NON-PUBLIC?: N
ACCESSION #: 9402040170
LICENSEE EVENT REPORT (LER)

FACILITY NAME: DIABLO CANYON UNIT 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000275

TITLE: TURBINE AND REACTOR TRIP DUE TO A GENERATOR EXCITATION PROTECTION TRANSDUCER FAILURE AND SUBSEQUENT ELECTRICAL SYSTEM DISTURBANCE
EVENT DATE: 12/26/93 LER #: 93-011-00 REPORT DATE: 01/25/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: DAVID P. SISK - SENIOR REGULATORY TELEPHONE: (805) 545-4420
COMPLIANCE ENGINEER

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: TL COMPONENT: TD MANUFACTURER: W120
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On December 26, 1993, at 1423 PST, with Unit 1 in Mode 1 (Power Operation) at 100 percent power, Unit 1 experienced a turbine trip and subsequent reactor trip. The unit was stabilized in Mode 3 (Hot Standby) in accordance with plant emergency procedures. A four-hour, nonemergency report was made in accordance with 10 CFR 50.72(b)(2)(ii) at 1455 PST.

The event was due to a failed excitation system isolation transducer combined with a fault on the Midway-Kern #1 and #2 230 kV lines. The fault, combined with the excitation protection system transducer failure, resulted in a unit trip.

The operators manually closed the main steam isolation valves (MSIVs) in response to a reactor coolant system (RCS) pressure and temperature

decrease. This action was successful in stopping the cooldown. The RCS pressure was recovered and the MSIVs were reopened. An investigation concluded that the cooldown was due to a combination of auxiliary feedwater (AFW) flow and the additional steam flow to the Moisture Separator Reheater (MSR) 1-2A.

The generator excitation protection transducer was replaced. The other two Unit 1 DC-DC isolation transducers were verified to be within tolerances. The Unit 2 generator isolation transducers will be inspected during the next outage of sufficient duration.

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END OF ABSTRACT

I. Plant Conditions

Unit 1 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Event

A. Summary:

Following a fault on the Midway-Kern #1 and #2 230 kV lines (FK) on December 26, 1993, at 1423 PST, with Unit 1 in Mode 1 at 100 percent power, Unit 1 experienced a turbine (TA)(TRB) trip and subsequent reactor (AB)(RCT) trip. The unit was stabilized in Mode 3 (Hot Standby) in accordance with plant emergency procedures. A four-hour, nonemergency report was made in accordance with 10 CFR 50.72(b)(2)(ii) at 1455 PST.

B. Background:

The main generator (TB)(GN) and equipment in the 25 kV system (EA) are designed to withstand the maximum momentary short circuit contribution from any onsite and offsite source for a fault on the 25 kV system.

The function of the exciter (TL)(EXC) is to provide field current for the excitation of the main generator. Protective features are provided to prevent damage to the main generator from prolonged exciter overcurrent. Exciter overcurrent is detected by the voltage regulator (TB)(ERG) Instantaneous Current Limiter 3 (TL)(TD).

Instantaneous Current Limiter 3 is used to trip the unit in case of a firing circuit failure. It is used as a backup to Instantaneous Current Limiters 1 and 2. This is the generator protective device that tripped Unit 1 on December 26, 1993.

C. Event Description:

Following failure of the generator excitation protection transducer (TL)(TD) combined with a fault on the Midway-Kern #1 and #2 230 kV lines on December 26, 1993, at 1423 PST, Unit 1 experienced a turbine trip and a subsequent reactor trip. The unit was stabilized in Mode 3 in accordance with plant emergency procedures.

Licensed plant operators in the control room responded in accordance with established emergency procedures, confirmed the reactor trip, verified proper engineered safety features (ESF) actuations, and initiated manual actions to stabilize the unit in Mode 3. A four-hour, nonemergency report was made in accordance with 10 CFR 50.72(b)(2)(ii) at 1455 PST.

Approximately 5 minutes after the trip, plant operators manually closed the main steam isolation valves (MSIVs)(SB)(ISV) in response to a reactor coolant system (RCS) (AB) pressure and temperature decrease. Manually closing the MSIVs in accordance with step 1.a.4) of Emergency Operating Procedure (EOP) E-0.1, "Reactor Trip Response," was successful in stopping the cooldown and recovering the RCS pressure. The MSIVs were subsequently reopened.

An Event Response Plan was developed by plant personnel to investigate the event, identify the root cause, and review and document all immediate corrective actions required to verify the unit ready for resumption of power operation.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

MSIV bypass valve (MS-1-FCV-22) did not indicate full closure when the MSIVs were manually closed. However, inspection of the valve showed that this lack of full closure indication was

only due to a position indicator problem. The indicator was repaired.

Initial concerns were raised that the cooldown was due to one of the moisture separator reheater (MSR)(SB)(HX) supply valves (FCV-401) being manually held open. PG&E later determined that two MSR valves, FCV-396 and FCV-401, remained open due to the failure of the valve positioner for FCV-396. Thus, the cooldown was confirmed to be primarily due to auxiliary feedwater (AFW)(BA) flow to the steam generators (AB)(HX) and the additional steam flow to MSR 1-2A via FCV-396 and FCV-401. The valve positioner was repaired.

In addition, an initial concern was that the stop valve for Main Feedwater Pump (FWP) 1-2 (SJ)(P) failed to close following the unit trip and that this may have contributed to the cooldown. A review of recorded data confirmed that the stop valve did close as required and that the only problem was in the valve position indicator. The valve position indicator was repaired.

E. Dates and Approximate Times for Major Occurrences:

1. December 26, 1993, at 1423 PST: Initiating Event:

System disturbance.

2. December 26, 1993, at 1423 PST: Event/Discovery Date:
Automatic unit trip
initiated.

3. December 26, 1993, 1455 PST: A four-hour,
nonemergency
report was made to the
NRC in accordance with
10 CFR 50.72(b)(2)(ii).

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

The event was immediately apparent to plant operators due to

alarms and indications received in the control room.

H. Operator Actions:

Licensed plant operators in the control room responded in accordance with established emergency procedures, confirmed the reactor trip, verified proper ESF actuations, and initiated manual actions to stabilize the unit in Mode 3.

Approximately 5 minutes after the trip, plant operators manually closed the MSIVs in accordance with step l.a.4) of EOP E-0.1, "Reactor Trip Response," in response to an RCS pressure and temperature decrease. This manual action was successful in stopping the cooldown and recovering the RCS pressure. The MSIVs were subsequently reopened.

I. Safety System Responses:

1. The reactor trip breakers (JC)(BKR) opened.

2. The main turbine tripped.

3. The control rod drive mechanism (AA)(DRIV) allowed the control rods to drop into the core.

4. The reactor coolant pumps (AB)(P) tripped on underfrequency.

5. The motor-operated auxiliary feedwater pumps (BA)(MO)(P) and the turbine-driven auxiliary feedwater pump (BA)(TRB)(P) started.

III. Cause of the Event

A. Immediate Cause:

As a result of a transient decrease in the 500 kV system frequency and voltage, the Unit 1 main generator voltage regulator attempted to boost the generator voltage. The demand (short-term) caused the DC current to the exciter to increase. The increase in exciter current combined with the failure (drift) of the main generator excitation protection isolation transducer resulted in the (incorrectly) sensed condition that initiated a required generator protection relay actuation and a unit trip.

B. Root Cause:

The event was due to a failed excitation system isolation transducer (drift) combined with a fault on the Midway-Kern #1 and #2 230 kV lines.

C. Contributory Cause:

None.

IV. Analysis of the Event

A reactor trip from 100 percent power is a previously analyzed FSAR Update, Chapter 15, Condition II event. Therefore, the health and safety of the public were not adversely affected by this event.

V. Corrective Actions

A. Immediate Corrective Actions:

The generator excitation protection isolation transducer was replaced.

B. Corrective Actions to Prevent Recurrence:

No additional corrective actions were deemed necessary since the generator protection scheme performed its intended function.

The other two Unit 1 DC-DC isolation transducers were verified to be within tolerances. PG&E performed searches of the NPRDS and maintenance history databases for similar transducer failures in the industry; no similar occurrences were noted.

The Unit 2 generator isolation transducers will be inspected during the next outage of sufficient duration.

VI. Additional Information

A. Failed Components:

Generator excitation protection isolation transducer.

B. Previous LERs on Similar Problems:

None.

C. Additional Information:

None.

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Gregory M. Rueger
Senior Vice President and
General Manager
Nuclear Power Generation

January 25, 1994

PG&E Letter No. DCL-94-018

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Licensee Event Report 1-93-011-00
Turbine and Reactor Trip Due to a Generator Excitation Protection Transducer Failure and Subsequent Electrical System Disturbance

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed Licensee Event Report concerning a turbine and reactor trip due to a generator excitation protection transducer failure and subsequent electrical system disturbance.

This event did not adversely affect the health and safety of the public.

Sincerely,

Gregory M. Rueger

cc: Mary H. Miller
Kenneth E. Perkins
Sheri R. Peterson
Diablo Distribution
INPO

DC1-93-EM-N051

Enclosure

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