

July 12, 1994

NOTE FOR: Lawrence E. Kokajko, Lead PM, STP, NRR/PDIV-2 (Via E-Mail)

FROM: Sada V. Pullani, DEIIB/AEODPJP

SUBJECT: STP DET Staff Action 6.b., not resolved.

Staff Action 6.b. in Reference 1. assigned NRR the responsibility to " evaluate the need to provide additional generic regulatory correspondence for multiple fuel injector hold down stud failures [of Emergency Diesel Generators (EDGs)] and to issue guidance as appropriate." However, Reference 2. closed this item based on the adequacy of a new solid stud design for the EDGs at STP, replacing old hollow stud design, but without evaluating the need to issue generic correspondence or guidance to the licensees. It should be noted that several other licensees had experienced similar failures of their EDGs made by the same manufacturer (Cooper-Bessemer) and the problem is not an isolated case at STP. Based on the above, AEOD's independent verification of the resolution of this item concludes that this item is not resolved.

The NRR staff is requested to discuss this matter with the AEOD staff ASAP and to continue to keep AEOD/DEIIB on distribution for items of interest on this issue. For the 1994 AEOD Annual Report purpose, please also provide us an expected date of completion for the NRR evaluation of need to issue any generic communication/guidance as stated in the staff action, ASAP but latest by end of January 1995.

References:

1. Memorandum from James M. Taylor to Thomas E. Murley, Staff Actions Resulting from the Diagnostic Evaluation of South Texas Project, August 3, 1993.
2. Memorandum from William T. Rusel to James M. Taylor, NRR Staff Actions Resulting from the Diagnostic Evaluation of South Texas Project (WITS-93133), June 14, 1994.

cc:

S. Rubin  
P. Prescott  
DEIIB Files D1012  
SVP File 1.52

E-File G:\DEIIB\DEPFILES\D1012\STPSA6B.1SP

July 12, 1994

NOTE FOR: Lawrence E. Kokajko, Lead PM, STP, NRR/PDIV-2 (Via E-Mail)

FROM: Sada V. Pullani, DEIIB/AEODPJP

SUBJECT: STP DET Staff Action 6.b., not resolved.

Staff Action 6.b. in Reference 1. assigned NRR the responsibility to " evaluate the need to provide additional generic regulatory correspondence for multiple fuel injector hold down stud failures [of Emergency Diesel Generators (EDGs)] and to issue guidance as appropriate." However, Reference 2. closed this item based on the adequacy of a new solid stud design for the EDGs at STP, replacing old hollow stud design, but without evaluating the need to issue generic correspondence or guidance to the licensees. It should be noted that several other licensees had experienced similar failures of their EDGs made by the same manufacturer (Cooper-Bessemer) and the problem is not an isolated case at STP. Based on the above, AEOD's independent verification of the resolution of this item concludes that this item is not resolved.

The NRR staff is requested to discuss this matter with the AEOD staff ASAP and to continue to keep AEOD/DEIIB on distribution for items of interest on this issue. For the 1994 AEOD Annual Report purpose, please also provide us an expected date of completion for the NRR evaluation of need to issue any generic communication/guidance as stated in the staff action, ASAP but latest by end of January 1995.

References:

1. Memorandum from James M. Taylor to Thomas E. Murley, Staff Actions Resulting from the Diagnostic Evaluation of South Texas Project, August 3, 1993.
2. Memorandum from William T. Rusel to James M. Taylor, NRR Staff Actions Resulting from the Diagnostic Evaluation of South Texas Project (WITS-93133), June 14, 1994.

cc:

S. Rubin  
P. Prescott  
DEIIB Files D1012  
SVP File 1.52

E-File G:\DEIIB\DEPFILES\D1012\STPSA6B.1SP

D/BC

[G:\DEIIB\DEPFILES\D1210\AEOD94AR.0SP, July 12, 1994]

[NOTE: This is the SVP's input to the DEP part of AEOD 1994 Annual Report. This input is revised to include the status of staff actions as documented in References received from the ROs upto the date of this revision. The references used for this input are listed below. Before the text is sent out for publication, please check if any later References were received and revise the text accordingly. Also verify, modify, or delete, as appropriate, the text in square brackets. Other parts of SVP's input to the AEOD 1994 Annual Report are in files: G:\DEIIB\IIPFILES\I1210\AEOD94AR.0SP and G:\DEIIB\BRANCH.FLE\B1001\AEOD94AR.0SP]

D/35

## Diagnostic Evaluation of the Palisades Nuclear Generating Facility.

In January 1994, the EDO directed that a diagnostic evaluation of the Palisades nuclear generating facility be conducted. The decision to conduct the evaluation was based on an apparent decline in the performance of plant operations, engineering, maintenance, and plant support. A 16-member team spent approximately three weeks evaluating activities at the Palisades site. The evaluation was performed in March and April of 1994. Some members visited the licensee's headquarters in Jackson, MI. The areas evaluated included operations and training, maintenance and testing, engineering and technical support, and management and organization. The team's evaluation report was issued in June[?] 1994. The findings and conclusions of the DET were discussed with the licensee at a public meeting on May 31, 1994.

The DET identified performance and programmatic deficiencies during its evaluation and found that weaknesses in management of Palisades significantly contributed to these deficiencies. Management did not effectively oversee and control activities and programs at Palisades. Management failed to integrate programs and processes and did not clearly define organizational roles and responsibilities. Furthermore, management failed to provide performance standards and communicate expectations in many instances, and did not hold individuals and organizations accountable for their performance. The lack of a sufficiently critical perspective by management, coupled with a denial of problems identified by outside entities, resulted in the continuation of performance problems. Additionally, management failed to provide for effective independent quality oversight and self assessment. The corrective action program that management had established was ineffective in assuring that deficiencies were identified, evaluated, and corrected.

The significant findings of the DET include: omissions and deficiencies in safety-related pump and valve testing that resulted in indeterminate operability of certain equipment; the failure of plant management to address and correct human performance problems despite numerous internal and external assessments that indicated that these problems continued to be significant contributors to operational events; ineffective and untimely engineering evaluations of degraded components and systems in support of operability determinations and root cause evaluations for equipment failures; a high threshold for identifying deficiencies coupled with ineffective or untimely evaluations that resulted in failure to take needed corrective action; and, ineffective independent quality oversight by the Nuclear Performance Assessment Department, as well as line organization self assessments, that resulted in not identifying or correcting performance and programmatic problems at Palisades. The team found that a significant contributor to the weaknesses in Engineering and its support of the plant stemmed from failure to clearly define and communicate to the staff the organizational roles and responsibilities between the Nuclear Engineering and Construction Organization and the Systems Engineering Department. In fact, the licensee had only recently designated the Nuclear Engineering and Construction Organization as acting as the design authority for Palisades, which previously had been abrogated to Systems Engineering and engineering contractors in many cases. Having single-point accountability and ownership of this significant function is particularly important at Palisades, given the historical condition of design basis information for the facility and the problems that the plant had in maintaining configuration control.

The DET found the root causes of Palisades' performance to be management's (1) acceptance of low standards of performance, (2) failure to integrate processes and clarify and communicate roles and responsibilities, (3) failure to ensure effective self assessment and quality oversight, and (4) failure to develop and implement an effective corrective action process.

Status of NRC Staff Actions Involving  
Potential Generic Issues Resulting From  
Diagnostic Evaluation Team Findings

Action Source: Memorandum from J. Taylor to Office Directors and Region IV Administrator, "Staff Actions Resulting from the Diagnostic Evaluation at South Texas Project," dated August 3, 1993.

Item 1: A number of operator workload issues were raised at South Texas Project (STP). Given the conditions that were prevalent at STP, the design of the facility, and operator workarounds, the scope of responsibilities and administrative work of the operating staff was excessive. For example, the team concluded that operator staffing, although it exceeded Technical Specifications (TS) minimum requirements, was strained in accomplishing the complex tasks for a scenario involving shutdown from outside the control room.

Action (b): Assess the generic implications of assigning conflicting multiple responsibilities to the operating staff for response to resource-intensive accidents such as fire brigade responsibilities plus support for shutdown from outside the control room. (Responsible Office: NRR)

Disposition: Ongoing.

The staff has addressed this South Texas specific item by including the DET observations with the operational data used in an ongoing NRC research project "nuclear power plant shift staffing levels." The research project will establish a technical basis for minimum shift staffing levels of licensed and nonlicensed personnel at nuclear power plants, confirming the adequacy of the requirements of 10 CFR 50.54(m), or will establish a regulatory basis for modifying these requirements. The project team will analyze the workload and function allocation for licensed and nonlicensed personnel both inside and outside the control room for high-workload transient responses. This research project is being tracked under NRR Human Factors Research User Need No. 6, "Shift Staffing Levels."

On February 3 and 4, 1994, NRR and RES staff held discussions with the Brookhaven National Laboratory project team regarding project status and details of the project plan. In addition to the South Texas DET report, the staff specified that operational data from other off-normal events (e.g., at Quad Cities) that seem to have challenged shift crews in their ability to mitigate events would be included in the research data. The project team has completed the initial review of this data and has observed an emergency exercise to identify situations in which shift staffing may play a significant role. This information will be used in selecting scenarios for simulator research and task network modeling to establish the regulatory basis for minimum staffing levels needed to successfully perform all necessary safety functions. The Office of Nuclear Regulatory Research has scheduled completion of this project for early in 1995.

Since this potentially generic issue is currently under active review, it will be tracked and reported through normal generic review methods and reporting requirements. Accordingly, the Human Factors Branch in NRR, in conjunction with the Office of

Nuclear Regulatory Research, will supply the necessary update on this issue. (Reference 1)

Item 2: The capability of the essential chilled water (ECW) system to perform its safety function during a design basis accident under low heat load conditions was never demonstrated, either through system testing or engineering analysis. The system design cooling capacity of 450 tons per train exceeds the requirements for the highest expected heat load, and greatly exceeds the expected heat load for cold weather conditions. The licensee has experienced surging and vibration of chillers, particularly when throttling ECW flow because of cool weather conditions. If an accident occurred during cold weather and all chillers operated as designed, in response to an engineered safety feature actuation, the chillers would be significantly under-loaded, potentially causing surging and failure. Failure of the chillers would result in loss of ECW system cooling of safety-related equipment. The piping design configuration did not allow the system to be tested with heat loads representative of those anticipated during accident conditions. The licensee indicated that the existing analysis did not adequately address the issue of chiller operation during a design basis accident under low heat load conditions, and agreed to perform an engineering analysis by September 1993.

Action (b): Assess the need and scope of baseline testing of the ECW system that would more closely simulate design basis accident heat load conditions and validate operability. Issue generic correspondence as appropriate. (Responsible Office: NRR)

Action (c): Assess the need and scope of periodic testing of the ECW system to ensure that it can perform its safety function. Issue generic correspondence as appropriate. (Responsible Office: NRR)

Disposition: Ongoing

The staff conducted a review of the ECW system. The staff determined that the licensee has completed an acceptable engineering evaluation demonstrating that the system is capable of performing its safety function under design-basis maximum and minimum heat load conditions. The licensee performed a thorough analysis demonstrating that the ECW system will perform acceptably under minimum loading conditions after the modifications to the service water system piping providing cooling water to the essential chillers were implemented. Data from the licensee's post-modification testing were used to validate the results of the analysis. This is documented in NRC Inspection Report 94-04.

The staff found the licensee's test program (baseline and periodic) for the system acceptable. [The Plant Systems Branch in NRR will prepare an information notice during calendar year 1994 to notify the industry of the licensee's actions in addressing this issue.] [Check, if the IN was issued] (Reference 1)

Item 4: At STP collapse of the HVAC duct-work would prevent cooling of safety-related components and systems. To protect the HVAC duct-work from collapse during a tornado, the outside ventilation intake dampers are designed to close automatically within .25 seconds, at a differential pressure of 3 psi.

Thirty dampers had not been tested to verify that they would operate as designed. An STP preventive maintenance action was scheduled on a ten year frequency, but had not yet been performed. STP agreed to motion test the dampers to verify operability.

**Action (b):** Assess the extent and frequency of damper motion testing at licensed facilities. Evaluate the need to establish technical specification damper motion testing requirements, and subsequent motion testing of ventilation dampers affecting safety-related equipment. Issue requirements as appropriate. (Responsible Office: NRR)

**Action (c):** Assess the need and scope of periodic testing of the dampers to ensure that they can perform their safety function. Issue guidance as appropriate. (Responsible Office: NRR)

**Disposition:** Ongoing

The Mechanical Engineering Branch has been reviewing information related to damper testing and probabilistic risk assessment. A meeting was held with the Probabilistic Safety Assessment Branch to discuss the action plan for damper testing, and the branch commented on the statement of work for contractor assistance. A contractor is expected to be assigned in the near future. Since this issue covers several topical areas (e.g. fire protection, control room habitability, tornado protection, emergency core cooling system, equipment room cooling, and isolation/filtration of radiation release), finding one contractor experienced in all these areas may be difficult.

Since this issue may be an emerging generic issue, it will be tracked and reported through normal generic review methods and reporting requirements. [Additionally, because of the dampers' effect on system operability, the Plant Systems Branch has taken the lead for, and will supply the necessary update on, this issue.] [Check with PSB for the update] (Reference 1)

**Item 6:** At STP nine failures of standby diesel generator (SDG) high pressure fuel injection pump hold down studs occurred from 1987 through 1993. Each time a failure occurred, the SDG was declared inoperable. Subsequent licensee operability reviews determined that failure of the fuel injector hold down studs would render the associated cylinder inoperable, but would not render the SDG inoperable. The licensee received correspondence from Cooper-Bessemer indicating that as many as 2 cylinders could be out of service and the SDG would still be operable. However there was no analysis available for team review.

The licensee attributed the failures to various root causes such as, faulty material, use of improper installation tools and improper lubrication of the hold down studs prior to torquing. Preliminary indications from the licensee also indicated that other utilities with Cooper-Bessemer SDGs have experienced fuel injector hold down stud failures. However, to date no formal industry notification has been issued by the licensee or the vendor.

**Action (b):** Evaluate the need to provide additional generic regulatory correspondence for multiple fuel injector hold down stud failures. Issue guidance as appropriate. (Responsible Office:

NRR)

Disposition: Ongoing

The staff concluded that the failure of the hollow hold-down studs in the fuel injection pumps (which led to the operability analysis of 18 and 19 cylinder operation) was caused by manufacturing tolerances, inadequate design margins, and deficiencies in installation practices. The new fastener design (solid hold-down studs with Belville washers) is considered adequate. Additionally, the standby diesel generators would be operable even with two cylinders out of service, provided the standby diesel generators are already operating at steady-state or decreasing load conditions. (Reference 1). [The staff will prepare an appropriate generic communication to licensees on this issue during calendar year 199? (needs a response from NRR for our E-Mail, Ref. G:\...D1012\STPSA6B.0SP)] .

References: 1. Memorandum from William T. Russel to James M. Taylor (NRC), Status of NRR Staff Actions Resulting from the Diagnostic Evaluation at South Texas Project (WITS-93133), June 14, 1994.