



TU ELECTRIC

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July 2, 1992

William J. Cahill, Jr.  
Group Vice President

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)  
DOCKET NO. 50-445  
REPORT OF EVENT WITH GENERIC INTEREST  
LICENSEE EVENT REPORT 92-013-00

Gentlemen:

Enclosed is Licensee Event Report 92-013-00 for Comanche Peak Steam Electric Station Unit 1, "Personnel Error Leading to Loss of Cooling Water Flow to the Spent Fuel Pool Heat Exchanger".

Sincerely,

William J. Cahill, Jr.

By:

A. B. Scott, Jr.  
Vice President Nuclear  
Operations

OB/tg

Enclosure

c - Mr. R. D. Martin, Region IV  
Resident Inspectors, CPSES (2)

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# **I. DESCRIPTION OF THE REPORTABLE EVENT**

## **A. PLANT CONDITIONS PRIOR TO THE EVENT**

On May 11, 1992, Comanche Peak Steam Electric Station (CPSES) Unit 1 was in Mode 1, Power Operation, with the reactor at approximately 100 percent of rated thermal power.

## **B. STATUS OF STRUCTURES, SYSTEMS, OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT**

Maintenance planned on the Spent Fuel Pool Heat Exchanger X-01 outlet flow indicator necessitated isolation of the Spent Fuel Pool side of the heat exchanger.

## **C. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES**

On May 11, 1992, at approximately 9:30 p.m. (CDT) Control Room personnel discussed the need to place Spent Fuel Pool (SFP) Heat Exchanger X-02 (EIS:(HX)(DA)) and SFP Pump X-02 (EIS:(P)(DA)) in service to allow maintenance on the flow element (EIS:(FI)(DA)) on the outlet side of SFP Heat Exchanger X-01. The Balance of Plant (BOP) Reactor Operator (RO) (utility, licensed) reviewed the system operating procedure for the Spent Fuel Pool Cooling System to determine the appropriate section to be used to secure from the existing lineup and place SFP Pump X-02 in service with SFP Heat Exchanger X-02. The BOP RO noted that the procedure directed him to system operating procedure SOP-502A, "Unit 1 Component Cooling Water System", to provide cooling water to SFP Heat Exchanger X-02.

At approximately 10:00 p.m., the Auxiliary Building Auxiliary Operator (AO) (utility, non-licensed) reported smoke coming from SFP Pump X-02, and the pump was shut down. The Unit 1 Unit Supervisor (utility, licensed) directed the BOP RO to start SFP Pump X-01 and line it up to SFP Heat Exchanger X-02 so that maintenance could proceed on the Heat Exchanger X-01 flow element. The BOP RO reviewed the system operating procedure to determine the appropriate section, and sent a working copy to the Auxiliary Building AO to be used in performing the alignment.

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The Auxiliary Building AO was standing his first qualified Auxiliary Building watch and had never aligned SFP cooling to Heat Exchanger X-02. He performed the procedure to align SFP Cooling through Heat Exchanger X-02.

The Auxiliary Building AO contacted the BOP RO just prior to starting SFP Pump X01, and at approximately 11:18 p.m. the pump was started, but no flow was indicated. The pump was shut down and the SFP Pump X-01 discharge valve was found out of position. The valve was opened, the pump was restarted, and again no flow was indicated. A walkdown revealed that the SFP Heat Exchanger inlet valve was also out of position, and the valve was opened. At this time flow was indicated through SFP Heat Exchanger X-02 on the Spent Fuel Pool side. When the AO reached the procedure step which directed that he throttle Component Cooling Water (CCW) (EHS:(BI)) flow to Heat Exchanger X-02, he contacted the BOP RO to ask how to perform the alignment. The BOP RO remembered from his previous review of the SFP Cooling operating procedure that it referred to SOP-502A (Unit 1 CCW). The BOP RO examined SOP-502A, but could not find directions for aligning Unit 1 CCW to establish cooling to the SFP. The BOP RO referred to the CCW System Piping & Instrumentation Diagrams to determine the alignment.

At approximately 11:20 p.m. the BOP RO directed the Auxiliary Building AO to open the CCW to Heat Exchanger X-02 inlet valve (EHS:(V),(BI)) and throttle the outlet valve (EHS:(V),(BI)) to the same position as the CCW to Heat Exchanger X-01 outlet valve. The BOP RO then directed the Auxiliary Building AO to open the CCW to Heat Exchanger X-01 outlet valve to the as-found position of the CCW to Heat Exchanger X-02 outlet valve. When the CCW to Heat Exchanger X-01 outlet valve was opened, the BOP RO observed an increase in total CCW system flow on a control room instrument and believed he had established Unit 1 CCW flow to Heat Exchanger X-02. The establishment of this flow path was not physically possible due to the existence of spectacle (blind) flanges separating Unit 1 CCW from Heat Exchanger X-02.

At approximately 3 a.m. on May 12, 1992, the BOP RO reported to the Unit 1 Unit Supervisor that SFP Pump X-01 was in service through Heat Exchanger X-02. The BOP RO and the Unit 1 Unit Supervisor failed to note that the annunciator (EHS:(ANN)(IB)) for low CCW flow to Heat Exchanger X-02, which had been illuminated for several months, did not clear upon completion of the alignment.

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**D. THE METHOD OF DISCOVERY OF EACH COMPONENT OR SYSTEM FAILURE, OR PROCEDURAL OR PERSONNEL ERROR**

On May 12, 1992, at approximately 1:00 p.m., while performing a Control Board walkdown, the Nuclear Regulatory Commission Senior Resident Inspector questioned a discrepancy between CCW valve position indication and a CCW low flow alarm. Investigation by operating personnel determined that there was no CCW flow to SFP Heat Exchanger X-02.

**II. COMPONENT OR SYSTEM FAILURES**

**A. FAILURE MODE, MECHANISM, AND EFFECT OF EACH FAILED COMPONENT**

Bearing failure caused by inadequate lubrication resulted in Spent Fuel Pool Cooling Pump X-02 being removed from service prior to the event.

**B. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE**

Inadequate lubrication of the SFP Cooling Pump bearing was caused by a procedural deficiency which precipitated the incorrect installation of the associated oil slinger ring.

**C. SYSTEMS OR SECONDARY FUNCTIONS THAT WERE AFFECTED BY FAILURE OF COMPONENTS WITH MULTIPLE FUNCTIONS**

Not applicable - there were no secondary functions affected.

**D. FAILED COMPONENT INFORMATION**

Not applicable - there were no component failures related to the event.

**III. ANALYSIS OF THE EVENT**

**A. SAFETY SYSTEM RESPONSES THAT OCCURRED**

Not applicable - no safety system responses occurred as a result of this event.



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## B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

The Spent Fuel Pool Cooling System was without cooling for approximately 17 hours.

## C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

The Spent Fuel Pool Cooling System is designed to perform the safety-related function of long term decay heat removal from spent fuel assemblies stored in either or both pools, and to ensure that the assemblies remain covered with water during all storage conditions. The maximum normal heat load is based on back to back refuelings during 2 unit operation plus the spent fuel assemblies from the maximum number of previous refuelings. The abnormal maximum heat load is based on the decay heat generated by a back to back refueling plus a complete core removal from the first unit immediately after the second unit has been returned to power. The maximum anticipated temperature of pool water under worst case conditions is 152 degrees F.

During the 17 hour period that cooling flow to SFP Heat Exchanger X-02 was interrupted, the SFP contained one-third of the Cycle 1 core. The relatively low heat load resulted in a temperature rise of approximately 5 degrees F from 80 to 85 degrees F. The temperature increase was noted by operating personnel and attributed to system realignment. A more significant temperature increase, occurring as a result of a more limiting set of initial conditions would have resulted in a high temperature alarm in the Control Room or operator scrutiny in the plant. It is concluded that the event did not adversely impact the safe operation of CPSES Unit 1 or the health and safety of the public.

## IV. CAUSE OF THE EVENT

Evaluation of the event identified a number of causal factors which contributed to establishing the set of conditions which culminated in the loss of cooling flow to the SFP heat exchanger. These causal factors have been grouped into three broader categories as follows:

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<p>1. Personnel performance was less than adequate.</p> <p>a. Personnel involved in the event failed to use or adhere to procedures. The BOP RO failed to use the appropriate system operating procedure to assist the Auxiliary Building AO in aligning CCW to SFP Heat Exchanger X-02, and instead relied on system drawings to determine required valve manipulations. Additionally, the BOP RO did not satisfy the administrative requirement to advise or request assistance from the Unit Supervisor when encountering a condition or evolution not covered by procedure.</p> <p>b. Verbal communication was incomplete or unclear. The Unit 1 Unit Supervisor told the BOP RO to start SFP Pump X-01 and align through SFP Heat Exchanger X-02 to SFP 01, but failed to address use of Unit 2 CCW to cool SFP Heat Exchanger X-02. The Unit 1 BOP RO failed to discuss with the unit supervisor his "sense of urgency" to restore SFP flow after the SFP Pump X-02 failed. The Auxiliary Building AO failed to discuss the system lineup problems and pump start problems with the BOP RO or unit supervisor. The Auxiliary Building AO communicated with the Unit 1 BOP RO via the plant Gai-Tronics system concerning alignment of the CCW, but the message was not clearly understood.</p> <p>c. Supervisory involvement and the pre-job briefing was insufficient. The Unit 2 Unit Supervisor discussion with the Unit 1 BOP RO about SFP system alignment required to hang a clearance did not address the use of the Unit 2 CCW System for cooling SFP Heat Exchanger X-02.</p> <p>Management expectations require a briefing for non-routine system alignments in accordance with administrative procedures. The Unit Supervisor is responsible for ensuring that each person involved has a thorough understanding of the evolution. The Unit Supervisor was not directly involved in recovery from the failed SFP Pump X-02 nor in observation of BOP RO actions and communications because of other activities requiring the Unit Supervisor's attention.</p> <p>d. Operating personnel did not use all available indications during evolutions and again at turnover. The BOP RO failed to verify that the annunciator for low CCW flow to Heat Exchanger X-02 had cleared as expected following completion of the alignment. On-coming operating crew members failed to observe the annunciator. The Auxiliary Building AO was not aware of SFP Heat Exchanger CCW local flow</p>					

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indications at the time of the event.

- e. Operating personnel did not document actions and problems as required. The BOP RO turnover sheet for the shift change occurring at 6:00 a.m. on May 12, 1992, did not address the SFP alignment or problems encountered achieving that alignment.

2. The impact of non-routine evolutions and plant design change was not adequately assessed.
  - a. The design modification (DM) which resulted in installation of the spectacle flange was not adequately evaluated for impact on operating procedures and operator training. As a result, all affected procedures were not revised.
  - b. Maintenance performed on the Heat Exchanger X-01 flow element was not adequately evaluated with respect to CCW availability following system realignment. The impact assessment on the related equipment clearance also failed to address the availability of CCW.
  - c. Operating personnel failed to assess the impact on the clearance instructions of using SFP Pump X-01 rather than SFP Pump X-02 as originally planned.
  - d. The use of Unit 2 CCW for SFP cooling was not evaluated in advance. As a result, an untested system, not yet in Operations custody, was used to provide cooling for a safety-related system.
  - e. Boundary valves between Unit 1 and Unit 2 were manipulated without performing an environmental review or a safety evaluation.
3. Operating procedures contained incorrect or incomplete information. An error in the system operating procedure for SFP Cooling led the BOP RO to believe the SFP Cooling Heat Exchanger X-02 should be aligned to Unit 1 CCW. During a detailed review conducted during event investigation, a number of similar errors were identified which can be attributed to inattention to detail.



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## V. CORRECTIVE ACTIONS

### A. IMMEDIATE ACTIONS

- Action was initiated to establish Unit 2 CCW flow to SFP Heat Exchanger X-02 in accordance with approved operating procedures.
- Following completion of maintenance on the SFP Heat Exchanger X-01 flow element, SFP cooling was realigned to Heat Exchanger X-01 and Unit 1 CCW.
- Plant personnel verified that all other crossties were in the required positions or performed necessary safety and environmental reviews.
- The personnel involved in the event (Shift Supervisor, Balance of Plant Reactor Operator and Auxiliary Building Auxiliary Operator) were removed from watchstanding pending remedial training and reevaluation.
- Information on the event was provided to other crews, with emphasis on the importance of achieving effective communications, both oral and written; maintaining awareness of plant conditions; and ensuring procedural compliance, including independent verification and adherence to clearance precautions.
- The use of Heat Exchanger X-02 was restricted to only those periods when Heat Exchanger X-01 is unavailable.
- Plant management initiated short term actions to increase supervisor and management participation in work activities.
- Restrictions were established to ensure that first time performance of sensitive tasks (high risk and infrequently performed) will be completed under observation of either an individual who has previously performed the evolution or supervisory personnel.
- Operating and maintenance personnel were trained and tested by their supervision on their knowledge and practice of the self verification process and were reinstructed on management expectations concerning independent verification.

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<p><b>B. ACTIONS TO PREVENT RECURRENCE</b></p> <p><b>Personnel Performance Issues</b></p> <ul style="list-style-type: none"> <li>• Lessons learned from the event were reviewed with operating personnel.</li> <li>• Management conducted meetings with shift supervisors to discuss the event and to reinforce performance expectations. Seminars with similar goals were conducted for unit supervisors.</li> <li>• Each Senior Reactor Operator will complete shift supervisor/unit supervisor philosophy modules.</li> <li>• Positive disciplinary action was initiated in accordance with department and company policy for the individuals involved.</li> <li>• Supervisory observation and coaching of auxiliary operators was increased.</li> <li>• Management has taken steps to provide the on-shift unit supervisor assistance in performing administrative duties.</li> <li>• Increased emphasis has been placed on annunciator control.</li> <li>• The event will be added to the formal operator training program.</li> </ul> <p><b>Impact Assessment of Activities</b></p> <ul style="list-style-type: none"> <li>• The Design Modification Review Group and associated safety review involvement in design modification assessments will be strengthened.</li> <li>• Establish requirement to perform safety and environmental reviews, and establish operational controls for specific uses of Unit 2 components for Unit 1.</li> <li>• Non-Technical Specification safety-related systems have been identified, and additional work control practices have been established to return them to service in a timely manner.</li> </ul>									

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- Operations department work instructions related to the clearance process have been changed to identify impact assessment items as requirements rather than as recommendations.
- The preparers of Operations Department procedures will be required to review procedure problems associated with the design modification which installed the spectacle flange in the SFP Cooling System cross-connect line.

#### Procedure Errors

- Action has been taken to improve self-verification by procedure writers and technical reviewers.
- The Operations Department has performed a survey of each crew for the purpose of identifying additional procedure problems.
- The need for feedback from procedure users to management has been reemphasized to operating personnel.

### C. ACTIONS ON GENERIC ISSUES

#### Personnel Performance Issues

- The performance of operating personnel during recent events has been reevaluated to more clearly identify areas for improvement.
- The adequacy of remedial training administered to the BOP RO following examination failure has been examined for adequacy.

#### Impact Assessment of Activities

- The programs controlling the interface points between Unit 1 and Unit 2 have been reviewed for adequacy.
- The interface design modification process was reviewed to assure that modification affecting Unit 1/Unit 2 interfaces are adequate.

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- A sample of other design modifications was reviewed to verify the adequacy of Operations Impact Assessments.

#### Procedure Issues

- A sample of existing operations procedures has been selected to be reviewed for technical adequacy and accuracy.

#### D. ACTIONS RELATIVE TO UNIT 2

- Unit 2 operating personnel were trained on the lessons learned from the event.
- In preparation for hot functional testing of Unit 2, management has improved administrative controls to ensure coordination between Unit 1 and Unit 2.

#### VI. PREVIOUS SIMILAR EVENTS

LER 91-030 described an event during which the Residual Heat Removal System crosstie valves were inadvertently mispositioned due to personnel error. The corrective action taken to address the event, with respect to management expectations for control of board awareness, procedural compliance, and the use of logs, did not receive sufficient emphasis to prevent misalignment of SFP cooling on May 11, 1992.

#### VII. ADDITIONAL INFORMATION

The event was reviewed against the criteria of 10CFR50.73 and determined not to be reportable. However, a voluntary report is being submitted due to recognition of the significance and generic interest of the event.