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CP-201000194
Log # TXX-10009

Ref. # 10CFR50.73(a)(2)(ix)(A)

February 11, 2010

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

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NO. 50-446
SINGLE CAUSE PREVENTING FULFILLMENT OF A SAFETY FUNCTION FOR TWO
CHANNELS IN DIFFERENT SYSTEMS
LICENSEE EVENT REPORT 446/09-001-00

Dear Sir or Madam:

Enclosed is Licensee Event Report (LER) 09-001-00 for Comanche Peak Steam Electric Station (herein referred to as Comanche Peak Nuclear Power Plant) Unit 2, "Unit 2 Gamma-Metrics Calibration Impact on Containment Pressure and RCS Cold Leg Temperature Channels."

This communication contains the following new commitment which will be incorporated into the Comanche Peak Nuclear Power Plant (CPNPP) licensing basis as noted.

<u>Number</u>	<u>Commitment</u>
3889101	Procedures will be changed to improve the control and use of test equipment to prevent this type of grounding interaction in the future.

The commitment number is used by Luminant Power for the internal tracking of CPNPP commitments.

Should you have any questions, please contact Tom Daskam at (254) 897-0348.

IE22
NPR

A member of the STARS (Strategic Teaming and Resource Sharing) Alliance

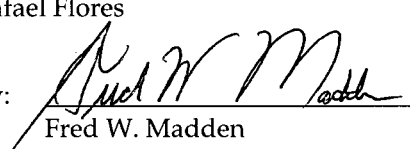
Callaway · Comanche Peak · Diablo Canyon · Palo Verde · San Onofre · South Texas Project · Wolf Creek

Sincerely,

Luminant Generation Company LLC

Rafael Flores

By:


Fred W. Madden

Director, Oversight & Regulatory Affairs

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. FACILITY NAME

COMANCHE PEAK NUCLEAR POWER PLANT

2. DOCKET NUMBER

05000 446

3. PAGE

1 OF 7

4. TITLE

Unit 2 Gamma-Metrics Calibration Impact on Containment Pressure and RCS Tcold

5. EVENT DATE

MONTH	DAY	YEAR
12	14	2009

6. LER NUMBER

YEAR	SEQUENTIAL NUMBER	REV NO.
2009	001	00

7. REPORT DATE

MONTH	DAY	YEAR
02	11	2010

8. OTHER FACILITIES INVOLVED

FACILITY NAME	DOCUMENT NUMBER
N/A	05000
FACILITY NAME	DOCUMENT NUMBER
	05000

9. OPERATING MODE

1

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

- | | | | |
|---|---|---|--|
| <input type="checkbox"/> 20.2201(b) | <input type="checkbox"/> 20.2203(a)(3)(i) | <input type="checkbox"/> 50.73(a)(2)(i)(C) | <input type="checkbox"/> 50.73(a)(2)(vii) |
| <input type="checkbox"/> 20.2201(d) | <input type="checkbox"/> 20.2203(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(viii)(A) |
| <input type="checkbox"/> 20.2203(a)(1) | <input type="checkbox"/> 20.2203(a)(4) | <input type="checkbox"/> 50.73(a)(2)(ii)(B) | <input type="checkbox"/> 50.73(a)(2)(viii)(B) |
| <input type="checkbox"/> 20.2203(a)(2)(i) | <input type="checkbox"/> 50.36(c)(1)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(iii) | <input checked="" type="checkbox"/> 50.73(a)(2)(ix)(A) |
| <input type="checkbox"/> 20.2203(a)(2)(ii) | <input type="checkbox"/> 50.36(c)(1)(ii)(A) | <input type="checkbox"/> 50.73(a)(2)(iv)(A) | <input type="checkbox"/> 50.73(a)(2)(x) |
| <input type="checkbox"/> 20.2203(a)(2)(iii) | <input type="checkbox"/> 50.36(c)(2) | <input type="checkbox"/> 50.73(a)(2)(v)(A) | <input type="checkbox"/> 73.71(a)(4) |
| <input type="checkbox"/> 20.2203(a)(2)(iv) | <input type="checkbox"/> 50.46(a)(3)(ii) | <input type="checkbox"/> 50.73(a)(2)(v)(B) | <input type="checkbox"/> 73.71(a)(5) |
| <input type="checkbox"/> 20.2203(a)(2)(v) | <input type="checkbox"/> 50.73(a)(2)(i)(A) | <input type="checkbox"/> 50.73(a)(2)(v)(C) | <input type="checkbox"/> OTHER |
| <input type="checkbox"/> 20.2203(a)(2)(vi) | <input type="checkbox"/> 50.73(a)(2)(i)(B) | <input type="checkbox"/> 50.73(a)(2)(v)(D) | <input type="checkbox"/> VOLUNTARY LER |

10. POWER LEVEL

100%

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Tim Hope – Nuclear Licensing Manager

TELEPHONE NUMBER (Include Area Code)

(254) 897-6370

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU- FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO15. EXPECTED
SUBMISSION
DATE

MONTH DAY YEAR

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

On December 14, 2009, at 0800 hours, Comanche Peak Nuclear Power Plant (CPNPP) Unit 2 was in Mode 1 at 100% power. A channel calibration on Unit 2 Train B Neutron Flux Monitoring System (Gamma-Metrics) resulted in the inoperability of channels in different systems: Unit 2 containment pressure channel 4, and Channel 4 of the Overtemperature N-16 and Overpower N-16 reactor trips. When the test equipment being used for the channel calibration was disconnected from the Gamma-Metrics system, the affected control room indications returned to normal. The cause of this event was grounding the Gamma-Metrics system to current paths and ground loops which served to couple a voltage potential through the plant grounding system to the affected plant parameters. Completed corrective actions include: 1) A Maintenance Standing Order was issued to control the use of test equipment that has the ability to ground a floating circuit, and (2) The shield cable ground was corrected for the Unit 2 containment pressure channel 3 and 4 main control board indicators. Planned corrective actions include procedure changes to improve the control and use of test equipment.

All times in this report are approximate and Central Standard Time unless noted otherwise.

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

1. FACILITY NAME COMANCHE PEAK NUCLEAR POWER PLANT	2. DOCKET 05000 - 446	6. LER NUMBER <table border="1"> <tr> <td>YEAR 2009</td> <td>SEQUENTIAL NUMBER 001</td> <td>REV NO. 00</td> </tr> </table>	YEAR 2009	SEQUENTIAL NUMBER 001	REV NO. 00	3. PAGE 2 OF 7
YEAR 2009	SEQUENTIAL NUMBER 001	REV NO. 00				

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

I. DESCRIPTION OF REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

10CFR50.73(a)(2)(ix)(A), "Any event or condition that as a result of a single cause could have prevented the fulfillment of a safety function for two or more trains or channels in different systems."

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

On December 14, 2009, CPNPP Unit 2 was in Mode 1 at 100% 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 December 14, 2009, two I&C technicians (Utility, Non-licensed) were assigned to perform a channel calibration on Unit 2 Train B Neutron Flux Monitoring System (Gamma-Metrics) [EIS: (IG)]. An oscilloscope was used as part of the test equipment for the channel calibration, and the oscilloscope was powered by a control room power outlet, which is grounded to plant ground. Between about 0830 and 0924, the oscilloscope test leads were twice connected to the Gamma-Metrics system as part of the calibration. During this same time frame, Unit 2 control room Reactor Operators (Utility, Licensed) observed plant computer alarms and abnormal, fluctuating indications for Unit 2 containment pressure [EIS: (IK) (PI)], channels 3 and 4, and Reactor Coolant System (RCS) temperature [EIS: (AB) (TI)]. The Unit 2 Unit Supervisor (Utility, Licensed) approached the I&C technicians performing the channel calibration, discussed the abnormal control room indications with them, and, as a result, the Gamma-Metrics channel calibration was suspended. The I&C technicians disconnected the oscilloscope test leads from the Gamma-Metrics system, and the affected control room indications returned to normal.

Believing that the fluctuating indications were related to a ground in the oscilloscope, the I&C technicians installed a two-prong grounding adapter between the oscilloscope's power cord and the plant power outlet. This action isolated the oscilloscope power cord from plant ground. The Gamma-Metrics channel calibration was then completed with no further adverse impact on plant indications.

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Plant computer data reflects the containment pressure channel 4 main control board meter fluctuations witnessed by control room operators, but not the fluctuations in containment pressure channel 3. The fluctuation witnessed in Containment Pressure channel 3 appears to have been only with the control board indicators, as the plant computer recorded no change. The cause analysis determined that the fluctuations on the channel 3 main control board meter were due to a ground loop problem on the channel 3 and 4 control board meter shield cables, and the Protection Set for containment pressure channel 3 was not adversely affected.

Unit 2 containment pressure channel 1 and 2 shield cables are grounded only at the Protection Sets, and the ground loop condition does not exist on channels 1 and 2.

The Gamma-Metrics system utilizes a floating ground. During the Gamma-Metrics channel calibration, this floating ground potential was connected to plant ground through the power cord, which adversely affected channel 4 RCS Cold Leg Temperature (Tcold) via the Protection Set 4 cabinet connection to plant ground. The channel 4 RCS Tcold fluctuations resulted in fluctuations of other channel 4 RCS temperature parameters that are derived from channel 4 RCS Tcold (e.g., channel 4 RCS average temperature). The RCS Tcold channels also provide input to both the Overtemperature N-16 reactor trip and Overpower N-16 reactor trip. The fluctuating channel 4 RCS Tcold signal during this event resulted in the inoperability of channel 4 for both the Overtemperature N-16 reactor trip and Overpower N-16 reactor trip. When the Gamma-Metrics channel calibration was resumed, a two-prong ground adapter was attached to the oscilloscope's power cord effectively isolating the oscilloscope from plant ground. That ground isolation prevented coupling the Gamma-Metrics circuit to the Protection Set and allowed the RCS channel 4 temperature indications to remain normal.

Channel 4 RCS average temperature (derived from channel 4 Tcold) provides input to several RCS related control systems, including rod control, pressurizer level control, and steam dumps. There were no observable actuations or changes in these control systems during the event.

The remaining Unit 2 protection channels (1, 2 & 3) were not affected by this event. Review of the protection signals from the plant computer history show no affect other than channel 4 containment pressure and RCS Tcold. The highly sensitive Nuclear Instrumentation [EIS: (IG) (JI)] and N16 Power [EIS: (IG) (JI)] signals showed no abnormal signal fluctuations during the event. Other signals that were reviewed included Pressurizer Pressure [EIS: (AB) (PI)] and Level [EIS: (AB) (LI)], Reactor Coolant System Flow [EIS: (AB) (FI)], Steam Generator Level [EIS: (JB) (LI)], Turbine First Stage Pressure [EIS: (IT) (PI)], and Steam Line Pressure [EIS: (SB) (PI)]. There were no abnormal signal perturbations during the event for these channels; therefore, the condition was limited to just channel 4 Containment Pressure and RCS Tcold.

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

Not applicable – No component or system failures occurred during this event. No procedural or personnel errors occurred during this event.

The shield cables for containment pressure channels 3 and 4 were found to be grounded at both the meter end and the Protection Set end, which was not in accordance with plant design. This appears to be an old construction personnel error; because the cause investigation indicates that this condition has existed since before Unit 2 was granted an operating license.

II. COMPONENT OR SYSTEM FAILURES

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

Not applicable – No component or system failures occurred during this event.

B. CAUSE OF EACH COMPONENT OR SYSTEM FAILURE

Not applicable – No component or system failures occurred during this event.

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

Not applicable – No component or system failures occurred during this event.

D. FAILED COMPONENT INFORMATION

Not applicable – No component or system failures occurred during this event.

III. ANALYSIS OF THE EVENT

A. SAFETY SYSTEM RESPONSES THAT OCCURRED

Not applicable – There were no safety system actuations during this event.

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B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

The bounding times for this event are on December 14, 2009, between about 0830 and 0924. However, the two instrumentation channels were only adversely affected for a total of about 15 minutes during the event, when the channel calibration test equipment was connected to the Gamma-Metrics system. During this 15 minute period, containment pressure channel 4 and the channel 4 input to the Overtemperature N-16 reactor trip and Overpower N-16 reactor trip were all inoperable. These channels are all a part of reactor Protection Set 4. The inoperable conditions described in this event did not exceed CPNPP Technical Specification allowances.

C. SAFETY CONSEQUENCES AND IMPLICATIONS

The safety function of the containment pressure intermediate range instrumentation channels is to provide an input for the actuation of the following Engineered Safety Features (ESF): safety injection, main steam isolation, containment spray, and containment isolation Phase B. Safety injection and main steam isolation both have a 2 of 3 logic to actuate, while containment spray and containment isolation Phase B both have a 2 of 4 logic to actuate. This event resulted in one of four containment pressure channels (channel 4, 2-P-0934) being inoperable for 15 minutes. The grounding problem imposed a non-conservative bias on containment pressure channel 4, which could have delayed the input from this channel for an ESF actuation. During this time period, there were no other containment pressure channels inoperable, and the remaining operable channels would have satisfied the required safety functions.

The safety function of the RCS cold leg temperature (Tcold) channels is to provide an input to the Overtemperature (OT) N-16 reactor trip and Overpower (OP) N-16 reactor trip. The OT N-16 and OP N-16 reactor trips both have a 2 of 4 logic to actuate. This event resulted in one of four OT N-16 and OP N-16 reactor trip channels (channel 4) being inoperable for 15 minutes. Again, the ground problem imposed a non-conservative bias on channel 4 of RCS Tcold, which could have delayed the input from this channel to an OT N-16 and/or OP N-16 reactor trip. During this time period, there were no other OT N-16 or OP N-16 reactor trip channels inoperable, and the remaining operable channels would have satisfied the required safety functions.

Since the time period that these instrumentation channels were inoperable was relatively short, 15 minutes, and the other three channels of containment pressure, OT N-16 reactor trip, and OP N-16 reactor trip were operable during this time period, the safety significance of this event is very low. The inoperable conditions described in this event did not exceed CPNPP Technical Specification allowances. The conditions during the event would not have prevented the fulfillment of a safety function, and there was no safety system functional failure. Based on this analysis, it is concluded that this event did not adversely affect the safe operation of CPNPP Unit 2 or the health and safety of the public.

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IV. CAUSE OF THE EVENT

The cause of this event was grounding the Gamma-Metrics system to current paths and ground loops which served to couple a voltage potential through the plant grounding system to various plant indications. This cause is evident by the fact that the indication fluctuations ceased: (1) when the oscilloscope was disconnected from the Gamma-Metrics card while still connected to plant ground, and (2) when the oscilloscope was connected to the Gamma-Metrics card while isolated from plant ground. The shield cable grounds for containment pressure channels 3 and 4 were not in accordance with plant design. This issue resulted in a ground loop through which extraneous signals could be conducted and contributed to the event.

An investigation was conducted to determine the cause of the event. Post-event troubleshooting and analysis ruled out some possibilities as a cause, including: the channel calibration test equipment (oscilloscope and frequency counter) and a faulty Gamma-Metrics test generator card, which was replaced during the channel calibration.

The cause analysis also reviewed the electrical grounding design of the Unit 2 Gamma-Metrics system, the reactor Protection Sets [EIS: (JE)], and various plant grounding systems [EIS: (FC)]. The Gamma-Metrics system utilizes a floating ground system. The reactor Protection Sets are connected to plant ground. The cabling for containment pressure channels 3 and 4 main control board meters consists of "shielded twisted pairs," which are twisted pairs of conductors contained within a shielded covering. Per design, the channel 3 and 4 cables are to be grounded at the Protection Set cabinet only, to help prevent induced noise. However, troubleshooting found that the shield cables for containment pressure channels 3 and 4 were grounded at both the meter end and the Protection Set end. This arrangement creates a "ground loop" through which extraneous signals may be conducted. When the oscilloscope was plugged into the power outlet, thereby grounding it to plant ground, and the oscilloscope test leads were connected to the Gamma-Metrics system during the channel calibration, the Gamma-Metrics floating ground potential was coupled to plant ground. That potential was picked up by the ground loop on the containment pressure channel 3 and 4 meter shield cables and caused the observed fluctuating meter indications and plant computer alarms for those channels. The cause investigation found that this incorrect channel 3 and 4 shield cable grounding has existed since before Unit 2 was granted an operating license.

The precise reason for channel 4 RCS Tcold's susceptibility to the ground problem has not been determined, however, recurrences of this event can be avoided through the isolation of test equipment from plant ground.

The I&C technicians performed the Gamma-Metrics channel calibration, including operation of the test equipment, in accordance with existing procedures. The lack of procedural guidance with regard to oscilloscope usage with floating and non-floating ground systems was a contributor for the event.

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V. CORRECTIVE ACTIONS

Completed corrective actions for this event include:

- (1) Maintenance Standing Order 2009-003, Revision 0, was issued on December 15, 2009, concerning test equipment use under various circumstances. Maintenance Standing Order 2009-003, Revision 3, is currently in effect; it was issued on January 28, 2010, to control the use of test equipment that has the ability to ground a floating circuit in Modes 1 or 2.
- (2) An Operations Shift Order was issued on December 17, 2009, to discuss the event. The Operations Shift order has carried this information for a month.
- (3) The ground loop problem on containment pressure channels 3 and 4 was corrected on January 14, 2010.

Planned corrective actions include procedure changes to improve the control and use of test equipment to prevent this type of grounding interactions in the future.

VI. PREVIOUS SIMILAR EVENTS

The cause evaluation for this event revealed two previous similar events. However, there were no previous Corrective Action Program identified causative factor ties to Gamma-Metrics calibrations.

During a Unit 2 Train B Gamma-Metrics channel calibration on November 29, 2006, plant computer data indicated that channel 4 RCS Tcold fluctuated for approximately 10 minutes. The RCS Tcold fluctuations coincided with the time the oscilloscope would have been connected to the Gamma-Metrics system for the channel calibration. Unexpected control rod stepping also occurred during this same time period and was addressed in CR-2006-003927. Post-event cause analysis of the control rod event did not state if the Gamma-Metrics channel calibration was considered as a possible causative factor.

During a Unit 2 Train B Gamma-Metrics channel calibration on June 4, 2008, fluctuations were again noted in channel 4 RCS Tcold. During this channel calibration, the RCS Tcold channel fluctuated for approximately one hour, which corresponded to the time period when the oscilloscope was connected to the Gamma-Metrics system.

During both the November 29, 2006 and June 4, 2008 channel calibrations, the only recorded or reported indication fluctuation was on channel 4 RCS Tcold.

There have been no previous similar events where a single cause prevented the fulfillment of a safety function for two or more trains or channels in different systems.