



Log # TXX-96493

File # 10200

TU ELECTRIC

Ref. # 10CFR50.73(a)(2)(iv)

October 18, 1996

C. Lance Terry
Group Vice President

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)-UNIT 2
DOCKET NO. 50-446
ACTUATION OF REACTOR PROTECTION SYSTEM
LICENSEE EVENT REPORT 446/96-006-00

Enclosed is Licensee Event Report (LER) 96-006-00 for Comanche Peak Steam Electric Station Unit 2 "Automatic Reactor Trip Caused by Lightning Strike."

Sincerely,

C. L. Terry
C. L. Terry

By: *Roger D. Walker*
Roger D. Walker
Regulatory Affairs Manager

OB:ob
Enclosure

cc: Mr. L. J. Callan, Region IV
Mr. J. I. Tapia, Region IV
Resident Inspectors, CPSES

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NRC FORM 395
(4-95)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 4/30/96

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY
INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED
ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO
INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE
INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8 F33), U.S. NUCLEAR
REGULATORY COMMISSION, WASHINGTON, D.C. 20555-0001, AND TO THE
PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND
BUDGET, WASHINGTON, DC 20503.

Facility Name (1)

COMANCHE PEAK STEAM ELECTRIC STATION UNIT 2

Docket Number (2)

05000446

Page (3)

01 OF 05

Title (4)

AUTOMATIC REACTOR TRIP CAUSED BY LIGHTNING STRIKE

| 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 Name | | | | | Docket Numbers | | | | | | | | | | | | | | | | | | | |
| 0 | 9 | 1 | 8 | 9 | 6 | 9 | 6 | - | 0 | 0 | 6 | - | 0 | 0 | 1 | 0 | 1 | 8 | 9 | 6 | CPSES UNIT 1 | | | | | 0 | 5 | 0 | 0 | 0 | 4 | 4 | 5 |
| | | | | | | | | | | | | | | | | | | N/A | | | | | 0 | 5 | 0 | 0 | 0 | | | | | | |

Operating Mode (9) 1

Power Level (10) 100

This report is submitted pursuant to the requirements of 10 CFR 5. (Check one or more) (11)

| | | | |
|--|---|--|--|
| <input type="checkbox"/> 20.2201 (b) | <input type="checkbox"/> 20.2203 (a) (2) (v) | <input type="checkbox"/> 50.73 (a) (2) (i) | <input type="checkbox"/> 50.73 (a) (2) (viii) |
| <input type="checkbox"/> 20.2203 (a) (1) | <input type="checkbox"/> 20.2203 (a) (3) (i) | <input type="checkbox"/> 50.73 (a) (2) (ii) | <input type="checkbox"/> 50.73 (a) (2) (x) |
| <input type="checkbox"/> 20.2203 (a) (2) (i) | <input type="checkbox"/> 20.2203 (a) (3) (ii) | <input type="checkbox"/> 50.73 (a) (2) (iii) | <input type="checkbox"/> 73.71 |
| <input type="checkbox"/> 20.2203 (a) (2) (ii) | <input type="checkbox"/> 20.2203 (a) (4) | <input checked="" type="checkbox"/> 50.73 (a) (2) (iv) | <input type="checkbox"/> OTHER |
| <input type="checkbox"/> 20.2203 (a) (2) (iii) | <input type="checkbox"/> 50.36 (c) (1) | <input type="checkbox"/> 50.73 (a) (2) (v) | <input type="checkbox"/> Specify in Abstract below |
| <input type="checkbox"/> 20.2203 (a) (2) (iv) | <input type="checkbox"/> 50.36 (c) (2) | <input type="checkbox"/> 50.73 (a) (2) (vi) | <input type="checkbox"/> or in NRC Form 366A |

Licensee Contact For This LER (12)

Name

RAFAEL FLORES - SYSTEM ENGINEERING MANAGER

Telephone Number (include Area Code)

(817)897-5590

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, completed EXPECTED SUBMISSION DATE) | X | NO | EXPECTED SUBMISSION DATE (15) | Month | Day | Year |
| | | | | | | |

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 18, 1996, at approximately 12:45 p.m., during a severe thunderstorm a lightning strike caused Comanche Peak Steam Electric Station (CPSES) Unit 2 T_{cold} channels II and IV to spike high which resulted in Overtemperature (OT) N-16 setpoint reduction and a subsequent trip signal. This completed the two-out-of-four logic for a reactor trip on OT N-16. All rods fully inserted into the core. The plant equipment response to the reactor trip was consistent with that expected for the existing plant conditions.

The cause of the reactor trip was deemed to be lighting strike coupled with a ground which existed from the shield to ground on the spare Resistance Temperature Detector (RTD) in channel II and both the spare and active RTDs in channel IV. A Design Change was implemented to eliminate the ground.

LICENSEE EVENT REPORT (LER) **TEXT CONTINUATION**

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| Facility Name (1) | Docket | LER Number (6) | | | | | | Page (3) | | | |
| COMANCHE PEAK STEAM ELECTRIC STATION UNIT 2 | 05000446 | Year | | | | | | | | | |
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| | | Sequential Number | | | | | | | | | OF |
| | | Revision Number | | | | | | | | | 05 |

Text (if more space is required, use additional copies of NRC Form 365A) (17)

I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

An event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF) including the Reactor Protection System (RPS).

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

On September 18, 1996 Comanche Peak Steam Electric Station (CPSES) Unit 2 was in Mode 1, Power Operation, operating at 100 percent power.

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

There were no inoperable structures, systems or components that contributed to the event.

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

On September 18, 1996, at approximately 12:45 p.m., during a severe thunderstorm a lightning strike caused the Channel II and IV T_{cold} to spike high which resulted in OT N-16 setpoint reduction and Channel IV to trip. This completed the two-out-of-four logic for a reactor trip on OT N-16. When the reactor tripped, the subsequent turbine trip caused the steam generator (EIIS:(SG)(SB)) level to shrink below the Lo Lo level resulting in a Auxiliary Feedwater Pump (EIIS:(P)(BA)) auto start. With the exception of Main Feedwater pump 2A, which tripped on overspeed, all other systems performed as designed.

An event or condition that results in an automatic or manual actuation of any ESF, including the RPS, is reportable within 4 hours under 10CFR50.72(b)(2)(ii). At approximately 1:31 p.m. on September 18, 1996, the Nuclear Regulatory Commission Operations Center was notified of the event via the Emergency Notification System.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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Text (if more space is required, use additional copies of NRC Form 365A) (17)

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

The Control Room Staff received an Overtemperature N-16 alarm.

II. COMPONENT OR SYSTEM FAILURES

- A. FAILED COMPONENT INFORMATION

Not applicable - there were no component failures associated with this event.

- B. FAILURE MODE, MECHANISM, AND EFFECT OF EACH FAILED COMPONENT

Not applicable - there were no component failures associated with this event.

- C. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE

Not applicable - there were no component failures associated with this event.

- D. SYSTEMS OR SECONDARY FUNCTIONS THAT WERE AFFECTED BY FAILURES OF COMPONENTS WITH MULTIPLE FUNCTIONS

Not applicable - there were no component failures associated with this event.

III. ANALYSIS OF THE EVENT

- A. SAFETY SYSTEM RESPONSES THAT OCCURRED

The lightning strike caused channels II and IV T_{cold} to spike high which resulted in OT N-16 setpoint reduction and channels II and IV to trip. This completed the two-out-of-four logic for a reactor trip on OT N-16. When the reactor tripped, the subsequent turbine trip caused

LICENSEE EVENT REPORT (LER) **TEXT CONTINUATION**

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Text (if more space is required, use additional copies of NRC Form 365A) (17)

the steam generator level to shrink below the Lo Lo level resulting in a Auxiliary Feedwater Pump auto start.

B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

Not applicable - there was no safety system train inoperability that resulted from this event.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

The subject reactor trip was caused due to a lightning strike, which spiked Unit 2 Channel II and IV T_{cold} high. This condition resulted in the automatic reduction of the overtemperature reactor trip setpoint to approximately 64 percent Rated Thermal Power (RTP).

This event is bounded by the analysis of the turbine trip presented in Section 15.2.3 of the CPSES Final Safety Analysis Report (FSAR). The analysis uses conservative assumptions to demonstrate the capability of pressure relieving devices and to demonstrate core protection margins. The event of September 18, 1996 occurred at 100 percent reactor power, and all systems and components functioned as designed. The event is bounded by the FSAR accident analysis which assumes an initial power level of 102 percent and conservative assumptions which reduce the capability of safety systems to mitigate the consequences of the transient. It is concluded that the event of September 18, 1996, did not adversely affect the safe operation of CPSES Unit 1 or the health and safety of the public.

IV. CAUSE OF THE EVENT

On September 18, 1996, at 12:45 PM, while at 100 percent reactor thermal power (1151 MWe), Unit 2 tripped during a storm on an Overtemperature (OT) N-16 signal. A lightning strike caused protection channel II and protection channel IV T_{cold} loops to spike high, which lowered the N-16 over-temperature set point below the current reactor power causing the trip.

Troubleshooting consisted of physical walkdown to trace the involved cabling, cabinet inspections, meggering and the use of a Time Domain

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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| | | Year | Sequential Number | | | | Revision Number | | | | |
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Reflectometer (TDR) to determine if there were any points where the N16 instrumentation was more susceptible to ground loop currents impacting the signal. During the troubleshooting of the two channels which spiked, I&C Technicians (utility, non-licensed) discovered that a ground existed from the shield to ground on the spare RTD in loop 2 and both the spare and active RTDs in loop 4.

The RTD for loop 2 was also suspect. However, further troubleshooting primary found no grounds on the shield for the RTD. The shield of the spare RTD was found to be grounded near the ECSA pigtail. Since the ECSA pigtails and a length of unshielded signal cables for both the spare and active RTDs for loop 2 are routed together, TU Electric believes that the circulating currents of the ground loop on the spare RTD's shield were induced into the active cable causing channel II T_{cold} to spike high.

V. CORRECTIVE ACTIONS

A Design Change was implemented to eliminate the grounds discovered during the trouble shooting of this event.

Although previous corrective actions seem to have prevented direct strikes of lightning to the containment structures, these actions were insufficient to prevent tripping of the units from lightning strikes. In response to previous lightning trips, TU Electric had formed a task team to evaluate previous lightning induced plant trips, and provide recommendations to management with respect to long term corrective actions. The September 18, 1996 plant trip has been included on the aforementioned task team's agenda.

VI. PREVIOUS SIMILAR EVENTS

There have been previous events that resulted in RPS actuation due to lightning strikes (refer to LER 445/90-028-00; LER 445/91-019-00, LER 445/91-021-00, LER 445/95-002-00 and LER 445/96-007-00). TU Electric had formed a task team to evaluate previous lightning induced plant trips, and provide recommendations to management with respect to long term corrective actions. The September 18, 1996 plant trip has been included on the aforementioned task team's agenda.