CP&L

Carolina Power & Light Company

JUN 9 1982

Mr. Darrell G. Eisenhut, Director
Division of Licensing
United States Nuclear Regulatory Commission
Washington, D.C. 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
NRC GENERIC LETTER 81-04
EMERGENCY PROCEDURES AND TRAINING FOR
STATION BLACKOUT EVENTS

Dear Mr. Eisenhut:

In response to your letter of February 25, 1981 (Generic Letter 81-04), Carolina Power & Light Company (CP&L) has reviewed our current operations, procedures, and training at the Brunswick Steam Electric Plant to determine our capability to mitigate a station blackout event. This review utilized, in part, the CP&L flow chart concept for the immediate action portion of the Brunswick Plant Emergency Procedures to help us evaluate our existing procedures and training against station blackout concerns addressed in Generic Letter 81-04. The results of our review are provided in Enclosure 1.

If you have any questions concerning this information, please contact us.

Yours very truly,

S. R. Zimmerman
for P. W. Howe
Vice President
Technical Services

WRM/PRB/lr (n-63)
Enclosure

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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT

GENERIC LETTER NO. 81-04

EMERGENCY PROCEDURES AND TRAINING FOR

STATION BLACKOUT EVENTS

The Brunswick Steam Electric Plant has reviewed NRC Generic Letter 81-04, Emergency Procedures and Training for Station Blackout Emergency, and as per the plant FSAR, does not consider loss of off-site and on-site AC power a design basis event. The FSAR does address as a design basis event loss of off-site power with one diesel generator failing to start for a LOCA on one unit and an orderly shutdown of the other unit. Safety designs as outlined in the FSAR for the Transmission/Switchyard Systems, Auxiliary Power Systems, and Standby Power Systems require that these systems be designed for prompt shutdown during emergency conditions as described above.

In addition to regularly scheduled periodic tests and maintenance instructions to maintain the operability of the above systems, the NRC has required the Brunswick plant to verify the adequacy/reliability of the Power Distribution System. The CP&L responses to these NRC requests are listed below:

1. CP&L response dated October 25, 1976, to NRC letter dated August 12, 1976, Request for Information Concerning Vulnerability to Degraded Voltage Condition.

2. CP&L response dated March 6, 1979, to NRC letter dated June 3, 1977, Susceptibility of Redundant Safety-Related Electrical Equipment to:

    a. Sustained degraded voltage conditions at the off-site power source.

    b. Interaction of the on-site and off-site emergency power systems.

3. CP&L response dated October 8, 1979, to NRC letters dated August 8, 1979, and August 16, 1979.

    a. August 8, 1979, NRC letter concerning adequacy of station electric distribution systems voltage.

    b. August 16, 1979, Request for Additional Information Concerning On-Site Emergency Power Systems.

4. CP&L responses dated July 24, 1980 and February 16, 1981, to NRC letter dated May 16, 1980, Adequacy of Station Electrical Distribution System Voltages.

5. CP&L Special Test 79-33 for NRC Bulletin 79-23, Continuous 24-Hour Diesel Generator Load Test.

Listed below are special test procedures and studies performed by the Brunswick plant and the Architect-Engineer (A-E) to provide the above responses and verify equipment reliability/operability:

1. 480 V load study

Rev. 0	January 10, 1975
Rev. 1	March 1, 1978

2. Voltage drop study

Rev. 0	December 2, 1978
Rev. 1	February 6, 1978
Rev. 2	December 15, 1980

3. Voltage drop study (208/120 V safety related loads)

Rev. 0	October 31, 1980
Rev. 1	February 25, 1981
Rev. 2	March 23, 1982

4. Special Test Procedure, SP-79-24, Recirculation Pump Trip Test, Part B. High power turbine trip with simultaneous starting of the ECCS equipment to verify operability of all related electrical equipment loads on site distribution system.

5. Special Test Procedure, SP-79-33, 24-hour Diesel Generator NRC Load Test. Continuous 24-hour D/G load test where diesel generator was subjected to design and full load loads (IE Bulletin 79-23).

6. Special Test Procedures, SP-80-31, Degraded Voltage Test. On-site test to verify the analytical results of the voltage drop study.

7. CP&L Systems Planning Study of the Switchyard and Transmission System. Study to determine the switchyard voltage limits during worse case conditions.

The safety design basis for the 230 kV switchyard requires a design to minimize the effect of failures of individual items of equipment so that any single credible event would not interrupt power from the 230 kV system network. The switchyard is designed to provide adequate off-site power to start the units, provide power for plant common auxiliary loads, and when necessary, supply power for the engineered safety features for a unit in a design basis accident condition while supplying the auxiliary power requirements for shutdown of the other unit. Transmission for the plant consists of eight 230 kV lines, four lines for each unit, each line being capable of supplying off-site power to the plant. No single failure of the lines to one unit will interfere with transmission to the other units. The transmission lines meet the requirements of the General Design Criterion No. 17. CP&L has always operated its switchyard and transmission system in a reliable and safe manner. The latest CP&L systems planning study indicates that the switchyard voltage did not fall below 98% of nominal voltage during 1979. Earlier studies support this also. Should the voltage fall below a pre-determined level, emergency instructions for degraded voltage or loss of the switchyard are available to the operator for these events.

The diesel generator design basis requires that three diesels be capable of mitigating the consequences of a design basis accident on one unit and an orderly shutdown of the other unit. Each month the diesel generators are started and loaded to verify their readiness. In addition to the monthly test, every 18 months the plant subjects the diesels to a cold start with a

simulated loss of off-site AC power and a simultaneous LOCA. Each unit must come up to speed and voltage in 10 seconds and then sequentially accept a worse case LOCA load as defined in the FSAR. To further test the diesel generators, the NRC required the plant to perform a 24-hour continuous load test. Each diesel generator was subjected to a two-hour load of 3850 kw and a 22-hour full load of 3500 kw. The Brunswick plant feels that these tests have verified the reliablity of the diesel generators.

The safety design basis of the auxiliary power systems requires the system to provide sufficient normal and alternate sources of power to assure a capability for prompt shutdown and continuous maintenance of the plant in a safe condition. The preferred and standby auxiliary sources are sufficient in number and of such electrical and physical independence that no single credible event can negate all auxiliary power at one time. The buses are arranged so that the engineered safety features loads can be easily transferred to the standby diesel generators. The buses and system components are physically separated to limit or localize the consequences of electrical faults or mechanical accidents occurring at any point in the system. The Brunswick plant has been involved in extensive studies and on-site tests required by a NRC letter dated August 8, 1979, Adequacy of Station Electrical Distribution System Voltages. These studies and tests have been used to enhance the system design and verify the system reliability. A distribution system computer model has been generated and the plant has completed verifying the authenticity of the program. Authentication of the model was performed by on-site tests where a transient was introduced on the system and the results compared with the analytical results. The distribution system adequacy was further verified by Special Test 79-24, Part B. By tripping the unit at a load greater than 70 percent while simultaneously starting all ECCS pumps without the diesel generators starting subjected the unit distribution system to the most severe worse case conditions possible without jeopardizing the safety of the unit. The above tests prove the reliability of the unit distribution system.

In summary, the Brunswick plant does not consider the loss of off-site and on-site AC power a single failure criteria event, nor a design basis event. Consequently, the plant design, procedures, training, and requalification do not specifically address this scenario. Should an event of this type occur, the training and procedures presently being used would be sufficient to mitigate the event and restore either source of power. However, loss of on-site and off-site AC power is currently being addressed in the development of our symptom based emergency procedures. These procedures are tentatively scheduled for implementation in February 1983 pending NRC approval of BWR Owners' Group guidelines. Annual retraining on these procedures will be accomplished as part of normal requalification upon implementation of the new procedures. Simulator exercises cannot be committed to until procedures are completed and simulator capabilities to address this scenario are evaluated.

A discussion of the specific items outlined in your February 25, 1981 letter is provided below:

Item 1

The actions necessary and equipment available to maintain the reactor coolant inventory and heat removal with only DC power available including consideration of the unavailability of auxiliary systems such as ventilation and component cooling.

Response

Automatic actions following a loss of off-site power and failure of all four standby diesel generators to start include a turbine trip, reactor scram, MSIV closure and associated group isolations. Operator actions are to verify the appropriate actions have occurred and to ensure the reactor is shut down by observing control rod position. This information is available as the RPIS is powered from the Uninterruptible Power Supply (UPS) bus. The safety relief valves (SRVs) will be cycled to control pressure and HPCI and RCIC will be manually started. Reactor pressure will be maintained below 950 psig by manually cycling the safety relief valves in a manner which will evenly distribute the heat load to the suppression pool. When suppression pool temperature reaches 120°F, a controlled depressurization of the reactor will be initiated. Depressurization at this point lowers the temperature of the coolant and thereby decreases the driving potential for heat transfer to the drywell. It also allows pressure to be decreased at a time when HPCI and/or RCIC are able to maintain vessel level from the CST. Even if HPCI and RCIC then fail, no further coolant inventory would be lost until the reactor pressure reached the SRV setpoint.

Both HPCI and RCIC will operate independent of AC power or external cooling. Lubrication oil cooling is provided from each pumps discharge header. The CST reserves 100,000 gallons of water for HPCI and RCIC. Both pumps' suction valves will automatically transfer to the suppression pool upon sensing a low CST level or a high suppression pool level.

Each unit has eleven SRVs; seven of these valves on Unit No. 2 are equipped with air accumulators which store sufficient air to allow the valve to be cycled five times. All eleven SRVs on Unit No. 1 are equipped with these accumulators.

Restoration of AC power is coordinated with the system dispatcher. Current emergency instructions on loss of off-site power contain the necessary guidance to prevent equipment from starting when the AC power is restored to the plant.

Item 2

The estimated time available to restore AC power and its basis.

Response

Two parameters must be considered for determining the time available to restore AC power:

1. Time to dis.narge the station batteries.

2. Time HPCI and RCIC will run without room coolers before isolation on high temperature.

The most recent DC load study states that the worst case accident can be controlled for eight hours supplying all classes of loads with not more than 75 percent of rated ampere hour capacity. If all loads except nuclear safety-related are dropped, 36 percent of the battery capacity is required. The station battery capacity will allow enough time for the plant to assess the damage and implement appropriate actions.

The most limiting time factor results from HPCI and RCIC isolating due to high main steam tunnel temperature. A preliminary TMI study determined that without room coolers, the HPCI System could be expected to isolate after approximately one hour and five minutes. The RCIC System would isolate after approximately one hour and 35 minutes due to high temperature. These times are conservative since the room was considered to be totally insulated (no heat escaping via the walls, floors, pipes, etc.). As the HPCI and RCIC system became inoperable, additional time would be available before the core became uncovered as the water inventory boiled off through the relief valves. This time period is variable and is not considered in the run times for HPCI and RCIC.

Summarizing the above, the batteries could be expected to last approximately eight hours; however, the limiting parameter would be the temperature limitations imposed on the HPCI and RCIC Systems.

Items 3 and 4

3. The actions for restoring off-site AC power in the event of a loss of the grid.

4. The actions for restoring off-site AC power when its loss is due to postulated on-site equipment failures.

Response

Before the plant can propose actions to restore off-site AC power the event and extent of damage must be defined. Each scenario would be unique and require a unique solution. CP&L believes that the plant's existing emergency procedures for degraded voltage and station blackout will provide the operator with sufficient information in addition to his experience to manage an emergency of this type.

Item 5

The actions necessary to restore emergency on-site AC power. The actions required to restart diesel generators should include consideration of loading sequence and the unavailability of AC power.

Response

The operators have procedures for manual startup of the diesel generators. As in Response 4 above, the type of failure would dictate the solution. In the event of the loss of an emergency bus the respective diesel generator will start and tie to the affected bus. All the substations will remain tied to the emergency bus. The operator can manually add loads to the bus or in a LOCA situation the bus will automatically be stripped and the essential loads will be tied to the bus.

Item 6

Consideration of the availability of emergency lighting, and any actions required to provide such lighting, in equipment areas where operator or maintenance actions may be necessary.

Response

In the event of loss of all AC power the station lighting will not be operational. Two emergency DC lighting sources are provided. One source is powered from the station batteries, and the other source is powered from batteries internal to each emergency light. Each emergency source is initiated by loss of AC lighting power. Both sources are expected to operate for approximately eight hours. These DC emergency light sources will allow the personnel to safely move about the buildings and ensure the operators a lighted path to panels and equipment required for safe shutdown of the unit.

In addition, the plant maintains a substantial supply of large portable hand-held lights plus repair parts for any activity requiring lighting where power is unavailable. To further enhance the availability of portable lighting, the Brunswick plant has a mutual aid agreement with the local city fire department to provide the plant with its emergency generator and lights.

Item 7

Precautions to prevent equipment damage during the return to normal operating conditions following restoration of AC power. For example, the limitations and operating sequence requirements which must be followed to restart the reactor coolant pumps following an extended loss of seal injection water should be considered in the recovery procedures.

Response

Normal startup procedures would be followed for systems not affected by equipment damage and are prepared to avoid damage to system components. Appropriate precautions are noted within the body of the system operating procedures to ensure the operator's cognizance of an abnormal initial condition. Systems appearing to be damaged would be assessed and repairs made in a normal manner. After the damage was repaired and the system was ready to be placed into service, normal startup procedures would be followed.