UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION REPORT
D. C. COOK 1&2
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 December 21, 1984, the licensee, Indiana & Michigan Electric Company provided responses to the plant specific questions identified by the staff in its August 10, 1983, Safety Evaluation Report of the generic Westinghouse design. 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 states that the proposed modifications will be implemented during their upcoming refueling outages scheduled to begin in March, 1985, for Unit 1 and November 1985, for Unit 2.

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 licensee's 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, test jacks wired in series with resistors across the undervoltage coil, and test jacks wired in series with resistors across the breaker shunt trip coil and the "a" auxiliary contact. Thus test connections for an undervoltage trip signal and breaker tripped condition are available to perform the response time test. Test connections across the shunt trip coil and "a" contact are available to verify the operability of the control room manual reactor trip switch contacts. Also, two normally closed contacts of the shunt trip actuation relay are used in the shunt trip circuit. This is done in case one of the two contacts fails to perform its intended function. Based on our review of these plant specific aspects of the design, we conclude that they do not introduce a safety significant consideration, will facilitate on-line response time testing, will verify the operability of control room manual reactor trip switch contacts, 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 to actuate the shunt trip of the reactor trip breakers and the shunt trip of the bypass breakers. Faults within the non-Class 1E breaker closing circuit, which is fed from the same Class 1E source, will be isolated from the shunt trip circuitry by coordinating fuses. Therefore, a fault within non-Class 1E circuitry will not degrade the shunt trip function.

The breaker position status lights are used to supervise the availability of power (250 Vdc) 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. In addition to the breaker's position lights as indication of power availability to the shunt trip coils, an auxiliary relay is installed to monitor the 250 Vdc branch circuits voltage and will annunciate in the control room upon loss of voltage to the shunt trip coil circuit.

The added shunt trip circuitry is powered from the reactor protection SSPS logic voltage supply. The logic voltage is provided by a regulated 48 Vdc power supply which has an overvoltage protection adjustment. During overvoltage conditions, the load including the UV coil and the parallel shunt trip actuation relay, will be removed, thus causing the reactor trip breaker to open.

Based on our review, we conclude that the 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 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 design at D.C. Cook includes the Potter and 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 that this aspect of the design is acceptable.

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 procedures and the test procedures to be used and provide the rationale/justification for these differences.

The licensee notes that the test procedure/sequence recommended by WOG to independently verify operability of the undervoltage and shunt trip devices in response to an automatic reactor trip signal will be incorporated into plant test procedures associated with the testing of the reactor trip breakers. We find this to be 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 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 to be acceptable.

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 the shunt trip attachments and associated circuitry will be seismically qualified in accordance with IEEE-344. Non-safety circuitry such as the reactor trip breaker closing and monitoring circuits are mounted with sufficient rigidity to ensure freedom from interference with the automatic shunt trip functions during or after a seismic event. We find this to be acceptable.

7. Verify that the components used to accomplish the automatic shunt trip function are designed for the environment in which they are located.

The licensee states that the components used to accomplish the automatic shunt trip function are designed for the environment in which they are located. We find this is 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.

The licensee states that the control switches used to manually initiate the shunt trip attachments of the reactor trip breakers are located on control room panels. A control switch and its associated wiring for one train of reactor trip breakers is separated from the other switch by an adequate barrier. Field cabling from the control room panels to the reactor trip switchgear is routed as Train oriented circuits; therefore, redundant circuits are physically separated by the separation criteria at time of license. Wiring of the shunt trip attachments, auxiliary relays, and their associated terminal blocks and test panels at the reactor trip switchgear, is separated by a metal barrier. We find this to be 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 provided the test procedure used to verify the operability of the manual trip function. The testing will be performed prior to startup after each refueling outage and will not involve installing jumpers, lifting leads or pulling fuses. We find this to be 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.

As per existing operating procedure, each bypass breaker is manually as well as automatically tested to demonstrate its operability prior to plant startup if testing was not performed in the previous seven days. The reactor trip breakers' monthly surveillance test does not currently require bypass breaker testing. The monthly surveillance test will be revised to include a manual trip initiation only with the bypass breaker in its test position, prior to testing of the main reactor trip breaker to demonstrate bypass breaker operability through the shunt trip attachment. We find this to be acceptable.

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 states that the monthly and start up surveillance procedures used to determine reactor trip breaker operability will also verify proper operation of control room indication/annunciation. 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 states that the response time of the automatic shunt trip feature will be tested periodically, in the monthly and start up surveillance test procedures, to demonstrate that the response time of the main reactor trip breakers is less than or equal to that assumed in the FSAR analyses.
We find this to be acceptable.

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

The licensee has addressed the changes to the plant technical specifications which will be proposed following implementation of the automatic shunt trip feature. The proposed change would indicate that both the UV and shunt trip functions will be tested in accordance with plant test procedures which will include the test procedure proposed by WOG. Confirming operability of the manual reactor trip switch contacts and wiring will be accomplished in the plant test procedure used for manual reactor trip in the proposed technical specifications.

Additional guidance on these changes will be provided to the licensees and applicants. Following implementation of the shunt trip modifications, the staff will review the technical specifications which are proposed for this modification.

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 proposed modifications are acceptable. The licensee should confirm that shunt trip components have been seismically qualified as noted in item 6. Proposed technical specifications should be submitted as noted in item 13, following implementation of this modification.

It should be noted that this evaluation satisfies the preimplementation review requirements for Item 4.3 of Generic Letter 83-28. Therefore, the modification for the automatic actuation of the shunt attachments of the reactor trip breakers should be implemented as presently planned.