DIABLO CANYON UNITS 1 & 2

DOCKET NO. 50-275 AND 323

SAFETY EVALUATION

GENERIC LETTER 83-28, ITEM 4.3

REACTOR TRIP BREAKER AUTOMATIC SHUNT TRIP

1.0 INTRODUCTION AND SUMMARY

Generic Letter 83-28 was issued by the NRC on July 8, 1983 indicating actions to be taken by licensees based on the generic implication of the Salem ATWS events. Item 4.3 of the generic letter requires that modifications be made to improve the reliability of the reactor trip system by implementation of an automatic actuation of the shunt attachment on the reactor trip breakers. The staff identified in its August 3, 1983, safety evaluation report of the generic Westinghouse design certain plant specific requests for information. By letter dated December 20, 1983, Pacific Gas and Electric Company (PG&E) provided responses to the plant specific questions. The staff has reviewed the licensee's proposed design for the automatic actuation of the reactor trip breaker shunt trip attachments and finds it acceptable. The staff evaluation is presented below.

2.0 EVALUATION

In response to the staff requests for plant specific information regarding the Westinghouse Owners Group (WOG) proposed generic design of the modification of the reactor trip breaker automatic shunt trip the licensee provided the information as described below. The staff requests and its evaluation of the information are presented below.

2.1 Provide the electrical schematic/elementary diagrams for the reactor trip and bypass breakers showing the undervoltage and shunt coil actuation circuits as well as the breaker control (e.g., closing) circuits, and circuits providing breaker status information/alarms to the control room.

The licensee provided the electrical schematic diagrams for the reactor trip and bypass breakers showing the undervoltage and the shunt trip circuits. The design of the electrical circuits have been reviewed and found to be consistent with the WOG generic proposed design which was previously reviewed and approved by the staff. We find this is acceptable.

2.2 Identify the power sources for the shunt trip coils. Verify that they are Class 1E and that all components providing power to the shunt trip circuitry are Class 1E and that any faults within non-class 1E circuitry will not degrade the shunt trip function. Describe the annunciation/indication provided in the control room upon loss of power to the shunt trip circuits. Also describe the overvoltage protection and/or alarms provided to prevent or alert the operator(s) to an overvoltage condition that could affect both the UV coil and the parallel shunt trip actuation relay.

Redundant Class 1E power sources are used for the shunt trip actuation of the reactor trip breakers and for the shunt trip of the bypass breakers. The additional shunt trip circuitry is powered from the reactor protection system regulated supply (48 Vdc). Class 1E circuitry is separated from non-1E circuitry. Therefore, a fault within non-Class 1E circuitry will not degrade the shunt trip function. This is in accordance with Regulatory Guide 1.75 and is, therefore, acceptable.

The breaker position status lights are used to supervise the availability of power to the shunt trip circuits. The red light which is connected in series with the shunt coil and the "a" auxiliary contact indicates that the breaker is closed and also indicates that the power is available to the shunt trip device and, therefore provides detectability of power failure to the shunt trip coil. A red indicating light (non-Class 1E) failure will not impact the shunt trip coil function. If the breaker is closed, the green light is off and the red light is on. If the red light goes out with the green light remaining off, either a power loss to the shunt trip coil or a burned out bulb would be indicated. Normally closed auxiliary switch contact of each breaker provides annunciation when the breaker trips. Also, normally open auxiliary switch contact of each breaker provides breaker status information to the plant computer.

Normally the shunt trip coils in the reactor trip breakers are in de-energized condition. When the trip breakers are closed, the red lamp current (approximately 50 ma) flows through the trip coil to monitor the circuit continuity which is not large enough to actuate the trip coil armature. Since the current through the shunt trip coils is interrupted when the breaker trips, energization of the shunt trip coil is only momentary. The maximum available voltage occurs during a battery equalizing charge at a maximum voltage of 115% of the nominal voltage. Due to the short duty cycle of the shunt trip coil, it can operate at this overvoltage condition without harmful effects.

The added shunt trip circuitry is powered from the reactor protection logic voltage supply (48 Vdc). Components in the added shunt trip circuitry have been selected based on their ability to perform their intended function up to 115% of nominal voltage. The reactor protection logic voltage is regulated with overvoltage protection set at 115% of nominal voltage.

Based on our review of the information provided by the licensee, we conclude that appropriate consideration has been given to the aspects of the design described above and the design is, therefore, acceptable.

2.3 Verify that the relays added for the automatic shunt trip function are within the capacity of their associated power supplies and that the relay contacts are adequately sized to accomplish the shunt trip function. If the added relays are other than the Potter & Brumfield MDR series relays (P/N 2383A38 or P/N 955655) recommended by Westinghouse, provide a description of the relays and their design specifications.

The added relays specified by Westinghouse for the automatic shunt trip function are the Potter and Brumfield MDR series relays (P/N 2383A38 for 125 Vdc or P/N 955655 for 48 Vdc). The licensee ordered MDR 5134 relays directly from Potter-Brumfield which are the same as Westinghouse P/N 955655. Westinghouse has verified that the relay contacts are adequately sized for the shunt trip function and are within the capacity of their associated power supplies. We find this is acceptable.

2.4 State whether the test procedure/sequence used to independently verify operability of the undervoltage and shunt trip devices in response to an automatic reactor trip signal is identical to the test procedure proposed by the Westinghouse Owners Group (WOG). Identify any differences between the WOG test procedure and the test procedure to be used and provide the rationale/justification for these differences.

The licensee plans to implement a test procedure that is functionally similar to the WOG proposed procedure. The staff will require that the test procedure be provided for staff review when it is available. However, this matter need not delay implementation of the proposed modification and is subject to subsequent staff review.

2.5 Verify that the circuitry used to implement the automatic shunt trip function is Class 1E (safety related), and that the procurement, installation, operation, testing and maintenance of this circuitry will be in accordance with the quality assurance criteria set forth in Appendix B to 10 CFR Part 50.

The licensee confirmed that the circuitry used to implement the automatic shunt trip function is Class 1E (safety related) and the procurement, installation, operation, testing and maintenance of this circuitry will be in accordance with the quality assurance criteria set forth in Appendix B to 10 CFR Part 50. We find this is acceptable.

2.6 Verify that the shunt trip attachments and associated circuitry are/will be seismically qualified (i.e., be demonstrated to be operable during and after a seismic event) in accordance with the provisions of Regulatory Guide 1.100, Revision 1 which endorses IEEE Standard 344, and that all non-safety related circuitry/components in physical proximity to or associated with the automatic shunt trip function will not degrade this function during or after a seismic event.

The licensee notes that WOG is performing seismic qualification tests to demonstrate operability of the shunt trip in accordance with the provisions of Regulatory Guide 1.100 Revision 1 which endorses IEEE Standard 384. These tests will be performed on a generic system and will encompass the Diablo Canyon features. We find this commitment to be acceptable.

2.7 Verify that the components used to accomplish the automatic shunt trip function are designed for the environment where they are located.

The licensee notes that the components used to accomplish the automatic shunt trip function are designed for the environment where they are located. We find this is acceptable.

2.8 Describe the physical separation provided between the circuits used to manually initiate the shunt trip attachments of the redundant reactor trip breakers. If physical separation is not maintained between these circuits, demonstrate that faults within these circuits cannot degrade both redundant trains.

The licensee confirmed that physical separation is maintained between redundant trains in the main control board, reactor trip switchgear and reactor protection logic for the shunt trip circuitry. The reactor trip switches on the main control board have barriers to separate redundant train switch contact decks. Shunt trip attachments interposing relays and their associated terminal blocks are mounted in separate metal enclosures. The reactor protection logic outputs for energizing the shunt trip interposing relays are housed in existing separate metal enclosures. Physical separation for field cabling between the redundant trains is maintained. We find this meets the requirement of Regulatory Guide 1.75 and is, therefore, acceptable.

2.9 Verify that the operability of the control room manual reactor trip switch contacts and wiring will be adequately tested prior to startup after each refueling outage. Verify that the test procedure used will not involve installing jumpers, lifting leads, or pulling fuses and identify any deviations from the WOG procedure. Permanently installed test connections (i.e., to allow connection of a voltmeter) are acceptable.

The licensee provided a copy of the test procedure used to verify the operability of the manual trip function. The procedures include the use of jumpers to defeat the action of the undervoltage trip attachment to independently verify the operability of the shunt trip attachment. The continuity of the manual reactor trip circuits could be verified by voltage measurements at the terminal blocks for the reactor trip breakers. Since this testing could be performed in a manner which would not require the use of jumpers, we find that the existing procedure is unacceptable. The staff requires that the procedure be modified such that the use of jumpers will not be required to permit verification of the manual trip circuits. The revised procedure should be submitted for staff review.

2.10 Verify that each bypass breaker will be tested to demonstrate its operability prior to placing it into service for reactor trip breaker testing.

The licensee has described the procedure for testing the trip breakers in the FSAR. The bypass breaker is closed and tripped to verify its operation. After its operability is verified it can be reclosed, and the reactor trip breakers of the same train can be tested. This is acceptable.

2.11 Verify that the test procedure used to determine reactor trip breaker operability will also demonstrate proper operation of the associated control room indication/ annunciation.

The licensee notes that the existing test procedures used to determine reactor trip breaker operability also demonstrates proper operation of the associated control room indication/annunciation. The red light indicates that the breaker is closed and the green light indicates that the breaker is open. We find this is acceptable.

2.12 Verify that the response time of the automatic shunt trip feature will be tested periodically and shown to be less than or equal to that assumed in the FSAR analyses or that specified in the technical specifications.

The licensee has not committed to perform the periodic time response testing of the automatic shunt trip feature at this time but will re-evaluate following life cycle testing under a WOG program. The staff will review this matter following completion of life cycle testing program.

2.13 Propose technical specification changes to require periodic testing of the undervoltage and shunt trip functions and the manual reactor trip switch contacts and wiring.

The licensee notes that a technical specification change request will be submitted incorporating the required testing of the reactor trip function. We find this commitment to be acceptable.

3.0 CONCLUSION

Based on the review of the licensee's response to the plant specific information requests identified in the staff's evaluation of the Owner's Group generic design modifications, we find the modifications acceptable with the following conditions:

a) Submission of test procedure used to independently verify operability of the undervoltage and shunt trip device as identified in item 2.4.

b) Confirmation of the seismic qualifications of shunt trip attachments and associated circuitry as identified in item 2.6.

c) Submission of revised test procedure for manual reactor trip testing as identified in item 2.9.

d) Submission of results of life cycle test program and conclusion on the need for tests as defined in item 2.12.

e) Submission of the proposed technical specification changes to require periodic testing of the undervoltage and shunt trip functions, the manual reactor trip switch contacts and associated wiring as defined in item 2.13.

The licensee shall provide, prior to exceeding 5 percent of rated power, a schedule for responding to items a through d. Finally, the staff concludes that the proposed modifications shall be implemented and proposed technical specifications (item e above) shall be provided for each unit prior to exceeding the 5 percent power level.