Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION

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May 22, 1992

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

Subject: Docket No. 50-361
30-Day Report
Licensee Event Report No. 92-008
San Onofre Nuclear Generating Station, Unit 2

Pursuant to 10 CFR 50.73(d), this submittal provides the required 30-day written Licensee Event Report (LER) for an occurrence involving an automatic reactor trip. Neither the health nor the safety of plant personnel or the public was affected by this occurrence.

If you require any additional information, please so advise.

Sincerely,

RWKrieger

Enclosure: LER No. 92-008

cc: C. W. Caldwell (USNRC Senior Resident Inspector, Units 1, 2 and 3)

J. B. Martin (Regional Administrator, USNRC Region V)

Institute of Nuclear Power Operations (INPO)



IE20
1/1

LICENSEE EVENT REPORT (LER)

| Facility Name (1) | Docket Number (2) | Page (3) |
|---|---|---|
| SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2 | 0 5 0 0 0 3 6 1 | 1 of 0 5 |

Title (4)
Automatic Turbine and Reactor Trip Due to Failure of Non-1E 4 kV to 480 V Transformer

| 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 Number(s) |
| 0 4 | 2 4 | 9 2 | 9 2 | 0 0 8 | 0 0 | 0 5 | 2 2 | 9 2 | NONE | 0 5 0 0 0 |
| | | | | | | | | | | 0 5 0 0 0 |

| OPERATING MODE (9) | 1 | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11) | | | |
|---|---|---|---|---|---|
| POWER LEVEL (10) | 0 7 9 | ___ 20.402(b) | ___ 20.405(c) | X 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) | ___ Other (Specify in Abstract below and in text) |
| | | ___ 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 | TELEPHONE NUMBER AREA CODE |
|---|---|
| R. W. Krieger, Station Manager | 7 1 4 3 6 8 - 6 2 5 5 |

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 |
|---|---|---|---|---|---|---|---|---|---|
| X | F A | X F M R | 1 0 3 0 | NO | | | | | |
| | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | Expected Submission Date (15) | Month | Day | Year |
|---|---|---|---|---|---|
| ___ Yes (If yes, complete EXPECTED SUBMISSION DATE) | XX NO | | | | |

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

At 0924 on 4/24/92, with Unit 2 at 79% power, an automatic turbine trip/reactor trip occurred as a result of an increase of level in the Moisture Separator Reheater (MSR) drain tank to the turbine trip setpoint. The transient was precipitated by the failure of transformer 2B13X at 0919, which in turn caused the trip of one of the two Main Feedwater Pumps. In response to the reduction of feedwater flow to the Steam Generators (SG) and resultant decrease in level, reactor power was reduced and Emergency Feedwater was manually actuated, as required by procedure and training, to recover SG level and avoid a reactor trip on low SG level. The MSR drain tank level control system response was not sufficient to properly respond to the plant transient and avoid a level increase to the turbine trip setpoint.

The failure of transformer 2B13X also de-energized the hydraulic actuator units for the turbine throttle and stop valves. Without power these valves would have closed due to hydraulic pressure decay, resulting in a plant trip even without the rise in level of the MSR drain tank to the turbine trip setpoint.

Transformer 2B13X was replaced. A root cause analysis of the failed transformer will be performed. The MSR drain tank level control system has been verified to be properly calibrated, but testing has indicated additional tuning may be necessary to optimize the response to plant transients such as occurred in this event. Appropriate corrective actions will be implemented based upon additional testing.

There is no safety significance to this event since all safety systems operated as designed.

Plant: San Onofre Nuclear Generating Station
Unit: Two
Reactor Vendor: Combustion Engineering
Event Date: 4-24-92
Time: 0924

A. CONDITIONS AT TIME OF THE EVENT:

Mode: 1, Power Operation (79% Power)

B. BACKGROUND INFORMATION:

1. Non-1E 4 kV Electrical Distribution System

The Non-1E 4 kV Electrical Distribution System [EA] supplies power to non-essential plant loads including the 480 V [EC] load centers through 4.16 kV to 480 V step down transformers [XFMR]. The Non-1E 480 V load centers distribute power to the non-essential 480 V loads and to various Motor Control Centers (MCC). The electrical loads of Non-1E 480 V load center 2B13 and its 4 kV to 480 V transformer include the hydraulic actuator units for the eight High Pressure Turbine (HPT) [TRB] governor valves [SCV] and stop valves [SHV] and one Low Pressure Turbine (LPT) intercept valve and stop valve. Loss of power to the actuator units results in eventual valve closure due to normal system hydraulic pressure decay. The 480 V MCCs further distribute power to other 480 V loads and to the 120/208 V Non-1E distribution panels.

2. Moisture Separator Reheater System

The two Moisture Separator Reheaters (MSR) [RHTR] extract moisture from the HPT exhaust steam and raise the temperature and quality of the steam prior to admission into the LPT. The moisture removed from the steam is collected in the MSR drain tank associated with each MSR. These tanks are equipped with normal level control and high level dump valves [LCV].

3. Turbine Protection System

The Turbine Protection System [JJ] monitors parameters which are critical to safe turbine operation and causes a turbine trip if any parameter reaches its setpoint. The measured parameters include high MSR drain tank level. In addition to tripping the turbine, a turbine trip signal initiates a reactor [RCT] trip if reactor power is greater than 55%.

C. DESCRIPTION OF THE EVENT:

1. Event:

At 0924 on April 24, 1992, with Unit 2 at 79% power, an automatic turbine trip/reactor trip occurred when level in the Moisture Separator Reheater (MSR) drain tank rose to the turbine trip setpoint. The transient was precipitated by the failure of 4 kV to 480 V transformer 2B13X at 0919, with Unit 2 at 100% power. The transformer failure caused a voltage transient on the supply side 4 kV bus, which in turn caused a slowing of the lubricating oil pumps associated with one of the two Main Feedwater Pump Turbines (MFWPT). The affected MFWPT tripped on low lube oil pressure. With only one feedwater pump operating at full power, steam generator [SG] levels began dropping. Operators (utility, licensed) responded by reducing reactor power and actuating the Emergency Feedwater Actuation System (EFAS) [JE], in accordance with procedure and training, to recover SG level and avoid a reactor trip on low SG level. However, the rise in level in the MSR drain tank as a result of the power reduction was sufficient to initiate a protective turbine trip.

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

None

3. Sequence of Events:

| TIME | ACTION |
|---|---|
| 0919 | Transformer 2B13X failed and caused load center 2B13 to de-energize. One MFWPT tripped. |
| 0920 | Operators reduced power from 100% to 79%. EFAS was manually initiated for both steam generators. |
| 0924 | Main Turbine tripped on high MSR drain tank level, followed by an expected reactor trip. |
| 0930 | Plant conditions stabilized in Mode 3. |

4. Method of Discovery:

Control Room alarms and indications alerted the operators to the MFWPT trip, and later the reactor trip.

5. Personnel Actions and Analysis of Actions:

Operators properly reduced power and actuated the EFAS, in accordance with procedure and training, in response to the MFWPT trip. Following the reactor trip, operators properly stabilized

plant conditions utilizing the Standard Post Trip Actions and the Reactor Trip Recovery procedures. Proper operation of all Reactor Protection System (RPS) [JC] and EFAS components was verified.

6. Safety System Responses:

The RPS and EFAS operated as designed.

D. CAUSE OF THE EVENT:

Failure of the 2B13X transformer caused a momentary voltage dip on its supply side bus, which is also the power supply for the main lube oil pumps on one MFWPT. The degraded voltage condition was sufficient to cause a slowing of the lube oil pumps, and the resultant trip of the MFWPT and loss of one train of feedwater.

The reduction in power following the loss of one train of main feedwater resulted in a challenge to the MSR drain tank level control system. Such a plant transient decreases the pressure differential between the MSR drain tank and the second point feedwater heater, thus creating the potential for an increase in the drain tank level. The drain tank level control system response was not sufficient to avoid a level increase to the turbine trip setpoint. Although the initial level in the drain tank was within the normal working region, it was approximately 4 inches higher than the level in the alternate tank, which did not generate a turbine trip. Subsequent testing of the level control system, although found to be properly calibrated, suggests that additional tuning may optimize the system response to similar transients.

The failure of transformer 2B13X also de-energized the hydraulic actuator units for all eight of the high pressure turbine throttle and stop valves and one low pressure turbine stop and intercept valve. With the loss of power to the actuator hydraulic pumps, which periodically cycle on and off to maintain hydraulic pressure necessary for the valves to remain open, these valves would have eventually drifted closed due to hydraulic pressure decay, resulting in a turbine trip. Although not immediately evident to the operators since the pressure decay is a relatively slow process, a plant trip would have occurred even without the rise in level of the MSR drain tank to the turbine trip setpoint.

E. CORRECTIVE ACTIONS:

1. Corrective Actions Taken:

a. Transformer 2B13X was replaced.

b. The calibration of the MSR drain tank level control system has been verified to be correct.

c. Preliminary testing of the response of the MSR drain tank level control system has been completed, and the requirements for further testing and evaluation have been identified.

2. Planned Corrective Actions:

a. The cause of the transformer failure will be determined by the performance of a root cause analysis on the damaged transformer. Based on the results of this analysis, appropriate corrective actions will be implemented.

b. Additional testing and evaluation of the response of the MSR drain tank level control system will be performed. Based on the results of this testing, appropriate corrective actions will be implemented.

F. SAFETY SIGNIFICANCE OF THE EVENT:

There is no safety significance to this event since all RPS and EFAS components operated as designed.

G. ADDITIONAL INFORMATION:

1. Component Failure Information:

The 2B13X transformer is a 4160 V to 480 V, three phase, 60 cycle, ventilated dry transformer, rated at 1000 kva, model type VU-9, manufactured by ITE Imperial Corporation.

2. Previous LERs for Similar Events:

None