**Richard A. Uderitz**
Vice President -
Nuclear

Public Service Electric and Gas Company P.O. Box 236, Hancocks Bridge, NJ 08038 609 935-6010

May 31, 1983

Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing

Gentlemen:

OPERATIONAL VERIFICATION PROGRAM
REACTOR TRIP BREAKERS
NO. 1 AND 2 UNITS
SALEM GENERATING STATION
DOCKET NOS. 50-272 AND 50-311

PSE&G hereby submits its long term operational verification program for the Westinghouse DB-50 reactor trip breakers. The intent of this program is to verify the adequacy of PSE&G's surveillance and maintenance program for the reactor trip breakers and to establish a basis for replacement of the undervoltage trip attachments (UTAs).

PSE&G will use the data generated in the Westinghouse DB-50 Breaker Test Program to fulfill its "Corrective Action Program" commitment identified in PSE&G's letter dated April 28, 1983 (Item A.2.b.1). The Westinghouse program was identified in a Westinghouse letter to the NRC dated March 25, 1983.

The test program data for the DB-50 reactor trip breakers will be used along with in-service data to assess the reliability of the UTAs. PSE&G has reviewed the testing program and the Westinghouse Owners Group plant data evaluation program and will use the results of these programs to verify the adequacy of PSE&G's surveillance and maintenance programs and to establish a basis for replacement of the UTAs.

The test program has been developed in a manner which provides assurance to PSE&G that the tests will be applicable to the equipment used at Salem and that the devices tested will be representative samples. The two devices to be tested will have been selected from a manufacturing program which requires 100% dimensional inspection of ten critical parts and a post-



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assembly acceptance test of twenty-five operations without failure at the manufacturing facility. This provides confidence in the validity of the testing.

The test program contains a sufficient number of test cycles (2500 per UTA) to provide reasonable assurance that useful data will result. At the end of the test, analysis of the data will be made using the total number of test operations observed as the statistically significant sample.

Based upon an evaluation of the test results, the Salem surveillance and maintenance program will be evaluated and criteria for replacement of the UTAs will be established.

The results and analysis of the DB-50 Breaker Test Program and the Westinghouse Owners Group plant data evaluation program are expected to be available in October 1983.

A test program summary is attached.

Sincerely,

Attachment
CC: Mr. Richard W. Starostecki, Director
Division of Project & Resident Programs, Region 1

Mr. Donald C. Fischer
Licensing Project Manager

Mr. Leif Norrholm
Senior Resident Inspector

SUMMARY OF TEST PROGRAM
FOR DB-50 REACTOR TRIP BREAKER
UNDERVOLTAGE AND SHUNT TRIP ATTACHMENTS

I PURPOSE

To verify that the DB-50 circuit breaker undervoltage and shunt trip attachments are suitable for reactor trip switchgear service and have adequate design margin by obtaining data which:

1) Documents the forces required to trip the circuit breaker, and

2) Demonstrates the cyclic performance characteristics of the undervoltage and shunt trip attachments.

II Selection of Test Samples

Two undervoltage trip attachment (UTAs) will be selected based on the following prerequisites to assure that they are representative samples:

a. Each UTA will be subjected to a 100% demensional inspection of ten critical parts.

b. Each UTA will be tested on a go-no-go basis 25 times with zero failures. This screening would eliminate testing of devices which could be susceptible to infant-mortality.

III Testing Conditions:

1) Environmental conditions of the test facility will be recorded.

2) The circuit breakers tested will be inspected in accordance to the type DB-50 circuit breaker instruction manual prior to testing. If adjustments are required to the as-received condition of the breakers, these will be documented. During the tests, the breakers and trip attachments will be inspected and maintained in accordance with the instruction manual and technical bulletin NSD-TB-83-02.

3) Identification of the test breakers and electrical characteristics of the undervoltage and shunt trip coils will be documented. The trip bars of the test breakers will not include overcurrent trip pads.

4) Identification of the test instruments and calibration data will be documented.

5) Testing will be conducted without load on the main contacts since the rating of the circuit breaker exceeds the capacity of rod drive power supply.

6) The undervoltage trip attachment will be energized for a sufficient time for the coil to attain a stable temperature at the beginning of the test to simulate actual operating conditions. The temperature will be recorded.

7) The circuit breaker shunt trip and closing circuits will be rated for 125 volts DC operation.

8) The undervoltage and shunt trip attachments used in the test will be compared with untested control specimens at the conclusion of the test.

IV Measuring the forces required to trip the circuit breakers:

Prior to the start of testing, the following data will be recorded:

1) Initial measurements:

a. Undervoltage trip attachment

1. Coil resistance and temperature

2. Power requirement at rated voltage

3. Voltage at which undervoltage trip device trips the circuit breaker (drop out voltage)

4. Voltage applied to the undervoltage coil at which the circuit breaker can be electrically closed

5. Time for the breaker to trip as measured from the time that the undervoltage trip device is de-energized to the time that the main contacts have parted

6. The distance between the trip lever and trip bar with the breaker closed and the undervoltage trip coil energized

b. Shunt trip attachment:

1. Coil resistance and temperature

2. Power requirement at rated voltage

3. Time for breaker to trip as measured from the time the shunt trip coil is energized to the time that the main contacts have parted

4. The distance between the trip lever and the trip bar with the breaker closed and the shunt trip coil de-energized.

2) Measure and record the force required on the circuit breaker trip bar to cause a trip.

3) Measure and record the force applied on the trip bar by the undervoltage trip device trip lever.

4) Measure and record the force applied on the trip bar by the shunt trip device trip lever.

5) a) Add weights in graduated amounts to the trip bar to increase the force required to trip the circuit breaker. Measure and record the added weight at which the undervoltage trip device fails to overcome the resistance and cause a trip.

b) Repeat the test for the shunt trip coil.

6) Measure and record the force developed by the undervoltage trip lever.

7) Measure and record the force developed by the shunt trip lever.

V Operational test on the circuit breakers-Undervoltage Trip Attachments:

An operational test of 2500 operations will be performed on the circuit breaker undervoltage trip attachment. Periodic force measurements and visual inspection will be recorded. The following test procedure will be used:

Close the circuit breaker electrically. De-energize the undervoltage coil to trip the breaker. Repeat the above operation 200 times. In accordance with the breaker application data publication, the frequency of operation will not exceed 30 times in one hour.

After 200 operations, inspect the circuit breaker visually for signs of wear: looseness of parts, and overall circuit breaker mechanical condition in accordance with the instruction manual and NSD-TB-83-02. Record the observation.

Perform the following force measurements and record results.

Measure and record the force required on the circuit breaker trip bar to cause a trip.

Measure and record the force applied on the trip bar by the undervoltage trip attachment trip lever.

The above test will be repeated every 200 cycles until 2400 cycles are completed and then after 2500 cycles are completed.

Additional force measurements will be taken as follows:

Add weights in graduated amounts to the trip bar to increase the force required to trip the circuit breaker. Measure and record the added weight at which the undervoltage trip device fails to overcome the resistance and cause a trip. This will be done after 200, 600, 800, 1000, 1200, 2000 and 2400 cycles.

In addition, the time for the breaker to trip will be measured from the time that the undervoltage trip device is de-energized to the time that the main contacts have parted. This will be done after 600, 1200, 1800 and 2400 cycles.

VI Operational Test on the Circuit Breakers-Shunt Trip

An operational test on the circuit breaker shunt trip attachment will be done after 1200 cycles.

Close the circuit breaker electrically. Keeping the undervoltage trip coil energized, energize the shunt trip coil momentarily. Repeat the above operation 200 times. In accordance with the breaker application data publication, the frequency of operation will not exceed 30 times in one hour.

After 200 operations, inspect the circuit breaker visually for signs of wear: looseness of parts, and overall circuit breaker mechanical condition in accordance with the instruction manual and NSD-TB-83-02. Record the observation.

Perform the time measurement described in Section IV, Step 1.b.3 and record the results.

Perform and record the force measurements described in Section IV, Steps 2, 3, 4, 5b and 7.

The same operational test will be duplicated twice after 2400 cycles and the following additional data will be taken.

Time for the breaker to trip as measured from the time that the undervoltage trip device is de-energized to the time that the main contacts have parted

The distance between the trip lever and the trip bar with the breaker closed and the shunt trip coil de-energized.

CONCLUSIONS:

The test data will be used to support the position that when the circuit breaker is properly maintained, there is adequate margin force applied to the type DB-50 circuit breaker trip bar by either the undervoltage trip lever or by the shunt trip lever to perform the reactor trip function. The test data will also establish margin criteria for force measurements which can verify continuing satisfactory performance of the undervoltage trip device in the reactor trip switchgear installed in nuclear power plants. In addition, the test data will be used to support and define maintenance recommendations and intervals including replacement of the undervoltage trip attachments.