Enclosure to TXX- 95217

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY 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)

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Title (4)

LOSS OF BOTH CONDENSATE AND BOTH FEEDWATER PUMPS DUE TO FAILURE OF NON-SAFETY RELATED INVERTER RESULTED IN A MANUAL REACTOR TRIP

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
06	11	95	95	- 003	- 01	08	14	95	N/A	

Operating Mode (9): 1

Power Level (10): 100

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

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

Licensee Contact For This LER (12)

Name	Area Code Telephone Number
R. FLORES, SYSTEM ENGINEERING MANAGER	(817) 897-5590

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

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

Supplemental Report Expected (14)

- [ ] Yes (If yes, complete Expected Submission Date)
- [X] No

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

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

On June 11, 1995, at approximately 12:01 CDT, while performing a slave relay actuation test on Unit 1, a non-safety related inverter transferred from its normal inverter AC power supply to its bypass (alternate) AC power supply, which was deenergized per the slave relay test procedures. This resulted in loss of both condensate pumps. The loss of the condensate pumps resulted in the trip of both Main Feedwater (MFW) pumps. A manual reactor trip of CPSES Unit 1 was initiated due to loss of feedwater to the steam generators. The trip of both MFW pumps initiated an Auxiliary Feedwater actuation signal which started the Motor Driven Auxiliary Feedwater (MDAFW) pumps. Following a LO-LO level signal in Steam Generators 1-01 and 1-02, the Turbine Driven Auxiliary Feedwater (TDAFW) pump started as designed but tripped on overspeed. The details involving the TDAFW pump overspeed will be provided in LER 445/95-004-01.

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I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

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

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

On June 11, 1995, Comanche Peak Steam Electric Station (CPSES) Unit 1 was in Mode 1, Power Operation, and 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

MDAFW pump 1-01 was inoperable due to alignment to its test header as required for the slave relay testing.

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

On June 11, 1995, at approximately 1201 CDT, the CPSES Unit 1 Balance of Plant (BOP) Reactor Operator (utility, licensed) was performing the Train A slave relay test for the K601A relay (EIIS:(RLY)). While performing the test, a non-safety related inverter transferred from its normal inverter AC power supply to its bypass (alternate) AC power supply, which was deenergized per the slave relay test procedure. This resulted in loss of power to auxiliary relays 1-PY/2111 & 2112 which caused a MFW pump (EIIS:(P)(SJ)) low oil pressure signal which tripped both condensate pumps. The loss of the condensate pumps resulted in a trip of both MFW pumps. A manual reactor trip of CPSES Unit 1 was initiated due to the loss of feedwater to the steam generators (EIIS:(SG)(SB)).

The trip of both MFW pumps initiated an Auxiliary Feedwater (EIIS:(BA)) actuation signal for the MDAFW pumps. MDAFW pump 1-02

started and supplied feed to Steam Generator's (SG) 1-03 and 1-04. However, MDAFW pump 1-01 was aligned to its test header as required for the slave relay testing. Following a LO-LO level signal in SG's 1-01 and 1-02 the Turbine Driven Auxiliary Feedwater pump started, but tripped on overspeed. MDAFW pump 1-01 was re-aligned to SG's 1-01 and 1-02 within approximately 8 minutes after the reactor trip. Control room personnel responded in accordance with emergency operating procedures, and the plant was stabilized in Mode 3, Hot Standby.

An event or condition that results in manual or automatic actuation of any ESF, including the RPS, is reportable within 4 hours under 10CFR50.72(b)(2)(ii). At 1312 CDT, on June 11, 1995, the Nuclear Regulatory Commission Operations Center was notified of the event via the Emergency Notification System.

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

Control board (EIIS:(MCBD)(JE) indicators and alarms alerted the Reactor Operator (RO) that there was a loss of feedwater. The RO verified the loss of feed indications and manually tripped the reactor. The BOP RO identified that the TDAFW pump had tripped on overspeed.

II. COMPONENT OR SYSTEM FAILURES

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

The inverter's static transfer switch malfunctioned when the switch transferred to a deenergized power source. The static transfer switch is designed to prevent a transfer to a deenergized power source.

B. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE

Although the precise cause of the static transfer switch malfunction could not be conclusively determined, TU Electric believes that the malfunction occurred due to inadequate transient protection in the design of the inverter and failure to calibrate the static switch logic sense printed circuit board (PCB) and the analog logic PCB. Electrical transients generated as a result of

load shedding of the bypass power source may have defeated the reverse lockout circuitry causing the inverter to transfer to the deenergized bypass power source. Although PCB calibrations were initially performed on the safety related Elgar inverters during Startup, documentation for the calibration of the non-safety related Elgar inverters could not be located. The failure to calibrate the static switch logic sense PCB and the analog logic PCB may have impaired the inverter's normal response to equipment challenges such as transients and may have resulted in the transfer to the deenergized power source.

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

Not applicable - no failures of components with multiple functions have been identified.

D. FAILED COMPONENT INFORMATION

Elgar Corp.
Part Number UPS-103-1-132
118 Vac Non-Safeguard Inverter IV1C2

III. ANALYSIS OF THE EVENT

A. SAFETY SYSTEM RESPONSES THAT OCCURRED

The Reactor Protection System (EIIS:(JC)) and Auxiliary Feedwater System (EIIS:(BA)) actuated during the event.

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B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

The failure of the non-safety related inverter did not result in the inoperability of any safety system trains. The failure of the Unit 1 TDAFW pump will be discussed in LER 445/95-004-01.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

The actual event resulted in less auxiliary feedwater initially available than is assumed in the analysis of the "Loss of Normal Feedwater" transient presented in FSAR Section 15.2.7. This ANS Condition II event is analyzed to demonstrate the adequacy of the Auxiliary Feedwater System. The relevant event acceptance criterion is that the pressurizer should not completely fill with water, which could potentially lead to a more severe event. In this analysis, 860 gpm of auxiliary feedwater is assumed to be delivered by a combination of the two, half-capacity motor-driven auxiliary feedwater pumps and the single, full capacity turbine driven auxiliary feedwater pump, depending on the assumed single failure.

However, in the actual event, the reduction in the delivered auxiliary feedwater flow was initially offset by the effects of the early manual reactor trip, which occurred when there was more fluid remaining in the steam generators than is assumed in the FSAR analysis. The realignment of the second motor driven auxiliary feedwater pump assured that sufficient heat removal capability was available. Even with the reduced initial supply of auxiliary feedwater, the pressurizer did not completely fill with water. Thus the ANS Condition II event acceptance criterion was not exceeded and the safety and health of the public was unaffected.

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IV. CAUSE OF THE EVENT

TU Electric believes that the causes of this event were the malfunction of the inverter's static transfer switch and the design of the protection portion of the condensate system which allowed a loss of power to auxiliary relays 1-PY/2111 & 2112 to cause both condensate pumps to trip on a MFW pump low oil pressure signal.

V. CORRECTIVE ACTIONS

TU Electric's initial corrective actions included repair of the identified inverter deficiencies and successful functional testing of the inverter. A Design Modification has been implemented on Unit 1 to prevent future loss of power to the subject relays from causing the condensate pumps to trip on a false low lube oil pressure resulting in a potential challenge to plant safety systems. A similar Design Modification has also been issued for Unit 2. A trip reduction initiative was completed and plant modifications have been proposed to reduce the probability of inadvertent plant trips.

The static switch logic sense PCB and the analog logic PCB have been calibrated. A review was performed of other inverters which indicated that, with the exception of the 7.5KVA Westinghouse inverters, other non-safety related inverters had also not been calibrated. These inverters will be calibrated upon completion of calibration procedures. Preventive maintenance activities will also be established to maintain calibration of all inverters. A transient analysis is being performed for the inverter involved in this event. Upon completion of this analysis, the need to perform transient analysis on other similar inverters will be determined. Other non-safety related Elgar inverters will be inspected and deficiencies will be corrected where identified.

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VI. PREVIOUS SIMILAR EVENTS

There has been one previous event that resulted in an RPS actuation due to a safety-related Westinghouse RPS inverter failure (LER 445/90-002-00) and one previous event that resulted in a Technical Specification required shutdown due to a safety-related Westinghouse RPS inverter failure (LER 445/90-041-00). Corrective actions taken to resolve the root causes of the previous events would not have prevented this event.