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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

GENERIC LETTER 83-28 ITEM 4.3

REACTOR TRIP BREAKER AUTOMATIC SHUNT TRIP

KANSAS GAS & ELECTRIC COMPANY

KANSAS CITY POWER AND LIGHT COMPANY

KANSAS ELECTRIC POWER COOPERATIVE, INC.

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

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 February 29, 1984, the licensee, Wolf Creek Nuclear Operating Corporation (WCNOC), previously identified as Kansas Gas and Electric (KG&E), submitted its design for this modification which is based on the WOG generic design proposal. By letter dated April 8, 1987 and May 29, 1987, WCNOC provided additional information to the staff documenting WCNOC's response to confirmatory items 6, 11, 12, and 13. 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.

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 KG&E 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 seris 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 overloads on the protection system power source for the undervoltage trip attachment. Based on our review of these plant specific aspects of the KG&E 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 regulated 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 (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, 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 Wolf Creek 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 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 procedure and the test procedure to be used and provide the rationale/justification for these differences.

The licensee has confirmed that the testing at Wolf Creek 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 Wolf Creek approved QA program. We find this 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 at Wolf Creek are part of the WOG reactor trip breaker seismic qualification program and will comply with WOG's recommendations. By letter dated April 8, 1987, WCNOC documented that the reactor trip breaker shunt trip attachment has been seismically qualified in accordance with Regulatory Guide 1.100, Revision 1. We find this 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 Revision 4), the environmental conditions for the location of reactor trip switchgear are enveloped by the Westinghouse requirements. We find this 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 separate metal enclosures, and coil to contact and contact 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. This test can be performed at shutdown within existing RPS equipment by use of voltmeters connected to appropriate points and can be done without cycling breakers. 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 notes that the verification testing of each bypass breaker is to be done concurrent with testing of the main reactor breakers. Since neither the WOG generic proposal nor the licensee's submittal addresses the manner in which bypass breakers would be tested, the staff requested that the licensee provide an outline of the test procedures for testing the bypass breakers. By telecon on April 26, 1984, the licensee indicated that the bypass breakers would be tested in the following manner:

1. The bypass breakers are normally maintained in a racked out position. When a test is to be performed on the reactor trip breakers, the bypass breaker will be placed in the test position and the operability of the local manual shunt trip feature is confirmed.

2. The undervoltage automatic trip feature of the bypass breakers is demonstrated to be operable during refueling outages.

Based on the licensee's clarification of testing of bypass breakers, we find this 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 notes that the test procedures being developed 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).

The licensee, by letter dated May 29, 1987 submitted additional information which confirms that plant procedures address verification of proper operation of control room indication for the reactor trip breakers.

We find this response confirms that the plant procedures address verification of control room indication of proper operation of the reactor trip breakers and this is 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 provided additional information addressing response time testing in their May 29, 1987 submittal. Their response quoted the results of testing reported in WCAP 10835 for type DS416 breakers which found there were no increases in trip response time vs. number of actuations for the shunt trip attachments tested at all trip coil voltage levels. The breakers were reported to exhibit a consistent, fast trip response time in all cases.

We find this response supports the licensee's position that it is not necessary to perform response time testing on the shunt trip attachments. We concur and find this response 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's May 29, 1987 submittal stated that technical specification changes which address surveillance testing of the shunt and undervoltage trip attachments of the reactor trip breakers are being proposed as the response to Generic Letter 85-09. The licensee subsequently submitted these technical specifications by letter dated June 29, 1987.

The proposed technical specification changes to provide for this testing will be reviewed by the staff during its resolution of the GL 85-09 concerns, therefore we find this response acceptable for closing this issue.

CONCLUSION

Based on the review of the licensee's response to the plant specific questions identified in the staff's evaluation of the Owner's Group generic design modifications, we find the modifications acceptable.

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Dated: July 19, 1988