ENCLOSURE

SAFETY EVALUATION REPORT

DOCKET NO. 50-483

CALLAWAY UNIT 1

GENERIC LETTER 83-28, ITEM 4.3

REACTOR TRIP BREAKER AUTOMATIC SHUNT TRIP

INTRODUCTION AND SUMMARY

Generic Letter 83-28 was issued by 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. By letter dated June 14, 1983 the Westinghouse Owners Group (WOG) proposed a generic design modification to implement the automatic shunt trip. By letter dated March 12, 1984, the licensee, Union Electric Company, submitted its design for this modification which is based on the WOG generic design proposal. 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 licensee has not specified the implementation date for these modifications.

EVALUATION

The following required plant specific information items were identified based on the staff's review of the WOG proposed generic design for this modification:

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 design of the electrical circuits for the shunt trip modification have been reviewed and found to be consistent with the WOG generic proposed design which was previously reviewed and approved by the staff. However, the UCE design includes test jacks to facilitate the capability to perform response time tests during plant operation. This addition to the WOG generic design consists of test jacks wired directly to an auxiliary switch "a" contact and test jacks wired in series with 1 Kohm (2.5 watt) resistors across the undervoltage coil. Thus test connections for an undervoltage trip signal and breaker tripped condition are available to perform the response time test. The resistors in series with the test connections to the undervoltage coil provide protection against potential accidental shorts or grounds during response time

testing to assure that such events would not result in an inadvertent breaker trip or overload on the protection system power source for the undervoltage trip attachment. Based on our review of these plant specific aspects of the UCE design, we conclude that they do not introduce a safety significant consideration, will facilitate on line response time testing, and are, therefore, acceptable.

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 logic voltage supply (48 Vdc). Class 1E circuitry is separated from non-1E circuitry 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. Also, normally open contacts of an auxiliary relay which is energized when the breaker is closed provide breaker status information to the plant computer. These contacts would change state if power for the shunt trip was lost.

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 (approx. 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 solid state protection system has an overvoltage protection set at 115% of nominal voltage.

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

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 design at Callaway includes the Potter & Brumfield MDR series P/N 955655 relays as specified in the WOG generic design for the automatic shunt trip function. The relay contacts are adequately sized to accomplish the shunt trip function. We find this aspect of the design to be acceptable.

4. State whether the test procedure/sequence used to independently verify operability of the undervoltage and shunt trip devices in reponse 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 has confirmed that the revised procedure OSP-SB-0001 to independently confirm the operability of the UV trip and shunt trip is identical to the test procedures developed by the WOG and is, therefore, acceptable.

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 has confirmed that the circuitry is Class 1E and that procurement of this hardware is made in accordance with the Westinghouse QA program, WCAP 8370 which has been approved by the staff. Installation of the hardware will be in accordance with the Callaway approved QA program for design and construction. Operation, testing and maintenance of this circuitry will be performed under the Callaway QA program. We find this to be acceptable.

6. Verify that the shunt trip attachments and associated circuitry are/will be seismically qualified (i.e., be demonstrated to be operble 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 the shunt trip attachment and associated circuitry at Callaway are part of the WOG reactor trip breaker seismic qualification program and will comply with WOG's recommendations. We find this commitment to be acceptable.

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 based on the Westinghouse EQDP (Number ESE-20 Rev. 4), the environmental conditions for the location of reactor trip switchgear are enveloped by the Westinghouse requirements. We find this to be acceptable.

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.

Physical separation between the circuits used to manually initiate the shunt trip attachments of the redundant trip breakers is maintained by locating them in separate metal enclosures. The reactor protection logic outputs for energizing the shunt trip interposing relays are housed in existing separate metal enclosures, and coil to contact is isolated within the reactor trip switchgear. The reactor trip switches on the main control board have barriers to separate redundant train switch contact decks. Physical separation for field cabling between the redundant trains is maintained. We find this meets the requirements of Regulatory Guide 1.75 and is, therefore, acceptable.

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 notes that all control room reactor trip switch contacts and wiring will be tested prior to startup after each refueling outage. The normally-closed contacts of MCB switches used to open the UV coil circuit for both the trip breakers and bypass breakers will be tested by monitoring the voltage across the UV coil while operating each switch individually. The

voltmeter is used to monitor the UV coil voltage. The normally open contacts of the MCB switches used to energize the shunt trip coil for both the trip breakers and bypass breakers will be tested by monitoring the voltage across shunt trip coil and the series connected '52a' auxiliary switch contact. A voltmeter is used to monitor the voltage. We find this is in accordance with our requirements and is, therefore, acceptable.

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 used a probabilistic analysis to support this conclusion that frequent testing of bypass breaker is not required and that based on this analysis there is no need for bypass breaker testing. The staff will require that the operability of bypass breaker under voltage trip attachment be demonstrated operable at a refueling outage frequency. Further the staff will require that the shunt trip attachment of bypass breakers be tested with the breaker in the test position prior to racking in and closing of bypass breakers for reactor trip breaker testing. The proposed technical specification should include these requirements.

11. Verify that 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 test procedures OSP-SB-00001 being revised to support operability testing of the undervoltage and shunt trip will verify proper operation of the control room indicators (i.e., red light will be on when the breaker is closed and the green light will be on when the breaker is open). We find this to be acceptable.

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 committed to perform the periodic time response testing of the automatic shunt trip feature. We find this to be acceptable.

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 has not proposed changes to the plant technical specifications at this time. Proposed changes to the technical specifications should be provided to reflect the licensee's commitments for testing as noted in items 4 and 9 above. Additional guidance on technical specifications changes in response to the Generic Letter will be provided to licensees and

applicants. Following implementation of the shunt trip modifications, the staff will require proposed technical specifications appropriate for this change to the trip system design.

CONCLUSION

Based on the review of the licensee's response to the plant specific questions identified in the staff's evaluation of the proposed design modifications, we find that the modifications are acceptable. The staff requires that the licensee submit confirmation that the seismic qualification of the shunt trip attachment has been successfully completed as noted in item 6. Further, the staff requires that proposed technical specification be submitted as noted in items 10 and 13, following implementation of this modification.