TU ELECTRIC

Log # TXX-93382
File # 10200
Ref. # Voluntary

December 17, 1993

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) - UNIT 1
DOCKET NO. 50-445
REPORT OF EVENT WITH GENERIC INTEREST
LICENSEE EVENT REPORT 93-009-00

Gentlemen:

Enclosed is Licensee Event Report (LER) 93-009-00 for Comanche Peak Steam Electric Station Unit 1, "Personnel Errors Leading to Refueling Cavity Water Transients."

Sincerely,

William J. Cahill, Jr.

NSH:tg
Enclosure

cc: Mr. J. L. Milhoan, Region IV
Mr. L. A. Yandell, Region IV
Resident Inspectors, CPSES

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Enclosure to TXX-93382

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO.3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

Facility Name (1)	Docket Number (2)	Page (3)
COMANCHE PEAK-UNIT 1	0 5 0 0 0 4 4 5	1 OF 11

Title (4)

PERSONNEL ERRORS LEADING TO REFUELING CAVITY WATER TRANSIENTS

Event Date (5)			LER Number (6)			Report Date (7)			Other Facilities Involved (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Numbers
									N/A	0 5 0 0 0
1 0	2 6	9 3	9 3	- 0 0 9	- 0 0	1 2	1 7	9 3	N/A	0 5 0 0 0

Operating Mode (9): 6

Power Level (10): 0 0 0

This report is submitted pursuant to the requirements of 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X Other (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

Licensee Contact For This LER (12)

Name	Area Code	Telephone Number
J. W. DONAHUE, OPERATIONS MANAGER	8 1 7	8 9 7 - 5 5 7 4

Complete One Line For Each Component Failure Described in This Report (13)

Cause	System	Component	Manufacturer	Reportable To NPRDS		Cause	System	Component	Manufacturer	Reportable To NPRDS	
				N							

Supplemental Report Expected (14)

☐ Yes (If yes, complete Expected Submission Date)

☒ No

Expected Submission Date (15): Month | Day | Year

Abstract (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

Event A - On October 26, 1993, Comanche Peak Steam Electric Station (CPSES) Unit 1 was in its third refueling outage. The Unit 1 core was off-loaded into the Fuel Building spent fuel pool. A removable lift gate was installed between the reactor vessel area and the fuel transfer area of the refueling cavity to facilitate the drain down of the reactor vessel area of the refueling cavity. The refueling cavity lift gate has a single inflatable seal to keep it watertight. While transferring the seal supply from Service Air to nitrogen supply, the lift gate seal deflated allowing approximately 18-20,000 gallons of water to flow past the refueling cavity lift gate. The water flowed into the reactor vessel and out the #1 and #4 steam generator hot and cold manways into the 808' elevation of the containment building.

Event B - At 11:57 p.m. that evening, while attempting to drain down the fuel transfer area of the refueling cavity, water was inadvertently sluiced through the drain piping into the reactor vessel area of the refuelirg cavity causing the reactor vessel to refill. This caused approximately 4,000 gallons of water to spill out of the #1 and #4 SG manways.

This is a voluntary report based on generic industry interest.

I. DESCRIPTION OF REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

This Licensee Event Report is submitted as a voluntary report.

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

On October 26, 1993, Comanche Peak Steam Electric Station (CPSES) Unit 1 was in a refueling outage. The core was off-loaded into the spent fuel pool in the Fuel Building and the Fuel Building was isolated from Containment.

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

TU Electric's evaluation concluded that there were no inoperable structures, systems or components that contributed to the event.

D. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES

EVENT A

Comanche Peak Unit 1 was in its third refueling outage (1RF03). The Unit 1 core was completely off-loaded into the fuel building spent fuel pool, the upper internals had been placed back into the reactor vessel and a single seal removable lift gate was installed between the refueling cavity and the fuel transfer area. The lift gate at CPSES uses an inflatable seal to remain watertight, allowing the reactor vessel area of the reactor cavity to be drained while the fuel transfer area remained flooded. The fuel transfer gate valve at the containment boundary was closed, isolating Containment from the Fuel Building.

On October 23, 1993 following core offload, the refueling cavity was filled to approximately the 858' elevation (24 feet above the reactor vessel flange). The refueling plan included maintaining the fuel transfer area of the refueling cavity flooded while draining the reactor vessel area of the refueling cavity. The lift gate was installed and pressure to the inflatable seal was supplied by a local nitrogen bottle. After the connection of the nitrogen supply by the Field Support Supervisor (FSS) (licensed, utility) a pressurization leak was observed at or near the seal connection. The FSS changed out both the seal and

hose fittings in an attempt to correct the leak. He assumed his actions had successfully stopped the leak. The FSS reported to the Control Room that the leak he observed had stopped.

Drain down of the reactor vessel area of the refueling cavity was commenced. (NOTE: This was completed 24 hours later.) During this evolution, the Auxiliary Operators (AOs) (non-licensed, contractor) and the FSS monitored the nitrogen use and noted that the usage was greater than experienced in the past but was manageable. The Control Room staff logged that a leak on the lift gate seal still existed. The Shift Supervisor (licensed, utility) informed the Duty Manager (non-licensed, utility) of the leak who in turn requested Engineering to evaluate the leak.

The Shift Supervisor (SS) (licensed, utility) decided to continue the drain down of the reactor vessel area of the refueling cavity based on the engineering evaluation and that the nitrogen usage, while higher than in the past, was not excessive (controllable rate) and that an adequate supply of bottles was believed to be available.

On October 24, 1993 a decision was made to supply the seal from Service Air. This was to provide a stable pressurization source and minimize the amount of nitrogen bottles needed to be brought into and out of containment. Service air was supplied from a nearby connection (approximately 40 feet away) to a regulator set at 35 psig. The connection was made to the regulator without the use of a quick connect. This configuration did not provide backflow protection through the hose. Potential loss of pressure was averted by the operator by kinking the supply hose. During this particular evolution, no water leakage was observed from the filled section of the refueling cavity to the partially drained section during or after the transfer to Service Air.

On October 26, 1993 the pressurization supply to the lift gate seal was scheduled to be transferred back to nitrogen to allow the Service Air to containment to be isolated for Local Leak Rate Testing (LLRT) of containment penetrations. The FSS was inside containment at the time and was instructed to transfer the pressurization source from Service Air back to the nitrogen bottles. After verifying adequate nitrogen pressure in the bottle, the seal supply hose was transferred to the nitrogen bottle regulator. This took approximately 20 to 30 seconds because the appropriate quick connect couplings were not attached to the hose. Some pressure was lost during the transfer. The FSS heard water running, looked into the reactor vessel area of the refueling cavity, and saw a

large amount of water leaking past the lift gate seal. He immediately transferred the pressurization supply for the lift gate seal back to Service Air believing that the nitrogen source was inadequate. He left the area as requested by Radiation Protection. Approximately 9 feet of water (18,000 to 20,000 gallons) entered into the reactor vessel area of the refueling cavity prior to the lift gate resealing. The reactor vessel level indication increased from 53 inches to 83.2 inches above the core plate and a large amount of water drained out of the Reactor Coolant System (RCS) through two open Steam Generator (SG) manways. At the same time preparations were underway for SG tube eddy current testing.

EVENT B

On October 26, 1993 at approximately [11:57 p.m.] the refueling cavity drain system was aligned by the operators to drain the fuel transfer area of the refueling cavity. The Unit 1 Reactor Operator (licensed, utility) informed the Senior Reactor Operator (licensed, utility) that the reactor vessel level was increasing (approximately 75 inches above the core plates which is 20 inches above the previous level). The Unit 1 Reactor Operator immediately went to the appropriate procedure to secure the drain in an attempt to stop the reactor vessel water level increase. An Auxiliary Operator (non-licensed, utility) was dispatched to close drain valves 1SF-0025 and 1SF-0026, which were previously opened for the draindown. Review of the work instructions and procedures indicated that the Unit Supervisor (licensed, utility) and Reactor Operator (licensed, utility) did not recognize that opening both valves 1SF-0026 and 1SF-0025 at the same time would align a sluice path around the refueling cavity lift gate and reflood the reactor vessel. The water refilled the primary side of the steam generators and ran out of the manways of steam generators 1 and 4. After valves 1SF-0025 and 1SF-0026 were closed, realignment of the system was performed to pump the reactor cavity and vessel back down to 55 inches above the core plate. Approximately 4,000 gallons of water entered the reactor vessel as a result of this event.

There was no contaminated water released outside the containment in either event. The spilled water on the loop room floors (in Event A) resulted in some shoe contaminations but no skin contaminations and no personnel injuries.

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

For the first event the Field Support Supervisor (licensed, utility) heard water running and looked into the reactor vessel area of the refueling cavity to discover the water leaking past the lift gate seal. For the second event the reactor operator (licensed, utility) noted that the level in the reactor vessel was rising. Additionally, it was reported to the control room staff that water was running out of the SGs 1 and 4 from the respective manways.

II. COMPONENT OR SYSTEM FAILURES

A. FAILURE MODE, MECHANISM, AND EFFECTS OF EACH FAILED COMPONENT

Not applicable - no component or system failures have been noted.

B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

Not applicable - there were no safety systems which were rendered inoperable due to this event.

C. SAFETY CONSEQUENCES AND IMPLICATIONS

The functions of the lift gate and reactor cavity drain valves are to isolate the fuel transfer area from the reactor vessel area of the refueling cavity as required.

At the time of both events, the core was fully off-loaded into the Spent Fuel Pool No. 1 in the fuel building. The spent fuel was isolated from containment by a closed fuel transfer tube gate valve, water in the fuel building transfer canal and the pool's swing gate closed. There was no fuel (new or spent) or irradiated components stored in the fuel transfer area of the refueling cavity.

The refueling cavity lift gate is Nuclear Safety Related. Its safety related function is to isolate the fuel transfer area of the reactor cavity from the reactor vessel area of the refueling cavity if spent fuel is present in the fuel transfer area of the reactor cavity and the reactor vessel area of the refueling cavity is drained. The fuel transfer area of the reactor cavity has a fuel storage rack for interim storage of new or spent fuel.

At the time of the event, the refueling cavity lift gate was in use to contain approximately 70,000 gallons of refueling water in the fuel transfer area of the refueling cavity in lieu of draining. The function of the gate was to isolate the refueling water in the fuel transfer area of the refueling cavity from the Reactor Coolant System which was drained down for maintenance activities. Thus, the function of the gate at the time was Non-Nuclear Safety Related.

Valve 1SF-0026 is the lower internals storage area of the Refueling Cavity to Reactor Coolant Drain Tank Pump suction isolation valve. It is a 4 inch, Nuclear Safety Related, diaphragm valve, located in parallel with valve 1SF-0025. Valve (1SF-0025) is the fuel transfer area of the refueling cavity to Reactor Coolant Drain Tank pump suction isolation valve. Its safety related function is to isolate the refueling cavity when flooded for fuel handling.

At the time of the second event, valve 1SF-0026 was closed to retain approximately 44,000 gallons of water in the Refueling Cavity below the reactor vessel flange elevation. The function of the valve at the time was Non-Nuclear Safety Related. The applicable function of the valve was to isolate the drain system from the Refueling Cavity and RCS.

Neither event caused any personnel injury or significant contamination. Several minor shoe and equipment contaminations did occur in the first event.

If new fuel had been stored in the interim fuel storage racks in the fuel transfer area of the refueling cavity as was done during the second Unit 1 refueling outage (1RF02), the consequences of the events would not have been different.

If a significant number of irradiated components (e.g., control rods, inserts, etc.) had been present, dose rates at elevation 860' (the refueling operations level) still would have been less than 2.5 mRem/hr for the first event since approximately 17 feet of water shielding remained. Had the level dropped to the bottom of the gate, the dose rates at elevation 860' could have been up to 90 Rem/hr.

If spent fuel had been stored in the interim storage rack, dose rates at the refueling operations level would have been less than 2.5 mRem/hr for the first event. Had the level dropped to the bottom of the gate, the dose rates at elevation 860' could have been up to 2000 Rem/hr; however, spent fuel from the current fuel cycle cannot be stored in the fuel

transfer area since procedures require the fuel transfer gate valve to be closed and it is the return path for cooling water. If the water level would drop due to loss of 20,000 gallons as in the events and the fuel transfer gate valve had been open for cooling, forced cooling would not be lost due to the location of the supply and return and the volume of water in the fuel building. Water shielding could be restored without access to the areas affected by the high radiation levels. In any of these cases, cooling would not have been lost.

Technical Specifications (i.e., Section 3/4.9, 3/4.3.3) are applicable to activities in the Containment Building in MODE 6 (Refueling with fuel in the vessel), during movement of irradiated fuel within Containment, or during storage of new or spent fuel in Containment. Since all fuel was in the Fuel Building, there were no Technical Specification requirements that were applicable.

All of the water from both events remained within the Containment Building. Although the equipment hatch was off; the Containment purge system was operational. Prior to both events, there were no measurable air-born contaminates in containment, thus no unmonitored or unfiltered release to the environment occurred during the draining events. There was no impact on public health and safety.

III. CAUSE OF THE EVENT

EVENT A

1) The deflation of the refueling cavity lift gate seal was caused by a decrease in the seal pressure during a transfer of the pressure supply from the Service Air System to nitrogen bottles. This was attributed to the following:

   a) The procedures which addresse refueling cavity lift gate activities were not clear in addressing the pressure source transfer and limitation/cautions associated with loss of seal inflation.

   b) The personnel involved in the evolution were not cognizant of the appropriate procedural guidance and requirements regarding the transfer of pressure sources.

   c) Communication among the cognizant personnel was inconsistent with management's expectation, on reporting of potential problems in the field to the proper levels of management.

d) The operations personnel did not receive specific refresher training prior to the outage, with respect to liftgate and swing gate evolutions.

e) The personnel involved with the event were focusing on matters related to nuclear safety. They did not fully appreciate the potential for failure of the gate seal, and the associated high flow rates and impacts of these activities on personnel safety.

2) The causes for the existence of the leak in the seal was determined to be mechanically induced damage of the seal during manipulation of the seal.

EVENT B

1) The sluicing of water from the fuel transfer area of refueling cavity to the reactor vessel area of the refueling cavity was caused by opening valves 1SF-0026 and 1SF-0025 simultaneously which resulted in an open pathway between the two areas. This event was attributed to the following:

a) The procedure used to drain the refueling cavity stated that "one or both" of the valves (1SF-0025 and 1SF-0026) should be opened. The procedure did not contain a caution which warned that opening of both valves could create a sluice path.

b) The Unit Supervisor (utility-licensed) and the Reactor Operator (utility-licensed), who marked up the drawings of the system as part of the pre-task review, did not properly review the drawings and did not recognize that opening of both valves would create a sluice path.

IV. CORRECTIVE ACTIONS

In response to the refueling cavity water transient an evaluation team was formed to review the event to determine causal factors, corrective and preventive actions and generic implications. The following actions have been identified.

A. IMMEDIATE

- o TU Electric management restricted Reactor Coolant System and cavity water movement until Operations procedure changes and gate seal integrity were validated. Activities were planned to remove the water in the fuel transfer area of the refueling cavity as an additional corrective action.

- o Clean-up and decontamination was commenced.

- o Operations department reviewed and enhanced the procedures for fuel building gates, and containment liftgate procedure prior to use of the fuel building gates. Training was provided to Shift Operations on these procedures.

- o The refueling outage procedure was enhanced to preclude storage of irradiated fuel or inserts when the containment lift gate is installed and the reactor cavity drained as normally performed.

- o The Operations department increased monitoring of the Spent Fuel Pool (SFP) gates (every 2 hours).

- o The Engineering department reviewed the refueling gate(s) and seal(s) conditions for potential operability concerns.

- o CPSES reviewed other refueling equipment prior to use for reload to confirm adequate controls.

- o A system engineer was assigned for refueling gates and seals.

- o ISEG reconfirmed the adequacy of the shutdown analysis for other refueling activities.

- o CPSES filled fuel transfer canal and partially filled #2 SFP as added precaution against gate seal failure until gate seal conditions could be evaluated.

B. ACTIONS TO PREVENT RECURRENCE

Procedures

- o Appropriate procedures have been revised which address refueling cavity lift gate activities.

o With respect to Event B, a caution statement has been added to the procedure. The caution statement assures that operators are aware of consequences associated with valve manipulations with respect to sluice path potentials.

Personnel Performance Issues

o An outage lessons learned will be developed which emphasizes that, during periods of extensive activities, a heightened awareness should be placed on protecting personnel from postulated equipment failures.

o TU Electric management will reinforce its expectations regarding the threshold for initiation of ONE Forms, and contract employee's role to communicate problems which occur during a performance of a task to supervision, during orientation/briefing processes of contractor personnel.

o TU Electric management will evaluate the need to increase the scope of Outage Refresher training for personnel who are involved with procedures and tasks that occur infrequently and/or rely heavily on "skills or knowledge possessed".

o Operations procedures were enhanced to require contingency plans for postulated seal loss.

o A lessons learned will be developed for Engineering, Operations, Work Control Center and Outage Management. This lessons learned will discuss the need for evaluations of equipment problems to consider the potential impact on personnel safety of a postulated failure of equipment.

Configuration Control

o Provisions will be included in procedures to control refueling pre-staged hoses.

o Evaluate a design change to relocate instrument air or provide filter for nearby service air connection.

o Revise Design Basis Documents to address gates and seals.

- Evaluate amendment to FSAR to prohibit storage of spent fuel or irradiated inserts in the refueling cavity fuel transfer area unless refueling cavity is fully flooded.

- Evaluate alternative seal configurations for future use.

Material Issues

- A Design Modification will be evaluated for the gate seal configuration and address protection against mechanically induced damage and inadvertent loss of pressure supply.

- A lessons learned will be developed from the evaluation of the leak.

- The refueling liftgates and seals will be included in the preventive maintenance program.

- Replace the Unit 1 reactor cavity lift gate seal and evaluate all other refueling gate seals for potential replacement.

C. ADDITIONAL PREVENTIVE ACTIONS

TU Electric management has reemphasized to first line supervisors their role regarding self-verification, and to evaluate planned activities for potential adverse impacts.

V. PREVIOUS SIMILAR EVENTS

There have been no previous similar events.