



10 CFR § 50.73
L-2005-188

AUG 26 2005

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

Re: Turkey Point Unit 4
Docket Nos. 50-251
Reportable Event: 2005-003-00
Date of Event: June 3, 2005
Incorrectly Wired P-10 Relay Renders One of Two Inputs to P-7 Interlock Inoperable
for a Single Train of At-Power Reactor Trips

The attached Licensee Event Report 50-251/2005-003-00 is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(ii)(B).

If there are any questions, please call Mr. Walter Parker at (305) 246-6632.

Very truly yours,

A handwritten signature in black ink, appearing to read "Terry O. Jones", written in a cursive style.

Terry O. Jones
Vice President
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, USNRC, Region II
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

A handwritten signature in black ink, appearing to read "JEZZ", written in a stylized, cursive font.

LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 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 Turkey Point Unit 4	2. DOCKET NUMBER 05000251	3. PAGE 1 OF 6
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4. TITLE
Incorrectly Wired P-10 Relay Renders One of Two Inputs to P-7 Interlock Inoperable for a Single Train of At-Power Reactor Trips

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
06	3	2005	2005	- 003 -	00	08	26	2005		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE 4	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)			
10. POWER LEVEL 0	<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 checked="" 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)
	<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)	Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

NAME Paul F. Czaya – Licensing Engineer	TELEPHONE NUMBER (include Area Code) 305-246-7150
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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 <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

During under-voltage time delay relay testing on June 3, 2005, an expected change of state was not detected on certain relays associated with the B train of the reactor trip system (RTS). Investigation found the wires on relay P-10-2-B that provide one of two inputs to the P-7 relays were wired to a normally closed contact rather than a normally open contact. The incorrect wiring prevented the P-10 permissive from enabling certain reactor trips when reactor power reached 10% based on nuclear instrumentation. However, the redundant turbine first stage pressure logic enabled the trips as designed at approximately the same time. The cause was a latent human error in verifying the final configuration of the relay wiring, while the post maintenance test did not appropriately challenge the work performed. Corrective action included: 1) B RTS P-10-2 relay properly wired and post maintenance test (PMT) was satisfactory, 2) all NBFD-65NR reactor protection relays used as replacements with the potential to have a similar condition with transposed contact wiring have been verified, 3) procedure O-ADM-737, Post Maintenance Testing, will be revised to further institutionalize the requirement that all contacts are tested when relay maintenance is performed. Since reactor protection features were not affected by the incorrect wiring of the P-10-2-B relay, the health and safety of the public and plant personnel were not affected.

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

DESCRIPTION OF THE EVENT

During under-voltage time delay relay [EIIIS: RLY, 27] testing on June 3, 2005, an expected change of state was not detected on certain relays associated with the B train of the reactor trip system (RTS) [EIIIS: JC]. Investigation found that relays P-7-1-B, P-7-2-B, P-7-3-B and P-7-4-B were not in their required state. These relays should have been de-energized due to relays P-10-1-B and P-10-2-B having been de-energized. Inspection of relays P-10-1-B and P-10-2-B found that the wires on P-10-2-B, that operate the P-7 relays, were wired to a normally closed contact [EIIIS: CNTR] rather than a normally open contact.

Relay P-10-2-B had been replaced on September 13, 1997. An independent verification sheet for lifted/landed leads was completed, and before and after relay wiring diagrams were generated in accordance with the plant procedure. The wires incorrectly landed were the P-10 permissive input to the P-7 RTS interlock [EIIIS: JC, IEL]. The wires were landed on a normally closed contact instead of a normally open contact.

The 1997 P-10-2-B relay replacement was due to an apparent coil [EIIIS: CL] failure. The failed relay was a type BFD 84S, and the replacement relay is a type Nbfd65NR. These relays are similar in appearance. Relay terminals are not physically labeled. The difference between relays is the quantity and location of normally open and normally closed contacts. Diagrams are provided in the procedure to assist in identifying contact state and relay terminal designations. The wires were landed in the same position on the new relay as they were previously installed on the failed relay. However, the contact for the P-10 input to P-7 needed to be a normally open contact and the contact in that position on the new relay is normally closed. Contact differences are resolved by generating a new wiring sheet whenever relay type is changed. The wiring sheet generated was included with the work order record and was correct, showing the P-10 input to P-7 correctly wired to a normally open contact. Once the relay is installed, a procedural step verifies the replacement relay is wired in accordance with the relay diagram. This step was not completed correctly.

The incorrect wiring on Unit 4 P-10-2-B relay prevented the B RTS from having certain reactor [EIIIS: AB, RCT] trips enabled from the P-10 input when reactor power reached 10% upon startup.

After evaluation, this condition was determined to be reportable on June 27, 2005 in accordance with 10 CFR 50.73(a)(2)(ii)(B), whereupon the 60-day period for submission of this report began.

At the time of discovery of the incorrectly wired P-10 relay, Unit 4 was in Mode 4 preparing for power operation from a refueling outage.

BACKGROUND

The Low Power Reactor Trips Block P-7 interlock is actuated by input from either the Power Range Neutron Flux P-10, or the Turbine [EIIIS: TRB] First Stage Pressure interlock. The P-7 interlock ensures that (1) on increasing power, the P-7 interlock automatically enables reactor trips and, (2) on decreasing power, the P-7 interlock automatically blocks reactor trips on the following functions:

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1. High pressurizer [EIS: AB, PZR] water level
2. Low pressurizer pressure
3. Low reactor coolant flow in 2 out of 3 loops
4. Undervoltage on both 4KV buses [EIS: EB, BU]
5. Reactor coolant pump [EIS: AB, P] breaker [EIS: BKR] open on 2 out of 3 reactor coolant pumps
6. Turbine trip

CAUSE OF THE EVENT

The cause was human error in verifying the final configuration of the relay wiring in 1997. The difference in the contact configuration was initially recognized during preparation of the wiring sheet. The difference was not properly executed during termination of the wires or verification against the wiring sheet.

The wiring error was not detected prior to returning the relay to service because the post maintenance test (PMT) did not appropriately challenge the work performed.

ANALYSIS OF THE EVENT

There were potentially three missed opportunities to detect the wiring error. One opportunity was during the original installation of the replacement relay, when the relay wiring diagram was generated and then verified against the as-left configuration. Another opportunity was the PMT, when each relay function should have been verified. The third opportunity was routine surveillance tests.

The PMT should have detected the wiring error. In this case, the relay replacement was identified during troubleshooting and was not considered during the initial PMT determination. The relay replacement was added to the work scope including the PMT sheet. Satisfactory PMT was designated as "proper operation." How proper operation was determined is not documented on the PMT sheet or elsewhere within the work documentation. It may have been thought that completion of procedure 4-OSP-049.1, Reactor Protection System Logic Test, was adequate to verify that all contacts functioned correctly. That logic would have been flawed since the P-10-2 relay is operated in tandem with relay P-10-1 and the state of the tandem contact from P-10-1 can mask the operation of the contact on P-10-2.

Subsequent to replacement of relay P-10-2-B, a Condition Report (CR) in 1997 documented failure of a contact for a reactor protection relay that provides annunciator [EIS: ANN] logic for over-power delta-T (OPDT). The CR evaluation identified an inadequate PMT was performed when the OPDT relay was replaced. One corrective action was the addition of precaution 4.1.8 to procedure 0-GMI-049.1, Testing and Replacement of BFD/NBFD Relays In Reactor Protection and Safeguards Systems, which requires that all relay contact functions be verified during PMT. This PMT requirement was not in place at the time that relay P-10-2-B was replaced. The CR evaluation also suggested that a mindset might have been in place that completion of procedure 4-OSP-049.1 verified adequacy of any relay maintenance performed.

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ANALYSIS OF SAFETY SIGNIFICANCE

The incorrect wiring on Unit 4 P-10-2-B relay prevented the B RTS from having certain reactor trips enabled from the P-10 input when reactor power reached 10% upon startup. The nuclear instrument process channels were incapable of activating the P-7 permissive interlock for the B RTS. The logic for P-10 input to P-7 is 2 out of 4 channels to enable the reactor trips and 3 out of 4 channels to disable them. The P-7 interlock is also activated by turbine first stage pressure in a 1 out of 2 logic for enabling reactor trips and 2 out of 2 for disabling them. The turbine first stage pressure input to P-7 was operable during the time (since 9/1997) that the P-10 input to the B RTS was unavailable.

Although the incorrect wiring prevented the power range nuclear instruments from enabling various reactor trip functions at 10% reactor power for the B RTS, the redundant turbine first stage pressure logic enabled the trips at approximately the same time. Therefore, the B RTS P-7 interlock was functional while the P-10-2-B relay was incorrectly wired and the required reactor protective trips remained operable for the B RTS. In addition, the unaffected redundant A RTS train would have been available to initiate reactor protective trips.

Since reactor protection features were not affected by the incorrect wiring of the P-10-2-B relay, the health and safety of the public and plant personnel were not affected.

CORRECTIVE ACTIONS

1. The B RTS P-10-2 relay was wired properly and the post maintenance test was satisfactory.
2. All NBFD-65NR reactor protection relays used as replacements with the potential to have a similar condition with transposed contact wiring have been verified. No issues were identified.
3. A significant change to the relay replacement procedure had been implemented since occurrence of the incorrect wiring of P-10-2-B. The requirement to carefully consider the necessary PMT was added to the precautions of procedure 0-GMI-049.1.
4. Procedure 0-ADM-737, Post Maintenance Testing, will be revised to further institutionalize the requirement to ensure all contacts are tested when relay maintenance is performed.

ADDITIONAL INFORMATION

EIIS Codes are shown in the format [EIIS SYSTEM: IEEE system identifier, component function identifier, second component function identifier (if appropriate)].

FAILED COMPONENTS IDENTIFIED: None

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SIMILAR EVENTS: Two other events were discovered during the recent Unit 4 refueling outage that involved incorrectly wired relays. In each of these cases, the incorrect wiring occurred during the initial installation of modifications performed in the late 1970s and in 1991. These events are similar in that proper relay operation was not verified. These events did not prevent any safety function from occurring and were not reportable. All events were discovered as a result of enhanced testing procedures Turkey Point is currently employing.