NON-PUBLIC?: N
ACCESSION #: 9108070063
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palisades Plant PAGE: 1 OF 5

DOCKET NUMBER: 05000255

TITLE: REACTOR TRIP WHEN 'A' CHANNEL REACTOR PROTECTIVE SYSTEM TM/LP
BISTABLE WAS INSERTED
EVENT DATE: 07/03/91 LER #: 91-012-00 REPORT DATE: 08/02/91

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: N 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:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JC COMPONENT: CL MANUFACTURER:
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On July 3, 1991, at 1435 hours, with the plant operating at 100% power, the reactor tripped. Troubleshooting and repair of the channel "A" Thermal Margin/Low Pressure (TM/LP) protection circuit was in progress at the time of the trip. Investigation into the cause of the trip indicated that a reactor trip signal was created when, during the performance of troubleshooting and repair of the TM/LP channel "A" circuit, a trip coil to test coil short, which existed in the circuit, activated the reactor protective system (RPS) trip relays for the A-D logic matrix.

The cause of the event was the failure of electrical components in the reactor protective system circuitry.

Corrective action for this event includes evaluating periodic monitoring the RPS test circuitry for indications of failed bistable trip relays,

evaluating isolating signal ground from earth ground at the Thermal
Margin Monitor (TMM) and Auxiliary Feedwater Actuation System (AFAS),
evaluating isolating Feed Only Good Generator (FOGG) system from RPS,
evaluating a PM prog
am to perform a coil to coil resistance test on all
trip relays in the RPS and reviewing a proposed modification to the RPS
circuitry to determine if a similar failure mechanism will exist.

The event involved the failure of electrical components in the reactor
protective system circuitry.

END OF ABSTRACT

EVENT DESCRIPTION

On July 3, 1991, at 1435 hours, with the plant operating at 100% power,
the reactor tripped. Troubleshooting and repair of the channel "A"
Thermal Margin/Low Pressure (TM/LP) protection circuit was in progress at
the time of the trip. The troubleshooting and repair was in progress due
to the following events having been observed in the circuit:

o increased TM/LP setpoint indication on PIA-0102A
o AFAS and FOGG sensor trips on channel 'A'
o full trip signal received on channel 'A' TM/LP trip unit

CAUSE OF THE EVENT

The cause of the event was the pre-existing failure of electrical
components in the reactor protective system circuitry prior to
troubleshooting.

A reactor trip signal was created when, during the performance of
troubleshooting and repair of the TM/LP channel A circuit, a trip coil
JC;CL! to test coil JC;CL! short, which existed in the circuit,
activated the RPS trip relays JC;RLY! for the A-D logic matrix.

ANALYSIS OF THE EVENT

The RPS logic test circuitry ties all trip coils for any particular
matrix together through test power supply wiring and test coils. The
trip coils are always energized and de-energize to trip. The test coils
are wound to oppose the trip coil. This allows a test voltage to be
applied to the test coil such that it will buck the energized trip coil
and subsequently cause the trip contacts to change state (open). The

matrix test circuit is arranged such that two test coils are hard wired in a loop. This is done so that test power can be applied to paired test coils which are opposites on the logic ladder. Since the trip coils are always energized, aging and heat induced breakdown of the insulation between the test coil and the trip coils occurs.

Insertion of the channel "A" Thermal Margin/Low Pressure (TM/LP) bistable unit completed an electrical path resulting in the energization of two paired test coils and the subsequent opening of opposite contacts in the trip matrix ladder.

The faulted electrical path can be described as follows:

The channel "A", K-3 (Hi Pressurizer Pressure) trip coil was shorted to its test coil. This allowed the K-3 (channel "A", Hi Pressurizer Pressure) test coil and its matrix test circuit pair, K-1 (channel "D", Hi Pressurizer Pressure) test coil to energize. When the K-3 and K-1 test coils energized they bucked their respective trip coils causing the relay contacts to open

resulting in a plant trip on the A-D matrix. After energizing the test coils, the circuit continued to the test circuit interconnecting negative bus. This bus (one of three) connects groups of 'K' relay test coil pairs. Of the relays connected to this bus the test coil K-3 for channel "A", Steam Generator 2 Low Pressure is of specific interest. This coil was also shorted to its trip coil creating a path to the channel "A", Steam Generator 2 Low Pressure signal common on the bistable trip unit.

The channel "A", Steam Generator 2 Low Pressure bistable signal common is connected to the channel "A" AFAS. From this point the signal common is connected to earth ground. From earth ground, the circuit continued up through the channel "A" of TMM. (The TMM supplies pre-trip and trip setpoints to the TM/LP bistable.) The circuit traveled on the setpoint signal common to the TM/LP bistable. From the TM/LP bistable, the signal passed to the signal common of channel "A", Hi Pressurizer Pressure bistable. This communication exists through the pressurizer pressure signal loop which provides input to both hi pressurizer pressure bistable and TM/LP bistable. Once into the channel "A", Hi Pressurizer Pressure bistable signal common, the circuit continued to the 15V dc bistable power supply which completes the circuit to the K-3 channel "A", Hi Pressurizer Pressure relay trip coil.

Conclusion

1. The Reactor tripped on the A-D channel Matrix, Hi Pressurizer Pressure.

2. There were two shorted bistable dual coil trip relays. One in the K-3 relay Hi Pressurizer Pressure. (channel "A") and Steam Generator 2 Low Pressure (channel "A").

3. Inserting the channel "A" TM/LP bistable completed the circuit to generate the trip signal.

4. A de-energized trip coil, producing a channel trip signal, could not be defeated by reverse energization of the test coil as there are diodes across the test coil leads preventing reverse energization.

5. Failure of the dual coil relays is attributed to aging, with heat contributing to the aging process.

6. The test coil energization circuit utilized signal ground to earth ground connections at the TMM and AFAS to complete the circuit loop.

CORRECTIVE ACTION

1. Evaluate periodically monitoring the RPS test circuitry for indications of failed bistable trip relays.

2. Evaluate isolating signal ground from earth ground at the TMM and AFAS circuitry.

3. Evaluate isolating Feed Only Good Generator (FOGG) system circuitry from RPS.

4. Perform a coil to coil resistance test on all (132) dual coil trip relays. Replace any defective coils as necessary.

5. Review the design of FC-888 "Replace RPS Bistables" and determine if a failure mechanism, similar to the mechanism described in E-PAL-91-14, will exist.

ADDITIONAL INFORMATION

None

Figure omitted.

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Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 91-012: REACTOR TRIP WHEN 'A' CHANNEL REACTOR
PROTECTIVE SYSTEM TM/LP BISTABLE WAS INSERTED

Licensee Event Report (LER) 91-012, Reactor Trip When 'A' Channel Reactor Protective System TM/LP Bistable was Inserted, is attached. This event is reportable to the NRC per 10CFR50.73(a)(2)(iv).

Gerald B Slade
General Manager

CC Administrator, Region III, USNRC
NRC Resident Inspector, Palisades

Attachment

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