ENCLOSURE

SAFETY EVALUATION REPORT
DOCKET NOS. 50-454/455/456/457
BYRON 1 & 2/BRAIDWOOD 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 applicants 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 February 15, 1985, Commonwealth Edison (CECo) 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 applicant's proposed design for the automatic actuation of reactor trip breaker shunt trip attachments and finds it acceptable except as noted in the SER.

The applicant 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 CECo 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 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 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. 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.

The UV Coil and the parallel shunt trip actuation relay for each Reactor Trip Breaker is powered from the 48Vdc system which is furnished by Westinghouse as part of the solid state protection system. These regulated 48Vdc power supplies are provided with voltage and current adjustments. The overvoltage protection point is factory adjusted for 115% of rated output voltage. A malfunction of the regulator circuit will cause the overvoltage circuitry to operate (open) the 48Vdc power supply output and thus remove all loads including the UV coil and parallel shunt trip actuation relay. This in turn will trip the Reactor Trip breakers. In addition, opening the power supply output will actuate the "Solid State Protection Cabinet General Warning" alarm in the main control room. Westinghouse has qualified the components of the added shunt trip circuitry to perform their intended function 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 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 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 applicant notes that the steps used to independently confirm the operability of the undervoltage trip and shunt trip devices in response to an automatic reactor trip signal will be the same in intent as the test procedure proposed by the WOG. This procedure will be implemented following the installation of the automatic shunt trip modification. 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 applicant 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 CECo quality assurance requirements which satisfy 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 applicant notes that the WOG is working with Westinghouse to obtain seismic qualification of the shunt trip attachments and the automatic shunt trip panel. Nonsafety-related circuitry/components to or associated with the automatic shunt trip function will not degrade the automatic shunt trip function during or after a seismic event. 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 applicant has not verified that the plant specific environmental conditions defined in the WOG generic design package Table 1 envelope Byron and Braidwood units.

This item remains as an open item.

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 routing the field cabling as train A and train B circuits. Metal braid enclosed cabling is used for train A and train B wiring where 6-inches air gap is not maintained. Dual section manual reactor trip switches with metal barriers are used between redundant train switch decks. 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 applicant notes that all control room manual reactor trip switch contacts and wiring will be tested prior to startup after each refueling outage by using a new station procedure which will utilize the test jacks installed with the breaker modification and will not cycle the trip breakers. The procedure will be performed once every 18 months. It is not clear as to how the licensee will verify the operability of the control room manual reactor trip switch contacts which are in the shunt trip circuit. Therefore, the licensee should confirm that the test will verify the operability of the breaker trip switch contacts and wiring for the shunt trip circuits of the manual reactor trip.

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 states the station tests the reactor trip bypass breakers at each refueling outage. The licensee states that the failure of the reactor trip system during testing is unlikely and, therefore, bypass breaker testing on an increased frequency is not required. Based on the review of the licensee's submittal, the staff finds that the testing of the bypass breaker undervoltage trip attachment to demonstrate that it is operable at a refueling outage frequency is acceptable. However, the staff requires that the shunt trip attachments of bypass breakers be tested to confirm its operability when a bypass breaker is closed for reactor trip breaker testing.

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 states that Byron and Braidwood stations will include verification of associated control room indication/annunciation in the procedures that verify reactor trip breaker operability. 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 testing of the reactor trip breakers will be performed in accordance to the Technical Specification requirements. We find this 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 states that technical specifications have a requirement to independently verify operation of the undervoltage and shunt trips of reactor trip breakers once every 18 months. We find this to be inconsistent with the WOG test procedures for on-line testing of the reactor trip breakers. The proposed technical specifications should reflect the requirement for independent testing of the undervoltage and shunt trip functions during on-line testing. The staff will issue additional guidance on appropriate technical specification for this modification. This matter will be subject to further staff review following the submittal of proposed technical specification changes.

CONCLUSION

Based on the review of the applicant's response to the plant specific questions identified in the staff's evaluation of the Owner's Group generic design modifications, we find that the modifications are acceptable, however, the staff's resolution of this matter is conditioned on the following:

a) Confirmation that shunt trip components have been seismically qualified as noted in item 6.

b) Confirmation that the components used to accomplish the automatic shunt trip function are designed for the environment where they are located as noted in item 7.

c) Confirmation that the test for the operability of control room manual reactor trip switch contacts and wiring will include the shunt trip circuits as noted in item 9.

d) Submission of proposed technical specifications 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 during the next refueling outage of Byron Unit 1 and prior to the full power license for Byron Unit 2 and Braidwood Units 1 and 2.