



Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
600 Rocky Hill Road  
Plymouth, MA 02360

June 22, 2015

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

SUBJECT: Licensee Event Report 2015-004-00, 480V Bus B6 Auto Transfer Function  
Degraded

Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
Docket No.: 50-293  
License No.: DPR-35

LETTER NUMBER: 2.15.048

Dear Sir or Madam:

The enclosed Licensee Event Report (LER) 2015-004-00, 480V Bus B6 Auto Transfer Function Degraded, is submitted in accordance with 10 CFR 50.73.

This letter contains no commitments.

Please do not hesitate to contact Mr. Everett P. Perkins, Jr. (508) 830-8323, if there are any questions regarding this submittal.

Sincerely,

A handwritten signature in cursive script, appearing to read "D E Noyes".

David E. Noyes  
Director, Regulatory and Performance Improvement

Attachment 1: Licensee Event Report 2015-004-00, 480V Bus B6 Auto Transfer Function  
Degraded (4 pages)

TE22  
NLR  
A small recycling symbol consisting of three chasing arrows forming a triangle.

cc: Mr. Daniel H. Dorman  
Regional Administrator, Region 1  
U.S. Nuclear Regulatory Commission  
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USNRC Senior Resident Inspector  
Pilgrim Nuclear Power Station

**Attachment 1**

Letter Number 2.15.048

Licensee Event Report 2015-004-00

480V Bus B6 Auto Transfer Function Degraded

(4 Pages)



## LICENSEE EVENT REPORT (LER)

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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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

Pilgrim Nuclear Power Station

## 2. DOCKET NUMBER

05000293

## 3. PAGE

1 OF 4

## 4. TITLE

480 Volt Bus B6 Auto Transfer Function Degraded

| 5. EVENT DATE              |     |      | 6. LER NUMBER   |   |          | 7. REPORT DATE  |     |   | 8. OTHER FACILITIES INVOLVED |               |
|----------------------------|-----|------|---|---|----------|---|-----|---|------------------------------|---------------|
| MONTH                      | DAY | YEAR | YEAR  | SEQUENTIAL NUMBER                                     | REV. NO. | MONTH   | DAY | YEAR  | FACILITY NAME                | DOCKET NUMBER |
| 04                         | 23  | 2015 | 2015  | 004   | 00       | 06  | 22  | 2015  | N/A                          | N/A           |
| 9. OPERATING MODE          |     |      | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) |   |          |   |     |   |                              |               |
| N                          |     |      | <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 type="checkbox"/> 50.73(a)(2)(ix)(A)   |                              |               |
| 10. POWER LEVEL<br><br>000 |     |      | <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 checked="" 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 checked="" type="checkbox"/> 50.73(a)(2)(i)(B) |          | <input checked="" type="checkbox"/> 50.73(a)(2)(v)(D) |     | Specify in Abstract below or in NRC Form 366A |                              |               |

## 12. LICENSEE CONTACT FOR THIS LER

## LICENSEE CONTACT

Mr. Everett P. Perkins, Jr. - Regulatory Assurance Manager

## TELEPHONE NUMBER (Include Area Code)

508-830-8323

## 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 |
|-------|--------|-----------|---------------|--------------------|-------|--------|-----------|---------------|--------------------|
| X     | ED     | 2         | A109          | Y                  |       |        |           |               |                    |

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

| MONTH | DAY | YEAR |
|-------|-----|------|
|       |     |      |

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

On April 23, 2015 with the unit shutdown for refueling outage, while performing plant procedure 3.M.3-27, Attachment 1 "480V Bus B6 Transfer Test, UV, Degraded Voltage and Timing Relays Calibration," there was indication the time delay Agastat relay 27A-B1X/TDDO contact 3-5 had failed. The contact never changed state during the cycling of the relay. The time delay Agastat relay 27A-B1X/TDDO provides under-voltage protection for Bus B6. In the event of a degraded voltage condition on bus B1 with normal alignment (B1 powering B6), bus B6 would not have automatically transferred to B2 as designed. This portion of the transfer scheme to transfer B6 to B2 from B1 was not operating (with contact 3-5 failed) and therefore B6 would have continued to receive power from bus B1 with degraded voltage. Bus B6 supplies 480 Volt vital power to the Low Pressure Coolant Injection (LPCI) valves that open to facilitate LPCI injection flow into the recirculation piping during the plant response to a postulated design basis event.

The relay was replaced during the refueling outage. This event was not risk significant and posed no threat to public health and safety.

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CONTINUATION SHEET

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## BACKGROUND

Bus B6 supplies 480 Volt vital power to the low pressure coolant injection (LPCI) valves that open to facilitate LPCI injection flow into the recirculation piping during the plant response to a postulated design basis event. Power to bus B6 is normally fed from bus B1 (train A). Bus B2 is the back-up power feed to bus B6 (train B). Bus B6 is designed to automatically transfer power to the opposite train power feed in the event of loss of power or degraded voltage on the feed providing power to bus B6.

On April 23, 2015 with the unit shutdown for refueling outage, Pilgrim Nuclear Power Station (PNPS) personnel were performing various surveillance tests required to be conducted during shutdown conditions. While performing plant procedure 3.M.3-27, Attachment 1 "480V Bus B6 Transfer Test, UV, Degraded Voltage and Timing Relays Calibration," there was indication the time delay Agastat relay 27A-B1X/TDDO contact 3-5 had failed. The contact never changed state during testing of the relay.

## EVENT DESCRIPTION

While performing plant procedure 3.M.3-27, Attachment 1 "480V Bus B6 Transfer Test, UV, Degraded Voltage and Timing Relays Calibration," there was indication the time delay Agastat relay 27A-B1X/TDDO contact 3-5 had failed. The contact never changed state during the cycling of the relay. Contact resistance measured 2.4K ohms.

a. Loss of Voltage Scheme

For a loss of bus B1 voltage (relays 27-B1/1 and 27-B1/2) or bus B2 voltage (relays 27-B2/1 and 27-B2/2); the swing bus B6 transfer scheme was fully operable in the past with relay 27A-B1X/TDDO contact 3-5 failed, since relay 27A-B1X/TDDO is used only for the bus B1 degraded voltage scheme.

b. Degraded Voltage Scheme

For Normal Operation (bus B6 being powered by bus B1), upon a degraded voltage signal via relays 27A-B1/1 and 27A-B1/2, relay 27A-B1X/TDDO is energized and its normally open contact 3-5 closes to energize relay 27-B1X/TDE. Normally open contact 7-11 of relay 27-B1X/TDE closes to trip breaker 52-601 and normally closed contact 3-5 of relay 27-B1X/TDE opens to prevent closure of breaker B52-601. Normally open contact 2-6 of relay 27-B1X/TDE closes to close breaker B52-602 and Bus B6 will be transferred to Bus B2. (Note: Breakers 52-102 and 52-202 which are in series with breakers 52-601 and 52-602, respectively also transfer in a similar manner, however this transfer is completely independent of the failed 27A-B1X/TDDO relay.)

For Alternate Operation (bus B6 being power by bus B2), relay 27A-B1X/TDDO does not affect the transferring scheme on degraded voltage on B2. This function is achieved by relay 27A-B2X1 which was fully functional.

This condition results in relay 27-B1X/TDE not being energized on a degraded voltage condition (relays 27A-B1/1 and 27A-B1/2) on Bus B1. This de-energized condition of relay 27-B1X/TDE is confirmed by the fact that if the 3-5 contact of relay 27A-B1X was closed (welded shut) and caused relay 27-B1X/TDE to be energized, then contact 7-11 of relay 27-B1X/TDE would have tripped breaker 52-601. This breaker trip did not occur and the trip signal was not present. The B1-B2-B6 transfer scheme has been tested in the past successfully, and Bus B1 normally powers B6.

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## CAUSE OF THE EVENT

A steady resistance of 2.4 k $\Omega$  was found across relay 27A-B1X/TDDO contact 3-5 regardless if the relay was energized or de-energized. Since the relay contact was still connected to the circuit at the time of this measurement, this resistance is the circuit resistance in parallel with the contact. Therefore the relay contact is stuck open and did not change state as the relay was energized and de-energized. Relay 27A-B1X/TDDO is an Agastat Model #E7022PB004.

## ADDITIONAL CONDITIONS

Manual operation to transfer bus B6 from bus B1 to bus B2 on a B1 degraded voltage condition per PNPS procedure 2.4.B.6 "Loss of Bus B6" was available.

Also, the LPCI injection valves could be opened manually from outside the drywell and inside secondary containment to facilitate LPCI injection into the recirculation lines during a design basis event.

## CORRECTIVE ACTIONS

The Agastat time delay relay was replaced, restoring the degraded voltage protection functionality for the condition where bus B6 is being power by bus B1.

## SAFETY CONSEQUENCES

It is not clear how long the under-voltage protection for bus B6 was not operable. It is assumed it was inoperable from the last know successful operation in RFO 19.

Bus B6 supplies 480 volt vital power to the low pressure coolant injection (LPCI) valves that open to facilitate LPCI injection flow into the recirculation piping during the plant response to a postulated design basis event. The time delay Agastat relay 27A-B1X/TDDO provides degraded voltage protection for Bus B6. During a degraded voltage condition on bus B1 with normal alignment (bus B1 powering bus B6), bus B6 would not have automatically transferred to B2 as designed. This portion of the transfer scheme to transfer B6 to B2 from B1 was not operating (with contact 3-5 failed) and therefore B6 would have continued to receive power from bus B1 with degraded voltage.

At PNPS, the Residual Heat Removal (RHR) Low Pressure Coolant Injection (LPCI) system provides low-pressure high-capacity cooling water into the reactor via injection into the recirculation lines in the event of a design basis event. The Core Spray (CS) system also provides low-pressure high-capacity cooling flow directly into the reactor pressure vessel (RPV) via a sparger inside the RPV. CS is a completely redundant system to the RHR-LPCI system. Therefore, PNPS maintained the ability to provide low-pressure high-capacity flow to the RPV to mitigate design basis events. As such, the safety function was preserved. Also, the challenge to LPCI system operability was only for potential under-voltage conditions on bus B1 when bus B1 was powering bus B6 (which powers the LPCI injection valves). (Note - this applies if the Unit Auxiliary Transformer, Emergency Diesel Generators (EDG) or the Shutdown Transformer is powering bus A5. If the Start-up Transformer (SUT) is powering A5, its degraded voltage relays would trip busses A5 & A6 off of the SUT, allowing the EDG's to pick up the busses.)

|   |  |                                    |               |                      |            |         |
|---|--|------------------------------------|---------------|----------------------|------------|---------|
| NRC FORM 366A<br>(02-2014)                                |  | U.S. NUCLEAR REGULATORY COMMISSION |               |                      |            |         |
| <b>LICENSEE EVENT REPORT (LER)<br/>CONTINUATION SHEET</b> |  |                                    |               |                      |            |         |
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Also, manual actions could be taken to (1) transfer bus B6 from bus B1 over to B2, or (2) manually open the LPCI injection valves. The actual function of the RHR-LPCI pumps was not affected. Manual opening of the LPCI injection valves requires more time than automatic opening.

#### REPORTABILITY

This LER report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B) – Operation or Condition Prohibited by Technical Specifications; and 10 CFR 50.73(a)(2)(v)(B) and (D) – Condition that could have prevented the fulfillment of the Safety Function of an SSC that is needed to: (B) Remove Residual Heat, and (D) Mitigate the Consequences of an Accident.

Since the under-voltage protection for bus B6 was potentially compromised when bus B6 was powered from bus B1, this rendered the LPCI system inoperable. Technical Specification 3.5.A.3 requires the LPCI system to be OPERABLE during Run, Startup, and Hot shutdown Modes and prior to reactor startup from Cold Shutdown. As specified in the related Surveillance Requirements, LPCI OPERABILITY is contingent on motor-operated valve OPERABILITY. The LPCI system may be INOPERABLE for up to seven (7) days with certain contingent conditions in place or PNPS is to shut down. It is assumed the contact 3-5 had failed for longer than seven (7) days. Therefore this event is concluded to be a condition prohibited by Technical Specifications.

#### PREVIOUS EVENTS

A review of Pilgrim Station License Event Reports (LERs) issued since 2005 was performed. The focus of the review was to identify LERs that involved time delay relay failure and degraded voltage transfer functions. The following LERs were reviewed:

LER 2008-002-00 – Under Voltage Relay Settings on A5 4kVBus

LER 2008-004-00 - Under Voltage Relay Failure HPCI Valve Power Supply

These LERs were reviewed but did not involve similar relay types or similar relay failure mechanisms (relay settings and manufacturing defects).

#### ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIS) CODES

The EIS codes for Components and Systems referenced in this report are as follows:

Components:

Relay, time delay - 02

Systems:

Low Voltage Power - ED

#### REFERENCES:

Condition Report CR-PNP-2015-3454 - 480 Volt Bus B6 Auto Transfer Test, UV, Degraded Voltage and Timing Relays Calibration