Room Thermal Response with Loss of HPCI Room Cooler at Dresden Station" was completed and issued. This calculation verified that the HPCI system would be operable without the room coolers, provided the HPCI room cooler fans were running to ensure a well mixed temperature distribution.

c. On December 21, 1992, a letter from the Nuclear Licensing Administrator to NRR stated that the HPCI room cooler fans would be required, if the room coolers were not in service, to ensure a well mixed temperature distribution.

d. On December 22, 1992, Revision 1 of Calculation 8982-19-19-2, "Contractor/Interposing Relay Coil Voltage at Pickup" was completed addressing degraded voltage issues. This calculation indicated that further analysis was needed on the six circuits identified in January of 1992, which were subject to possible degraded voltage problems. The HPCI room cooler fan control circuit was one of these circuits. No change was made in the priority for the required analysis.

e. On February 3, 1993, emergency core cooling system room cooler operability requirements were completed and issued. These requirements indicated that HPCI room cooler fans were required to ensure adequate temperature distribution in the HPCI room.

f. On November 1, 1993, the HPCI room cooler drive belts were discovered broken, the HPCI system was declared inoperable and Unit 3 entered a seven day Limiting Condition for Operation (LCO) per Technical Specification Section 3.5. The LCO was terminated on November 3, 1993.

This problem was documented on LER 249/93-017, dated November 17, 1993. Although this was a clear indication that licensee personnel considered the cooler fans required for HPCI operation, no change was made in the status or priority of the room cooler fan control circuit calculations.

g. During March and April of 1994, NRC inspectors performing a routine engineering and technical support inspection noted that detailed calculations for six circuits included in degraded voltage modifications were missing. One of these circuits was the HPCI room cooler fan control circuit. The inspectors were told the six circuits had been evaluated. Pending receipt of the calculations, the item was made an inspection follow up item in inspection report number 237/249/94003, which was issued on May 11, 1994.

h. In response to the inspection item, an operability determination was completed on the HPCI room cooler fans on April 12, 1994. The NRC was subsequently notified by phone of the possible inoperability of the HPCI system under degraded voltage conditions due to the possible failure of the HPCI room cooler fans. LER 237/94-010 was issued on May 9, 1994, to document this problem.

The plant operated with the HPCI system in a possible degraded condition until the Unit 2 room cooler fans were placed in continuous operation on April 12, 1994. Because of an incorrect assumption in January of 1992, licensee personnel were not aware that the HPCI room cooler fans were required for HPCI operation until the September 15, 1992, meeting. Several other occasions are documented where meetings were held or documents were issued indicating that the operation of the HPCI room cooler fan was required and that the fan control circuit was subject to the degraded voltage problem. Until NRC concerns were expressed, no action was taken to expedite the resolution of the problem. The failure to take timely corrective action to determine and ensure the operability of the HPCI system to perform required safety related functions under degraded voltage conditions is an apparent violation of Criterion XVI of 10CFR50, Appendix B.

2.5 Safety Significance

Section D of LER 237/94-10 described the safety significance of the possible loss of the HPCI pump room coolant fans as "minimal" due to General Electric Company's "Small Break Analysis." Other factors also tend to minimize the safety significance of the loss of these fans; however, the most significant issue is the failure of the corrective action system to determine the need for and provide prompt and effective corrective action.

In this case, repetitive opportunities occurred indicating the need to expedite the matter and bring it to the attention of management or responsible engineers. Also of significance was the failure to perform the calculations necessary to prove the operability of safety related equipment and the inability or failure to accurately determine if equipment was required for a system to perform its required safety function.

2.6 Problem Contributors

The inspector noted several weaknesses or possible problems that appeared to have contributed to the low priority assignment and the lack of action on the HPCI pump room cooler fan problem. These are discussed below.

- Inadequate Communications -- Communications on this issue were weak. Different organizations were involved in different areas and the complete picture did not seem to be addressed by anyone.

  Plant management and supervision, as well as some key engineers, were involved in discussions, meetings and work activities that indicated that the HPCI room cooler fans were required for HPCI system operation and that further engineering analysis was required to determine if this subsystem would be affected by degraded voltage. No action was taken to expedite resolution of the issues and, it appeared that the degraded voltage issue was not tied to the need for the HPCI room cooler fan issue. The inspector was told that, until April of 1994, the engineering organization responsible for the additional calculations on the HPCI room cooler fan control circuit was not aware of any change in the original low priority for completing the calculations.

- Systems Engineering Involvement -- Systems engineers assigned to the HPCI, the HPCI room cooler and the 480 volt electrical systems did not expedite resolution of the fan cooler issues. These engineers, as well as the systems engineering supervisor, should have been aware that the room cooler fans were required for HPCI system operation and that further engineering analysis was required to determine if this subsystem would be affected by degraded voltage.

- Error in the Updated Final Safety Analysis Report -- A portion of the confusion related to the assignment of a low priority for completion of the additional calculations for the HPCI system room cooler fans appeared to be due to an error or a lack of clarification in the Dresden Updated Final Safety Analysis Report (UFSAR). Section 6.3.2.3 of the UFSAR stated, "Operation of the HPCI system in the emergency mode is completely independent of ac power and requires only dc power from the station battery to operate the controls." Several documents, including engineering calculations, indicated that the 480 vac driven HPCI room cooler fans were necessary for the HPCI system to perform the required technical specification safety functions. The UFSAR wording and the need for clarification was brought to the attention of licensee personnel.

3.0 Exit Meeting

The inspector met at the Dresden Nuclear Power Station with licensee representatives (denoted in Section 1 of this report) on July 26, 1994, to summarize the purpose, scope, and findings of the inspection. The inspectors discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. Licensee personnel were asked to identify any proprietary information or material discussed during the exit meeting. Licensee personnel did not identify any information, material or documents as proprietary.