

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO PROCEDURES FOR DEGRADED

GRID VOLTAGE PROTECTION FOR CLASS 1E

POWER SYSTEMS FOR FACILITY OPERATING LICENSE NO. DPR-61

CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT

DOCKET NO. 50-213

INTRODUCTION

The on-site alternating current (AC) safety class 1E electric system is supplied power from either the off-site transmission grid or from the on-site standby emergency diesel generators. During normal plant operating conditions, the class 1E busses are supplied power from the transmission grid. Should the grid voltage degrade and become low enough so that the voltage at the class 1E equipment is below its qualified operating voltage, equipment damage could occur.

The NRC requested that the licensee address this degraded voltage condition by responding to NRC Generic Letter dated June 3, 1977. The generic letter requested the licensee to analyze the class 1E system to determine the grid voltage at which damage could occur. As a result, the licensee made plans to install a voltage sensing device on the class 1E busses with coincident logic and with the low voltage set point above a value where equipment damage could occur. This voltage device would then cause the off-site grid supply to be disconnected from the class 1E system at voltages below this value. The class 1E busses would then be supplied power from their respective emergency diesel generators.

New England licensees were concerned that significant degradation of the grid would result if automatic disconnection occurred as a result of the large number of nuclear plants in the New England area. It was their view that automatic disconnection from the grid should only be required if a low grid voltage occurred at the same time as a Loss of Coolant Accident (LOCA). They agreed that should their plant have a LOCA at the same time there was a degraded grid voltage condition, they would automatically disconnect from the off-site grid. The emergency diesel generators would then supply power to the class 1E systems. However, if there was a degraded grid voltage condition without a LOCA the operator would take the necessary manual action to protect the class 1E system.

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This proposal for the licensee has been reviewed and accepted by the NRC and is documented in the NRC Letter and Safety Evaluation Report of July 9, 1982. The Safety Evaluation report identified that the licensee should develop an operating procedure to provide the necessary operator guidance to protect the class 1E system under degraded grid voltage conditions without a LOCA condition. By letter dated February 14, 1985, the licensee submitted for staff review revised plant procedures to cover the required operator actions. This safety evaluation is for these procedures.

DISCUSSION

By letter dated February 3, 1983, the licensee submitted to NRC for review Abnormal Operating Procedure AOP 3-2-25, Low Voltage on Emergency Busses. This procedure was designed to assure protection of class 1E systems under degraded grid voltage conditions without a concurrent LOCA. The procedure was reviewed during an inspection conducted at the facility. During this review the staff requested additional information to aid in the evaluation of the procedure. These items were discussed in Inspection Report 50-213/84-19.

The information requests dealt with the following issues:

- Basis for starting motors at low voltages

- Basis for the minimum bus voltage for satisfactory starter operation

- Basis for timing low voltage on the grid

- Clarification of diesel operability/availability

- Provisions to minimize the time the diesel generators operate in parallel with a degraded grid.

By letter to NRC dated February 14, 1985, the licensee submitted responses to the NRC information request and also submitted Revision 3 to AOP 3-2-25 dated January 25, 1985, which incorporated changes and clarifications as follows:

- Procedure step 4.10.1 (now 4.13.1) has been revised to eliminate shifting/starting safety-related motor loads.

- All affected motor starters required to operate at 386 volts will be tested. If any fail to operate either AOP 3-2-25 will be revised or all of the starters will be replaced with units which will operate at 386 volts.

- Procedure steps 4.3, 4.5, 4.8, and 4.10 have been modified to provide a basis for timing low voltage on the grid.

Procedure steps 4.4 and 4.8 (now 4.10) have been modified to clarify the diesel operability/availability terms.

Procedure step 4.6.4 has been revised to minimize the time diesels operate in parallel with a degraded grid by use of a five minute time limit.

EVALUATION

The staff review of AOP 3-2-25, Revision 3 identified the following facts.

There are three levels of undervoltage protection alarms-level three at 3980 volts, level two at 3642 volts, and level one at 2870 volts. Operator actions are based on the limiting alarmed condition.

When a level three (3980 volt) alarm sounds and if there is no LOCA, the operator starts timing the duration of the low voltage and notifies CONVEX to see if the grid voltage can be restored. If the grid voltage is not restored within 24 hours, the operator must bring the plant to hot standby within the next six hours.

If the voltage drops to 3850 volts, the diesel generators are manually started, immediately loaded in parallel with the grid and the emergency bus separated from the grid within five minutes.

When a level two (3642 volt) alarm sounds and there is no LOCA, the operator starts timing the duration of the low voltage and notifies CONVEX to see if the grid voltage can be restored. If not restored, the operator must proceed to hot standby within four hours. If the voltage drops to less than 3450 volts and cannot be restored within ten minutes, the operator must proceed immediately to hot standby and utilize the emergency diesel for providing shutdown power to their respective busses.

When a level one trip signal occurs (2870 volts), offsite power is automatically tripped off and the busses are powered by onsite power.

CONCLUSION

We have concluded, based on the considerations discussed above, that:

(1) Licensee procedure AOP 3-2-25 Revision 3 dated January 25, 1985 provides technically acceptable procedures covering operator actions required during degraded grid voltage conditions without concurrent LOCA conditions.

(2) There is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner.

ACKNOWLEDGEMENT

This Safety Evaluation was prepared by Mr. Carl Woodard, Division Reactor Safety, Region I.

Dated: July 2, 1985