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June 16, 1981

Docket Nos. 50-277
50-278

Mr. John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Stolz:

Your letter of May 15, 1981, requested additional information concerning our previous submittals on "Grid Voltage Degradation" and "Adequacy of Station Electric Distribution System Voltages". The "Action to be Taken" and our responses are listed sequentially below.

SUBJECT: GRID VOLTAGE DEGRADATION

REFERENCES: a) NRC letter to all power reactor licensees, dated June 2, 1977.

b) Philadelphia Electric Company letter to the NRC, dated February 13, 1981.

Action to Be Taken:

1. Ref. (a), enclosure 1, page 3, requests that the voltage monitors be designed to meet IEEE Std. 279-1971. In particular, paragraph 4.12 of this standard requires that the bypassing of a protective function should be removed automatically whenever permissive conditions are not met. Ref. (b) states that a test block would be used to bypass the protective action of the degraded voltage protection relays. This test block must be manually removed. Provide details on how the plant can

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meet IEEE Std. 279-1971 requirements for automatic functioning.

Response

The Class 1E Electric Power System, including voltage monitors, meets the requirements of IEEE 279-1971. Paragraph 4.12 of this standard requires automatic removal of Operating Bypasses whenever permissive conditions are not met. Paragraph 4.11 of this standard requires that the system be designed to permit testing of a channel during power operation without initiating a protective action at the systems level. The test blocks which are installed to test the voltage protection relays are not "Operating Bypasses" as referenced in paragraph 4.12, but are "Channel Bypasses" for testing purposes as referenced in paragraph 4.11 and are needed to meet the requirements of this paragraph.

The Class 1E Electric System is essentially a "one-out-of-two" system (correct 2 of 4) and therefore falls under the coverage of the exception of paragraph 4.11; that is, "The bypass interval required for a test, calibration, or maintenance operation could be shown to be so short that the probability of failure of the active channel would be commensurate with the probability of failure of the "one-out-of-two" system during its normal interval between tests". The length of time that these devices are under test is short compared to their time in normal service. The exposure, then, to a degraded condition, being undetected due to testing, is low. In addition, if a degraded voltage condition should exist, three of four buses in the plant would transfer automatically. This condition would be noted by the operator, and he could then restore the function of the relay by removing the test block.

Accordingly, we believe the entire Class 1E system, including voltage monitors meets all the requirements of IEEE 279-1971.

SUBJECT: ADEQUACY OF STATION ELECTRIC DISTRIBUTION SYSTEM VOLTAGES

REFERENCES: a) NRC letter to all power reactor licensees, dated August 9, 1979.

b) Philadelphia Electric Company letter to the NRC, dated November 13, 1980.

c) Philadelphia Electric Company letter to the NRC, dated December 31, 1979.

d) NRC letter to Philadelphia Electric Company, dated September 22, 1980.

Action to Be Taken:

1. Reference (b), page 2, stated that starting the RHR pumps can cause a voltage dip to 59.4% of nominal. Verification should be submitted that this voltage dip will not prevent the proper operation of all Class 1E equipment at all voltage levels. Particular attention should be paid to the capability of relays and contactors to remain actuated during the transient dip.

Response

We propose to verify the capability of relays and contactors to remain actuated and perform as designed by conducting a test at Peach Bottom which will result in a voltage dip to approximately 59.4% of nominal. Past tests at Peach Bottom have shown that starting an RHR pump on an unloaded 4kV emergency bus that is being supplied by a diesel generator will produce a voltage dip to 62% of nominal. The test will be conducted by adding load to the 4kV buses before the RHR pump is started, in order to produce a voltage dip to about 59% of nominal. When the RHR pump is started we will monitor the operation of 460 volt contactors and 120 volt control relays which will be operating on feeds supplied by the emergency bus being tested. We expect to perform this test during the performance of surveillance tests that will be conducted prior to start-up of Unit #3 from the current refueling outage.

Action to Be Taken:

2. Reference (a) requested that the voltages used in the analyses be terminal voltages. This request was repeated in reference (d). In order to verify that the Class 1E equipment is operating within the design voltage rating a submittal of analyzed terminal voltages is required.

Response

An analysis of voltage drops between the 460 volt buses and Class 1E equipment indicates that the worst case of a long cable run and large motor produces a voltage drop of three volts. A similar analysis of 4kV loads produced a worst cases voltage drop

of five volts between the 4kV bus and the motor terminals. These voltages are for steady state, full load conditions and should be deducted from the bus voltages given in reference (c) in order to determine terminal voltages.

Action to Be Taken:

3. Reference (a) requests that an analysis should consider the starting of a large non-safety load to verify that voltage design rating of Class 1E equipment will not be exceeded and that Class 1E relays and contactors will not drop out due to a voltage transient. Reference (b) states that such an analysis is not a realistic case for Peach Bottom as a transfer is completed with the large non-Class 1E pumps continuing to run. Consideration should be made of a large non-Class 1E pump motor dropping out during the transfer and having to be restarted. Submit an analysis for starting a large non-Class 1E load after the Class 1E loads have been started and the voltages are considered steady state.

Response

Starting a large non-safety load while all the Class 1E equipment is operating is not a realistic case for the Peach Bottom plant. In the case of an accident and transfer of the unit auxiliary buses to the offsite source, the recirculation pumps are tripped and cannot be restarted during accident conditions. Any other large pumps on the unit auxiliary buses that might be dropped out during the transfer would not be restarted since plant procedures call for reducing loads on the unit auxiliary buses after an accident. We propose to submit an analysis of the voltage dips experienced during the restart of a recirculation pump after a unit trip, without accident, and unit auxiliary bus transfer to the offsite source. To obtain reliable data for this condition, we will take test measurements of the recirculation pump MG set starting while the unit auxiliary bus is being fed from the offsite source. We anticipate that these tests will be completed prior to start-up of Unit #3 from the current refueling outage.

Action to Be Taken:

4. Reference (a) requests a validation by tests of the calculated values. Reference (b) states that tests which simulate the conditions used in the analysis would not be practical. Submit a validation showing the

deviations between calculated and actual values at loads and conditions that are practical.

Response

We propose to submit a validation of calculated values of bus voltages at Peach Bottom by taking actual measurements of transformer loads and bus voltages and comparing them to calculated values. We plan to take measurements for Unit #2 within 30 days after the Unit is in service and carrying a load greater than 40%. Sufficient voltages and loads will be measured at the 230kV, 13.8kV, 4kV and 460 volt buses to allow a reliable comparison with calculated values for the steady state conditions. In addition, measurements will be taken during the start of a large Class 1E motor to allow a comparison with calculated values for transient conditions.

If you have any questions or require additional information, please do not hesitate to contact us.

Very truly yours,