SAFETY EVALUATION BY NRC REGION V

GENERIC IMPLICATIONS OF SALEM ATWS EVENT

GENERIC LETTER 83-28, ITEM 4.5.1

WASHINGTON NUCLEAR PROJECT NO. 2

DOCKET NO. 50-397

I. INTRODUCTION

On February 25, 1983, during startup of the Salem Unit 1 plant, both circuit breakers in the Reactor Trip System failed to open automatically upon receipt of a valid trip signal. As a result of that event, the NRC's Office of Inspection and Enforcement issued IE Bulletin 83-01 which described the event and requested specified prompt corrective and preventive actions by licensees. As the cause and ramifications of the event were more clearly developed, the NRC's Office of Nuclear Reactor Regulation issued on July 8, 1983, Generic Letter 83-28, "Required Actions Based on Generic Implications of Salem ATWS Events." This letter addressed issues related to reactor trip system reliability and general management capability. The letter was sent to all licensees of operating reactors, applicants for operating licenses and holders of construction permits.

One of the areas of reactor trip system reliability considered in Generic Letter 83-28 (GL 83-28), is that of system functional testing. This is identified in GL 83-28 as Item 4.5.1. This evaluation considers the acceptability of the response to this item provided by the Washington Public Power Supply System (the licensee) for the Washington Nuclear Project No. 2 (the facility).

II. EVALUATION

Item 4.5.1 of GL 83-28 states as follows:

> "On-line functional testing of the reactor trip system, including independent testing of the diverse trip features, shall be performed on all plants.
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> "1. The diverse trip features to be tested include the breaker undervoltage and shunt trip features on Westinghouse, B&W... and CE plants; ...and the scram pilot valve and backup scram valves (including all initiating circuitry) on GE plants.

In addition, Item 4.5.1 states that licensees and applicants should submit a statement confirming that this action has been completed.

By letter dated November 18, 1983, the licensee responded to a number of GL 83-28 items, including Item 4.5.1. Regarding Item 4.5.1, the licensee stated the Reactor Protection System (RPS) utilizes a one-out-of-two taken twice trip logic. According to this design, there are two sub-channels - both of which are required to trip in order to produce a reactor trip. Each of these sub-channels, however, has two inputs - and either of these (one-out-of-two) can cause the sub-channel to trip. Tripping one sub-channel can be used to produce a so-called "half-scram", which can test all of the components in the circuit for that sub-channel from the input sensor to the actuated device. The actuated devices are one of two sets of 185 pilot valves associated with the control rod drive units (Note: Two pilot valves are provided for each drive unit. These are divided into two sets - one for each logic sub-channel - and both sets must be actuated to produce reactor trip). It is because only one set of pilot valves is actuated by this test, that a "half scram" is produced. The reactor trip system, therefore, can be tested "on-line" without concern about shutting down the reactor. The licensee states this type of testing is performed weekly using the Intermediate Range Monitors (IRMs) and the Average Power Range Monitors (APRMs) of the Nuclear Monitoring System, and monthly for other RPS process variables.

The function of the pilot valves mentioned above is to exhaust air from the air-operated valves which control water flow in the control rod drive units. With a loss of air, these valves automatically move to the scram position. A redundant means for exhausting air from the air-operated valves is provided by the "scram backup valves." Two such valves are connected in parallel to the header which supplies air to the pilot valves. When either of these valves opens, air is exhausted from the pilot valve air supply header. According to the licensee, both channels of the reactor trip logic must be tripped (a full scram) to test these valves, and if either valve opens, the reactor is shutdown. Therefore, on-line testing is not considered feasible. Instead, the licensee states surveillance testing is performed at cold shutdown. The licensee states the surveillance test includes the RPS circuit (manual trip) to actual verification of air vent bleed off at the backup scram solenoid valve.

The licensee justifies the omission of on-line testing for the backup scram valves on the basis of the high reliability of the scram system. In support of this, the licensee cites the reliability provided by having 185 redundant actuation devices (the scram pilot valves) where only a fraction of the valves are needed for shutdown, and the on-line testing provided for these valves. The licensee also cites the diversity provided by the design wherein the pilot valves actuate to the scram position upon a loss of electric power, and the backup scram valves must be energized to open.

The staff notes many other BWR licensees have provided similar justifications for not performing on-line testing of the backup scram valves. In addition, the staff notes the following additional considerations which contribute to the reliability of the backup scram system and thus reduce the need for on-line testing. These include:

1. The backup scram solenoid valves (which as noted, are energized to trip) are supplied power from separate reliable DC power sources. By contrast, the individual scram solenoid valves are normally energized from the Reactor Protection System motor generator set power supplies.

2. The backup scram uses redundant solenoid valves - the operation of either of which would vent the scram air header.

3. The backup scram uses the same reactor protection system logic that is tested on-line in connection with the pilot valve "half scram" testing.

4. The backup scram is testable during plant shutdown.

Based on these considerations, the staff has concluded that imposition of the requirement for on-line testing of the backup scram valves would not significantly improve the reliability of this system, and therefore, contrary to the position stated in GL 83-28, on-line testing of these valves need not be required. At the same time, the staff notes that although the licensee states that the backup scram valves are tested during cold shutdown, there is no current requirement that this testing be performed. It is the staff's position, therefore, that in view of the positive contribution to safety provided by these valves, the valves should be included under the limiting conditions for operation and surveillance requirements of the facility technical specifications. This matter, is not within the scope of review for Item 4.5.1, but will be addressed under separate Item 4.5.3 of GL 83-28.

III. CONCLUSION

Based on the licensee's frequent required on-line testing of the scram pilot solenoid valves, the licensee's testing of the backup scram valves during cold shutdowns, the staff's plans to make such testing a formal requirement (under Item 4.5.3), and the staff's finding that a requirement for on-line testing of the backup scram valves would not significantly contribute to system reliability, we conclude the licensee has acceptably conformed to the requirements of Item 4.5.1 of Generic Letter 83-28. Accordingly, this item is closed.

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