

APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Inspection Report: 50-323/94-28

License: DPR-82

Licensee: Pacific Gas and Electric Company
77 Beale Street, Room 1451.
P.O. Box 770000
San Francisco, California

Facility Name: Diablo Canyon Nuclear Power Plant, Unit 2

Inspection At: Diablo Canyon Site, San Luis Obispo County, California

Inspection Conducted: October 19-28, 1994

Inspector: M. Tschiltz, Resident Inspector

Approved: _____

D. Kirsch
D. Kirsch, Chief, Reactor Projects Branch E

11/7/94
Date

Inspection Summary

Areas Inspected (Unit 2): A special inspection of the circumstances associated with the loss of residual heat removal (RHR) cooling during diesel generator (DG) testing on October 18, 1994. During the inspection, Inspection Procedures 92901 and 92703 were used.

Areas Inspected (Unit 1): No inspection of Unit 1 was performed.

Results (Unit 2):

On October 18, 1994, during DG surveillance testing, the failure of licensee personnel to follow the procedural requirements resulted in the inadvertent shutdown of the RHR pump providing cooling to the core. After a period of approximately 6 minutes the control operator noted that the running RHR pump had been de-energized during the testing and restarted the RHR pump. Prior to de-energizing Bus H, there were two separate steps in the procedure which, if performed properly, would have identified that RHR Pump 2-2 should not be in operation during the testing which de-energized 4 kv Bus H. Additionally, a note in the procedure should have alerted operators to the fact that RHR Pump 2-2 should not be in service to support any critical plant operations during the testing.



Plant Operations

Weaknesses:

- The inspection identified two instances of operator failure to follow surveillance procedure requirements which resulted in the loss of RHR cooling flow through the core.
- A detailed tailboard was not conducted prior to performing the surveillance. Neither the shift foreman nor shift supervisor were involved with the discussion of DG testing. The tailboard conducted by the operator and system engineer did not meet management expectations for integrated plant testing.
- The shift foreman did not provide adequate oversight of testing which had the potential to impact core cooling. The level of involvement by the shift foreman did not meet management expectations for integrated plant testing.
- The control operator failed to adequately consider the effect of the surveillance test on core cooling. A visual examination of the control boards to identify components that would be de-energized during the surveillance test failed to identify that RHR Pump 2-2 was in operation.

Results (Unit 1): Not applicable.

Summary of Inspection Findings:

- Violation 323/94-28-01 was identified (Section 2).

Attachment:

- Attachment 1 - Persons Contacted and Exit Meeting
- Attachment 2 - Acronyms.



DETAILS

1 BACKGROUND

At the time of the Diablo Canyon Unit 2 loss of RHR cooling, on October 18, 1994, the unit was in Mode 5 with a reactor coolant system temperature of 96°F. The unit was in the 25th day of Refueling Outage 2R6. Core reload was complete and both trains of RHR were available. RHR Pump 2-2 was running and powered from 4 kv Bus H. DG surveillance testing was being performed that required vital 4 kv Bus H to be de-energized. RHR Pump 2-2 was improperly left in service during this testing. When power to 4 kv Bus H was secured, per the surveillance, DG 2-2 autostarted and aligned to re-energize 4 kv Bus H; however, as expected for the autoloading feature under test, the RHR pump did not autoloading back onto the 4 kv bus. The de-energization of RHR Pump 2-2 resulted in the loss of core cooling. The loss of RHR flow was noted by the control operator approximately 6 minutes after the pump was de-energized, at which point RHR Pump 2-2 was restarted. During the interruption of core cooling core temperature increased approximately 6°F from 96 to 102°F. The licensee made a 4-hour nonemergency report regarding this event to the NRC in accordance with 10 CFR 50.72(b)(2)(iii)(B).

2 DG SURVEILLANCE TESTING

2.1 DG 2-2 Autostart and Load Transfer Testing

On the evening of October 18, 1994, DG 2-2 testing per Surveillance Test Procedure STP M-9G, Revision 18, "Diesel Generator 24-Hour Load Test," was performed which involved the demonstration of autostart and load transfer functions. The autostart portion of the test involved running DG 2-2 at full load for 1 hour or until operating temperature stabilized, unloading and securing the DG, opening the auxiliary power feeder breaker supplying the 4 kv bus associated with the DG being tested, and verifying that the DG autostarted and loaded onto the bus within 10 seconds. The load transfer portion of the test verified that breakers for 4 kv auto-connected loads closed onto the bus after the DG breaker closed.

A licensed operator was assigned to operate and align equipment per STP M-9G, as required, during the test. A system engineer was assigned to the testing team to provide technical guidance if required during testing. Control room equipment alignments, required during the performance of STP M-9G, were accomplished by the licensed operator with the surveillance procedure in hand. Changes in equipment lineups were communicated to the control operator.

In preparation for the autostart auto load test portion of STP M-9G, the procedure specified alignment of Vital Bus H equipment. Systems and components affected by the loss of 4 kv Bus H power were required to be realigned, prior to de-energizing the bus, to ensure the test did not adversely impact plant operation. Step 12.3.1.e.4, stated, in part, that "The following equipment will not autostart in this test and must be shut down: a)



RHR Pump No. 2 b) Containment Spray Pump No. 2 c) SIS Pump No. 2." This step was initialed by the operator as complete in error, since the RHR pump was not secured. Immediately following Step 12.3.1.e.4, the procedure contained a note which explains that these 4 kv bus H loads are secured because the load shed signal, which is generated during the test, will trip the breakers supplying power to the pumps if they are in service. The note additionally cautioned that "if the autotransfer signal cannot be reset these pumps can not be manually restarted" and concludes with the statement that "these pumps should not be in service to support any critical plant operations."

At a subsequent point in the procedure, prior to securing the power to 4 kv Bus H, Step 12.3.2.g.1 required that a review be performed to verify that the equipment lost due to the transfer will not place the plant in a Technical Specification (TS) action statement. The step was initialed as being completed by the operator; however, the operator did not identify that the operating RHR pump was powered from 4 kv Bus H and that securing power to 4 kv Bus H would result in the entry into TS 3.4.1.4.1 action statement. TS 3.4.1.4.1 requires that one RHR train be operable and in operation when in Mode 5 with the reactor coolant loops filled.

Prior to securing the auxiliary power feed to the bus, the control operator discussed the sequence of events from de-energizing the bus to the autostarting of the loads with the operator. The shift foreman was informed when the portion of the test which de-energized the bus commenced. The control operator scanned the control board to determine which loads would be lost during the transfer. During the scan, the control operator did not identify that the running RHR pump would be stripped from the bus during testing. Caution tags were hanging on the control board which obscured the control operator's view of color coded labeling indicating equipment power sources; however, the tags did not obscure RHR Pump 2-2 running light indication. The control operator did not recognize that the running RHR pump would be affected by the surveillance.

Conclusion

The two instances where the operator failed to follow the instruction of the surveillance test procedure, STP M-9G, are examples of failure to follow procedural requirements and are a violation of TS 6.8.1. TS 6.8.1 requires that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, including procedures covering the performance of surveillance tests on emergency power systems (Violation 323/9428-01).

2.2 Tailboard and Supervision Involvement

During the previous performance of STP M-9G for DG 2-2 on October 17, 1994, DG 2-2 failed to meet the acceptance criteria for time to hot restart and load onto the bus. The actual time for this portion of the testing was greater than 10 seconds, which is the maximum allowable per the surveillance procedure. The licensee's preliminary review of the conditions in effect



during the test indicated that the failure to meet the test criteria was related to the slow rate of voltage decrease following the opening of the auxiliary feeder breaker. NRC review of the initial failure of DG 2-2 to meet the acceptance criteria will be documented in NRC Inspection Report 50-323/94-27.

On October 18, 1994, the shift foreman made the decision to not conduct a tailboard for the STP M-9G testing scheduled for the evening of October 18, 1994. This decision was based on the shift foreman's assessment that the involved system engineer and operator familiarity with STP M-9G was acceptable, in part, because portions of STP M-9G had been performed by the operators and the system engineer the previous day. Neither the shift foreman or the senior control operator were directly involved with supervision or oversight of the STP M-9G testing prior to commencing the testing which resulted in de-energizing the running RHR pump. The shift foreman relied upon the system engineer to conduct the test with the operator. The system engineer and the operator did review portions of the test procedure together prior to performing the test. The review included a basic overview of the sequence of the test and DG limitations. The control operator participated in a portion of the test review for the discussion of the electrical loads which would be de-energized during the test and the loads which would autoloading onto 4 kv Bus H. During this review the system engineer explained that all Bus H loads would initially be de-energized during the test. The operator's primary concern was the 480 volt loads which were to be de-energized and the loads which were to autoloading onto the bus during the test.

Conclusion

The decision of the shift foreman to not be involved with critical portions of the testing involving de-energizing Bus H was not in accordance with management expectations for integrated plant testing. Additionally, the decision that a formal tailboard for the DG testing was not required was not in accordance with management expectations for the conduct of tailboards. As a result of these problems, licensee management has initiated actions to reinforce expectations for the conduct and content of tailboards.

2.3 System Engineer Involvement with Surveillance Testing

The authority and responsibilities of the system engineer during the surveillance test were not clearly understood. Personnel involved with the test had differing views of the system engineer's role during the test. The system engineer role in the performance of testing is defined in licensee administrative Procedure AD13.ID1, Revision 1A, "Conduct of Plant Equipment Tests," paragraph 5.4.3, which states, "if technical guidance of testing activities is needed, the person in charge of the test should contact the appropriate System Engineer or the procedure's sponsor."



Conclusion

There is not a clear definition or understanding of system engineer responsibilities during system testing. The involvement of system engineers with surveillance testing has increased with the shortened outage periods. The NRC views the increased involvement of the system engineer as a strength of the outage testing program; however, increased system engineer involvement without clear definition of system engineer responsibilities during the conduct of testing creates an increased potential for errors in communications. The licensee is reviewing the need for more clearly establishing the role of the system engineer during the conduct of testing.



ATTACHMENT 1

1 PERSONS CONTACTED

1.1 Licensee Personnel

- G. M. Rueger, Senior Vice President and General Manager, Nuclear Power Generation Business Unit
- J. D. Townsend, Vice President, Nuclear Technical Services
- *W. H. Fujimoto, Vice President and Plant Manager, Diablo Canyon Operations
- R. P. Powers, Manager, Nuclear Quality Services
- *M. J. Angus, Manager, Nuclear Technical Services
- D. B. Barkley, Shift Foreman, Operations
- S. Bednarz, System Engineer, Systems Engineering
- *C. C. Belmont, Auditor, Quality Assurance
- *B. J. Berndt, Engineer, Regulatory Compliance
- *T. L. Grebel, Supervisor, Regulatory Compliance
- *W. G. Crockett, Manager, Technical and Support Services
- *S. R. Fridley, Director, Operations
- C. M. Harvey, Control Operator, Operations
- *J. R. Hinds, Director, Nuclear Safety Engineering
- *K. A. Hubbard, Engineer, Regulatory Compliance
- M. S. Lemke, Shift Supervisor, Operations
- *D. B. Miklush, Manager, Operations Services
- *D. H. Oatley, Director, Materials Services
- *R. Ortega, System Engineer, Systems Engineering
- *J. L. Portney, System Engineer, Systems Engineering
- J. B. Whetsler, Nuclear Operator, Operations

1.2 NRC Personnel

- *M. Tschiltz, Resident Inspector

*Denotes those attending the exit meeting November 2, 1994.

In addition to the personnel listed above, the inspectors contacted other personnel during this inspection period.

2 EXIT MEETING

An exit meeting was conducted on November 2, 1994. During this meeting, the inspectors reviewed the scope and findings of the report. The licensee acknowledged the inspection findings documented in this report. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.



ATTACHMENT 2

ACRONYMS

DG	Diesel Generator
KV	Kilo-volt
RHR	residual heat removal
TS	Technical Specification
STP	surveillance test procedure

