



Portland General Electric Company
Trojan Nuclear Plant
71760 Columbia River Hwy.
Rainier, Oregon 97048
(503) 556-3713

December 17, 1990
WRR-177-90

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

Gentlemen:

Licensee Event Report No. 90-45 is attached. This report discusses an event in which it was discovered that the Emergency Diesel Generator output breaker decouple switch was inoperable because of a wiring design error.

Sincerely,

W. R. Robinson
General Manager
Trojan Nuclear Plant

c: Mr. John B. Martin
Regional Administrator, Region V
U.S. Nuclear Regulatory Commission

Mr. David Stewart-Smith
State of Oregon
Department of Energy

Mr. R. C. Barr
USNRC Resident Inspector
Trojan Nuclear Plant

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555 AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, DC 20503

FACILITY NAME (1) Trojan Nuclear Plant DOCKET NUMBER (2) 0 5 0 0 0 3 4 4 1 OF 0 7 PAGE (3)

TITLE (4) Wiring Design Error and Inadequate Post Installation Testing Result in Emergency Diesel Generator Output Breaker Decouple Switch Inoperability

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)
11	16	90	90	045	00	12	17	90	NA		0 5 0 0 0
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OPERATING MODE (9) 1 THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)

20.402(b)	20.405(e)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(ii)	50.35(a)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(iii)	50.35(a)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iv)	X 50.73(a)(2)(iii)	50.73(a)(2)(viii)(A)	
20.405(a)(1)(v)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(vi)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12) NAME E. W. Ford, Compliance Engineer TELEPHONE NUMBER 5 D 13 5 5 6 - 5 5 7 7 AREA CODE

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS
NA									

SUPPLEMENTAL REPORT EXPECTED (14) YES (If yes, complete EXPECTED SUBMISSION DATE) X NO EXPECTED SUBMISSION DATE (15)

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

On November 16, 1990 the Trojan Nuclear Plant was operating at 100 percent Rated Thermal Power. Post maintenance testing on a relay that had been replaced in the "B" Emergency Diesel Generator output breaker decouple circuit was in progress. The post maintenance testing could not be completed because of a wiring error in the decouple circuit. The wiring error would have prevented switching to a normally disconnected power supply for the breaker controls if the normal fuses were blown during a Control Room or cable spreading room fire. This event was determined to be caused by personnel error in design of the circuit. Inadequate testing following installation of the decouple circuit and inadequate surveillance procedures also contributed to this event. The wiring error was corrected and the decouple switch was returned to Operable status at 0240 on November 22, 1990. The post installation testing of the remaining decouple circuits will be reviewed to determine if the testing was adequate to demonstrate circuit design functions. Circuits which were not adequately tested will have full functional testing performed. Surveillance procedures will be upgraded to assure they adequately demonstrate decouple circuit functions. Since the time this error occurred (1986), procedures which control the design, design change and post modification testing processes have also been strengthened.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (if more space is required, use additional NRC Form 366A's) (17)

BACKGROUND

Item 1: On March 21, 1984, IE Information Notice 84-20 was issued by the Nuclear Regulatory Commission. This Information Notice provided details regarding earlier than anticipated failure of Agastat GP series and GTE Sylvania AC relays when used in continuously energized applications. Review of this Information Notice under the Trojan Operating Experience Program was completed in May, 1985. At that time there were no Agastat series GP or GTE Sylvania AC relays installed in safety related applications at Trojan. No additional corrective actions were taken.

Item 2: On July 6, 1990, Portland General Electric Company submitted Licensee Event Report 90-21 which discussed an event in which it was determined that surveillance testing of relays in the Emergency Diesel Generator output breaker decouple circuit was not being adequately performed. It was found that the surveillance did not assure that both of two relays which were wired in parallel in the circuit were functioning. The surveillance procedure was revised to assure that the function of both relays was demonstrated. An additional corrective action was assigned to have other decouple circuits reviewed by November 30, 1990, to determine whether similar situations existed. The review was completed on November 30, 1990. Five situations, in which the function of relays in other decouple circuits was not being adequately demonstrated during routine surveillance, were identified. In addition to these findings, on November 16, 1990, a design wiring error was identified in the decouple circuit for the Emergency Diesel Generator output breaker. This report discusses the circumstances surrounding the design wiring error, but the corrective actions discussed in this report will also apply to the inadequacy of the decouple switch surveillance procedures originally identified in Licensee Event Report 90-21.

EVENT DESCRIPTION

On November 15, 1990, the Trojan Nuclear Plant was in Mode 1 (Power Operation) at 100 percent Rated Thermal Power. The generator load was approximately 1150 MW. At 1930, the Control Room was notified that three Agastat series EGP control relays had been in service for a period in excess of what the manufacturer considers to be their reliable life. This discovery was made as a result of a review of recent industry operating experience through the Trojan Operating Experience Review Program. Two of the relays (LOPR-49A and LOPR-49B) were in the Solid State Protection System (SSPS). Their function is to indicate a loss of power to the SSPS input bay via the General Warning annunciator. In response to this

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condition, administrative controls were established which required the operators to periodically monitor the status of the SSPS power supplies until replacement of the relays was completed on November 26, 1990.

The other affected relay (143-208R2) was in the decouple circuit for the "B" Emergency Diesel Generator output breaker. In response to this condition, a continuous fire watch was established in the cable spreading room in accordance with Trojan Technical Specification 3.3.3.8, Instrumentation - Decouple Switches, as a compensatory measure. A Maintenance Request was prepared, and the relay was replaced. On November 16, 1990 post maintenance testing on this relay was being completed. At 2030, the Shift Supervisor was notified that the post maintenance testing could not be completed as specified because there was a wiring error in the decouple circuit. The decouple switch was declared inoperable because of this condition and the fire watch remained stationed in the cable spreading room.

Decouple switches are installed in the control circuits for various plant components which are required to operate following a fire in the Control Room or cable spreading room. Their function is to remove portions of the component control circuits, which pass through the Control Room or cable spreading room, from the remainder of the circuit. This is to assure that the components will remain functional, and can be operated locally, regardless of circuit damage caused by a fire in the Control Room or cable spreading room.

The decouple switch which is the subject of this report has an additional function to provide an alternate source of control power to the Emergency Diesel Generator output breaker. This is accomplished by switching a normally disconnected fuse into the breaker control circuit to supply power when the decouple switch is used. This portion of the decouple switch circuit was incorrectly wired, and would not have assured a source of control power to the breaker if the normal supply was lost. The decouple function of the switch was not affected.

Trojan Technical Specification 3.3.3.8 requires the plant decouple switches to be Operable whenever the equipment they are associated with is required to be Operable. The wiring error discovered on November 16, 1990 has existed since installation of the decouple switch in 1986. The error made the switch incapable of performing one of its design functions. Therefore, the decouple switch had been inoperable since it was installed. Plant operation with an inoperable decouple switch is considered to be a condition which is prohibited by the Technical Specifications, and is reportable under

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the requirements of 10 CFR 50.73 (a)(2)(i)(B). This report is submitted to fulfill those requirements.

CAUSE

This event was determined to be caused by personnel error in design of the circuit. The error occurred when a Field Change Notice was issued to revise the originally designed location of the relay in the decouple circuit. The wiring change issued with the Field Change Notice was incomplete and left a jumper connected to the wrong terminal on one relay. An additional error was made in that the wiring deficiencies were not detected during an independent review of the Field Change Notice.

A contributing cause to this event was inadequate testing following installation of the decouple circuit. The post installation testing associated with this decouple circuit did not adequately simulate the conditions under which the circuit is required to function, and failed to detect the wiring error. Specifically, the fuses in the lines which normally supply power to the Emergency Diesel Generator output breaker controls should have been removed as part of the test. This would simulate a disruption of these lines such as that which could occur during a fire. This type of testing was not done.

The routine surveillance of the decouple switch also did not detect this wiring error. The surveillance designated by the decouple switch Technical Specification requires verifying that the equipment connected to the decouple switches will start when in the decoupled mode and that a control room alarm is received when the switches are placed in the decouple position. Although the surveillance procedures associated with the decouple switches met the literal requirements of the Technical Specifications, they were not adequate to demonstrate full functional capability of the decouple circuits.

CORRECTIVE ACTIONS

The decouple switch was declared inoperable on November 16, 1990, when the wiring error was discovered. A (previously established) fire watch was verified to be in place in the cable spreading room in accordance with the requirements of Technical Specification 3.3.3.8. A Plant Modification Request was written to have the decouple circuit wiring error corrected. The modification and post maintenance testing were completed and the decouple switch was returned to an Operable status at 0240 on November 22, 1990.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-830), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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Since the time this error occurred (1986), procedures which control the design, design change and post modification testing processes have been strengthened. There are now requirements that all Field Change Notices receive an independent review which is documented in a Design Review Report. There is a checklist available to use when preparing the Design Review Report. The checklist addresses the adequacy of post installation test requirements, and the development of acceptance criteria in design documents so that satisfaction of design requirements can be verified. The procedure will be further strengthened to require use of the checklist during the review of Field Change Notices. This procedure revision will be completed by January 15, 1991.

With regard to post modification testing, Plant Systems Engineering Procedure 20-7, Review of Design Document, now requires the system engineer and the design engineer to review the post modification testing procedures and results to determine that all components affected by modification work are adequately tested with satisfactory results. The procedure further requires that Field Change Notices be reviewed to determine, among other items, that testing guidance has been provided to cover the change.

The procedural improvements discussed in the paragraphs above will reduce the likelihood that design errors will occur or remain undetected in post modification testing.

The details of this event will be the subject of a special training session for both the Nuclear Plant Engineering and Plant Systems Engineering Departments' management and supervision. The training will stress the importance of assuring that plant design packages are correct, performing careful and thorough independent reviews and the need to ensure that post installation and surveillance testing adequately test system functions. This training will be completed by January 15, 1991.

Portland General Electric Company will conduct a review to determine whether the post installation testing of the remaining decouple circuits was adequate to demonstrate their design functions. Circuits which were not adequately tested will have full functional testing performed. Appropriate surveillance procedures will also be upgraded to ensure that they test the required components within the circuits and adequately demonstrate the functional capabilities of the decouple switches. These corrective actions will be completed by the end of the 1991 refueling outage. This corrective action is also intended to apply to the decouple switch surveillance deficiencies identified in Licensee Event Report 90-21.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 80.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-830), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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The compensatory measures required by Technical Specification 3.3.3.8 for inoperable decouple switches will remain in effect until the decouple circuits have been verified to be operating properly.

Since it was found that Agastat series EGP relays had been installed in safety-related circuits subsequent to the Operating Experience Review Program review of IE Information Notice 84-20, an additional corrective action will be taken to investigate how this occurred without application of a component service life specification. This investigation will be completed by April 15, 1991.

SAFETY SIGNIFICANCE

The wiring error described in this report would have only affected the ability to electrically close the Emergency Diesel Generator output breaker if the normal power supply fuses were lost due to a fire. The error did not preclude the ability to manually close the breaker, nor did it affect the circuit's decouple function. The Trojan Emergency Fire Procedure instructs the operator to manually close the breaker if it fails to operate normally. The need to manually close the breaker could add a delay (estimated to be four minutes) in restoring plant power during a Control Room or cable spreading room fire. The Trojan Nuclear Plant 10 CFR 50, Appendix R alternative shutdown analysis contains a requirement to establish Reactor Coolant System makeup flow within 13 minutes after its loss to ensure pressurizer level stays on scale. The 13 minute requirement is based upon a calculation which assumed that the reactor was initially at full power, the pressurizer level was 61.5 percent, Reactor Coolant Pump seal leakage rate of 3 gpm/seal for 10 minutes and 21.1 gpm/seal thereafter, and the pressurizer power operated relief valve spuriously opened for 3 minutes. According to another calculation related to the Trojan 10 CFR 50, Appendix R analysis, the time required to establish makeup flow is 12.1 minutes. This calculation did not assume manual operation of the Emergency Diesel Generator output breaker was required. Therefore, this wiring error could have affected ability to establish Reactor Coolant System makeup flow in time to maintain pressurizer level on scale during a Control Room or cable spreading room fire under the assumptions listed above. Although this could make Reactor Coolant System pressure control more difficult, it would not have precluded the ability to safely shut the plant down. The Emergency Fire Procedures direct the operators to establish stable plant conditions following a Control Room or cable spreading room fire. One of the parameters indicating stable plant conditions is pressurizer level. The operators are instructed to maintain the

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level between 17 and 30 percent, with a follow on instruction to throttle charging flow to obtain that level if it is not present. The wiring error had no effect upon operation of the Emergency Diesel Generator output breaker during other normal or emergency plant operations. There were no plant fires which required the use of alternate shutdown capabilities. Therefore, this event had no effect upon the health and safety of the public.

PREVIOUS SIMILAR EVENTS

Three previous similar events were identified. Each of these events is briefly described below.

Licensee Event Report 89-09: This report described an event in which it was discovered that the Residual Heat Removal System suction isolation valves did not automatically close upon receipt of a signal indicating Reactor Coolant System Pressure is greater than 600 psig. The cause of this event was determined to be an original plant wiring error in a connector plug which was corrected, but not documented in plant drawings. During the 1988 refueling outage the control system for these valves was modified and the wiring was restored in accordance with the plant drawings. Because of its limited scope, the post installation testing of the 1988 modification did not detect that the original wiring error which was re-introduced when the system was restored in accordance with the plant drawings.

Licensee Event Report 89-30: This report described a condition in which it was discovered that the response time of the Control Room Ventilation System chlorine detectors did not meet the assumptions of the plant toxic gas analysis. The cause of this event was determined to be a failure to specify the response time in the system design which led to a failure to perform a response time test during manufacturer or start-up testing.

Licensee Event Report 90-21: This report described an event in which it was determined that surveillance testing of relays in the Emergency Diesel Generator output breaker decouple circuit was not being adequately performed. The cause of this event was attributed to an inadequate surveillance procedure and the design configuration of the relays in the circuit. (This was the same decouple circuit which is the subject of this report.) The corrective actions taken for this event addressed the failure of the procedure to adequately test all of the components in the decouple circuit. Now that the design wiring error has been discovered, the scope of the corrective actions have been expanded to also assure that the circuit function is adequately demonstrated during routine surveillance testing.