



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
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KING OF PRUSSIA, PENNSYLVANIA 19406-1415

FILE

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February 4, 1998

Mr. J. E. Cross
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Post Office Box 4
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**SUBJECT: NRC INTEGRATED INSPECTION REPORT 50-334/97-09, 50-412/97-09
NOTICE OF VIOLATION**

Dear Mr. Cross:

The NRC conducted an inspection of the Beaver Valley Power Station (BVPS) facilities from November 16 to December 27, 1997. The enclosed report presents the results of that inspection.

During the 6-week period covered by this inspection period, your conduct of activities at the Beaver Valley Power Station facilities was generally characterized by safe operations and conservative management decisions. Your staff displayed an excellent questioning attitude in identifying issues associated with the control room ventilation system and supports for small bore piping. Shutdown safety has been appropriately emphasized and maintained during the extended refueling outage on Unit 1 and the forced outage on Unit 2.

You have established a generally effective program for maintaining occupational exposures as low as reasonably achievable (ALARA). Improvements in work planning and integration of ALARA controls into the radiological work planning process were evident during the current Unit 1 refueling outage (1R12). Although the outage duration has extended to more than twice that originally scheduled, total occupational exposures have only increased 13% above the exposure goal.

Your onsite emergency preparedness program was characterized by generally strong performance, but we noted some weaknesses in your performance of emergency plan and implementing procedure revisions. We also noted that you had not performed regular testing of some of the communication circuits at the alternate emergency operations facility in Coraopolis, PA. This was a violation of NRC requirements.

This violation is cited in the enclosed Notice of Violation, and the circumstances surrounding the violation are described in detail in the enclosed report. The violation is of concern because of the duration of the noncompliant condition. Please note that you are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

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CH2 *(b)*

unnecessary challenge to the operators when the linkage failed. Licensee assessment of the linkage failure under the Maintenance Rule was not yet complete, but preliminary evaluation was that it would be considered a maintenance preventable functional failure.

c. Conclusions

Inspectors assessed that the licensee responded appropriately to the valve linkage failure and noted good coordination between operators, system engineering, and maintenance staff. The prompt response eliminated a potential challenge to safe plant operation. Some inconsistencies were noted in the guidance provided to operators and maintenance staff regarding emergency work. In addition, inspectors assessed that failure to repair the degraded linkage during earlier opportunities indicated a weakness in the work control process that unnecessarily challenged operators when the linkage subsequently failed.

M1.4 Routine Surveillance Observations (61726)

The inspectors observed portions of selected surveillance tests. Surveillance tests reviewed and observed by the inspectors are listed below.

- 1BVT-1.1.7, Rev.2 Rod Position Indication System Calibration Verification
- 1BVT-1.1.1, Rev.0 Control Rod Drop Time Measurement

The surveillance testing was performed safely and in accordance with proper procedures. The inspectors noted that an appropriate level of supervisory attention was given to the testing, depending on its sensitivity.

M8 Miscellaneous Maintenance Issues

M8.1 Emergency and Appendix R Lighting (62707)

Inspectors reviewed the UFSAR, Operating Manuals and Preventive Maintenance Procedures (PMPs) for both units regarding Appendix R Lighting and Emergency Lighting maintenance and testing. Licensee personnel contacted were knowledgeable. The PMPs fulfilled surveillance requirements in licensee administrative procedure NPDAP 3.5 and assured that the requirements of Section III.J of Appendix R to 10 CFR Part 50 were met. The inspectors identified minor discrepancies which the licensee entered into the corrective action program to be resolved.

III. Engineering

E1 Conduct of Engineering

E1.1 Unit 1 Small Bore Piping Operability Assessment

a. Inspection Scope (37551, 92903)

In June 1997, while performing reviews for a motor operated valve replacement, engineers noted that a sliding support for a 2-inch diameter reactor coolant system valve drain line (PS-2) was disengaged from its guide. The inspectors reviewed design documentation, interviewed personnel, and observed licensee inspection and repair activities to evaluate the licensee's resolution of this problem including extent of condition reviews.

b. Observations and Findings

NRC Inspection and Enforcement Bulletin (IEB) 79-14, "Seismic Analyses for As-Built Safety Related Piping System," Rev. 1, required licensees to confirm safety related piping $\geq 2 \frac{1}{2}$ inches in diameter, as installed, satisfied seismic design requirements. No specific action was required regarding smaller bore piping. In late 1996, the licensee identified inadequately supported small bore piping inside containment (see LER 50-334/96-010). Three deficiencies were corrected and a sample inspection identified no further deficiencies. Engineering Standard ES-N-017, "Pipe Stress Reconciliation," was instituted to ensure no additional piping support deficiencies were created through plant design changes. ES-N-017 specified that computer based stress calculations be performed to reconcile as-installed piping configurations against design requirements prior to implementing piping design changes. In June 1997, engineers identified that support PS-2 was disengaged from its guide while reviewing a photograph in preparation for replacing a motor operated valve inside containment. Additional inspections were initiated to determine the extent of condition.

Engineers initially reviewed all ≤ 2 -inch diameter and smaller, safety related Q1 category piping attached to the reactor coolant system (RCS). Twelve sliding type supports were identified as being susceptible to significant RCS loop movement which would challenge support integrity. Two supports (PS-2 and PS-3) were found disengaged. Six were inspected and found satisfactory. Four of these had the same design as PS-2 and PS-3. The two disengaged supports and those with similar design were replaced using design change package (DCP) 2263. The remaining four sliding supports were determined to be acceptable through routine inservice inspection program activities.

Extent of condition review scope quickly expanded through the condition report process (CR 970999). Bar type anchors were reviewed based on reassessment of LER 50-334/80-056. Twenty-three bar type anchors were modified based on these inspections. Engineers determined that many of the piping, anchor, and support deficiencies were due to original construction design not meeting applicable American National Standards Institute (ANSI) B 31.1-1967 or American Institute of Steel Construction (AISC) Seventh Edition codes. UFSAR B.2.1.9 indicates that the small bore safety related piping was originally evaluated under a "simplified" method that did not employ formal calculations. Engineers concluded that this condition was not applicable to Unit 2 because Unit 2 required small bore piping evaluation using rigorous computer based analytical methods. The licensee submitted a voluntary report (LER 50-334/97-035) to report the Unit 1 deficiencies as a

potentially generic issue. The station architect engineer performed a 10 CFR 21 evaluation of the bar type anchor deficiencies, and concluded that the condition did not appear to result in a substantial generic safety hazard. The licensee performed additional inspections in the Fall of 1997, and generated CR 971875 and CR 972079 regarding additional small bore piping support design deficiencies.

Engineers determined that numerous sliding supports and bar type anchors were inadequately designed for their intended application in the plant. Sliding supports were damaged by piping movement associated with normal thermal plant transients. The conditions existed since original plant design and construction. Three additional conditions which resulted in not meeting design requirements were identified: (1) installed valves in small bore piping systems may be heavier than accounted for in original plant design; (2) pipe supports in small bore piping systems were inadequately designed to support rated load capacity; and (3) interaction of non-safety related small bore piping with safety related piping (Q-Breaks) were not adequately considered in original plant design. Thirty-eight additional supports were modified during refueling outage number 12 using DCP 2298 to restore them to Code requirements.

The inspectors observed field walkdowns and several support and anchor modifications, and discussed ongoing project status with the Director of Design Basis Engineering. Based on the above observations, the licensee initiated a support design review of all safety related small bore piping and associated Q-Breaks. Approximately 2400 support drawings and over 650 piping isometric drawings were analyzed against Code design requirements. This extensive verification effort was staffed with approximately 80 engineers, the majority of which were contractor support. The inspectors determined that appropriate oversight of the contracted engineering support was provided. Engineers identified approximately 200 small bore piping support and anchor Code deficiencies. Affected systems included the RCS, excess letdown system, letdown system, reactor coolant pump seal leak-off, RCS loop fill, RCS charging, and high head safety injection. Due to the large number of deficiencies, each of associated system piping isometric drawings was analyzed for operability using NRC Generic Letter 91-18 as guidance. The licensee concluded that each of the analyzed piping systems remained operable, notwithstanding the numerous Code deficiencies. This assessment was completed in mid-December 1997. The inspectors observed that the methodology used for operability assessment was sound.

Basis for Continued Operation (BCO) 1-97-007 was developed to document the justification that it was safe for Unit 1 to start up and operate at power prior to restoring each of the identified small bore piping supports and anchors deficiencies to fully meet Code requirements. The BCO specified that all associated piping systems remained operable. The BCO will remain in effect through the end of the upcoming operating cycle, with restoration of supports and piping to full design requirements scheduled for the next refueling outage. The inspectors reviewed the BCO and attended the Nuclear Safety Review Board (NSRB) meeting during which the BCO was evaluated. The inspectors observed that the safety issue was clearly presented by Nuclear Engineering Department personnel. Detailed background as well as potentially generic aspects were discussed. The NSRB concurred with the Onsite Safety Committee approval of the BCO. The inspectors determined that the safety analysis performed for the BCO was technically sound.

10 CFR 50, Appendix A, Criterion 15, "Reactor Coolant System Design," requires the RCS to be designed with sufficient margin to assure that the design conditions of the reactor coolant pressure boundary are not exceeded during any condition of normal operation, including anticipated operational occurrences. 10 CFR 50.55(a) requires in part that systems and components must be designed, and constructed to quality standards commensurate with the importance of the safety function to be performed. ANSI B31.1-1967 specified Code requirements for installed piping support integral welds (Q-Breaks). AISC Seventh Edition specifies load requirements for piping supports. Failure to originally design and install piping supports and anchors commensurate with the applicable Code standards was a violation. This non-repetitive, licensee identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy (NCV 50-334/97-09-01).

c. Conclusions

The inspectors concluded that engineers demonstrated an excellent questioning attitude in identifying a non-conforming safety related small bore piping deficiency. Over 200 supports and anchors did not meet Code requirements due to inadequate original construction design specification. Extent of condition reviews, findings, causal assessment, and corrective actions were comprehensive. Communication of this potentially generic issue to the industry demonstrated a sound safety perspective.

E4 Engineering Staff Knowledge and Performance

E4.1 Control Room Emergency Pressurization Ventilation System Design Deficiencies

a. Inspection Scope (71707, 37551, 92901, 92903)

Inspectors reviewed the licensee's follow-up to an anomaly observed during control room emergency air cleanup and pressurization system testing. The inspectors reviewed the surveillance testing procedure, 3BVT-1.44.1, "Control Room Emergency Bottled Air Pressure Test," Rev. 4, and the design and licensing bases documents associated with the control room emergency ventilation system.

b. Observations and Findings

On December 9, the system engineer and operators performed 3BVT-1.44.1, a TS surveillance required every 18-months, to test the control room ventilation systems. During the testing, the operator observed the Unit 2 "B" emergency supply fan running indicator light cycle off and on approximately 11 seconds after the initial auto-start of the fan. A second auto-start of the fan showed the same anomaly. The fan was declared inoperable.

Subsequent troubleshooting and engineering review identified the problem to be the differential pressure switch actuating and stopping the "B" fan, which resulted from the difference in opening times of the control room dampers. During the

ITEMS OPENED, CLOSED AND DISCUSSED**Opened**

50-334 and 412/97-09-02 URI Control Room Emergency Pressurization Ventilation System Design Deficiency (Section E4.1)

50-334 and 412/97-09-03 VIO Status of EP Facilities, Equipment, and Resources (Section P2)

Opened/Closed

50-334/97-09-01 NCV Unit 1 Small Bore Piping Operability Assessment (Section E1.1)

Closed

50-334 and 412/97-04-04 IFI Process Control Program (PCP) Update (Section R8.1)