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

SAFETY EVALUATION

VIRGINIA ELECTRIC & POWER COMPANY

DOCKET NO. 50-338 & 50-339

NORTH ANNA UNITS 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 November 4, 1983, Virginia Electric and Power Company provided responses to the plant specific questions identified by the staff in its August 3, 1983, Safety Evaluation of the generic Westinghouse design. The staff has reviewed the licensee's proposed design for the automatic actuation of reactor trip breaker shunt trip attachments and finds it acceptable.

The licensee states that the current implementation schedule is Fall 1984 for Unit 2 and the first outage of sufficient duration after the Fall of 1984 for Unit 1.

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 elecrical schematic/elementary diagrams for the reactor trip and bypass breakers showing the under-voltage 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 under-voltage and the shunt trip circuits. The design of the electrical circuits has 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. 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. Therefore, a fault within non-Class IE 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 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 the shunt trip coils in the reactor 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 nomiral 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. 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 supply is 48V dc which is derived from the solid state protection system (SSPS). The SSPS is provided with 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 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 North Anna 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 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 details of the testing to independently confirm the operability of the undervoltage and shunt trip will be based on the procedure submitted by the WOG to the NRC in letter No. OG-101. 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 VEPCO nuclear power station quality assurance manual which satisfies the quality assurance requirements of 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. The WOG is working with Westinghouse to obtain seismic qualification of the shunt trip attachments. If qualification tests show that any of the added components do not perform their intended function during or after a postulated seismic event, these components will be replaced at the next scheduled outage. subsequent to receipt of the replacement component. We find this 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 has verified that the plant specific environmental conditions defined in the WOG generic design package Table 1 envelope North Anna Units 1 & 2. 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.

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 from the main control board and reactor protection logic to redundant train A and train B reactor trip switchgear as train A and train B circuits. Contact to contact isolation is provided within reactor trip switchgear and the wiring meets the separation criteria in effect at the time of licensing. 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 manual reactor trip switch contacts and wiring will be tested prior to start up after each refueling outage. The test procedure used will not involve installing jumpers, lifting leads or pulling fuses and will be identical to the WOG procedure. 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.

The licensee notes that each bypass breaker is tested to demonstrate its operability during the refueling outage. Since bypass breakers are closed only during testing of main trip breakers and it is only during this time that the bypass breaker could be called upon to provide a protective action, the licensee concludes that the probability of complete failure of the reactor trip system due to failure of the bypass breaker during testing is remote and does not appear to warrant testing of the bypass breakers prior to placing them into service for reactor trip breaker testing. The staff finds that confirmation of the operability of the bypass breaker undervoltage trip attachment at a refueling outage frequency is acceptable. However, 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 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 new test procedures being developed to support operability testing of the under-voltage and shunt trip will include verification of the proper operation of the associated control room or instrument test rack indication. We find this commitment 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 notes that Westinghouse is in the process of performing the life cycle testing of the reactor trip breakers. Should life cycle testing show that breaker trip response time degrades with operation, periodic on-line response time testing of the automatic shunt trip feature will be considered. 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 notes that proposed technical specification changes to require periodic testing of the undervoltage and shunt trip functions and the manual reactor trip switch contacts and wiring will be provided at a later date. It was noted that the WOG is working with Westinghouse on this effort. We find this commitment to be acceptable.

CONCLUSION

Based on the review of the licensee's response to the plant specific questions identified in the staff's evaluation of the Owners Group generic design modifications, we find that the design 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, which are responsive to the staff requirements noted in items 10 and 13 following implementation of this modification.