CP&L

Carolina Power & Light Company

SERIAL: LAP-83-551

NOV 30 1983

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
REQUEST FOR ADDITIONAL INFORMATION
ELECTRICAL DISTRIBUTION SYSTEM VOLTAGES

Ref: Carolina Power & Light Company letter, S. R. Zimmerman, to Office of Nuclear Reactor Regulation, NRC, Adequacy of Station Electric Distribution Systems Voltages, November 23, 1982.

Dear Mr. Vassallo:

On October 17, 1983, Carolina Power & Light Company (CP&L) informed the NRC (CP&L letter LAP-83-454, P. W. Howe to D. B. Vassallo) that your request for additional information, dated September 1, 1983, would be responded to by November 30, 1983.

Enclosed are CP&L's responses to the questions asked concerning Enclosure 1 and 2 of the above referenced letter. The answers to Enclosure 3 of the referenced letter will be provided by January 31, 1984.

Should you have any questions concerning this letter, do not hesitate to contact a member of our licensing staff.

Yours very truly,

P. W. Howe

P. W. Howe
Vice President
Brunswick Nuclear Project

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PPC/cfr (8592PPC)
Enclosures

cc: Mr. D. O. Myers (NRC-BSEP)
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Carolina Power & Light Company
Answers to Request for
Addition Information Concerning
Electrical Distribution System Voltages

A. The following items are to clarify the referenced letter, Enclosure 1.

Question 1

The BOP relays are not Class 1E, and sense the voltage on non-Class 1E buses. Only Items e, f, and g are Class 1E item d is on a BOP bus and is a voltage relay.

Response

All relays (Items a through d) are nonsafety-related relays and sense the voltage on BOP bus. The other relays (Items e through g) located on E-bus are safety-related relays purchased in accordance with UE&C specification 9527-01-145-2. The seismic testing defined within this specification was performed in accordance with IEEE-344.

Question 2

Describe how the overvoltage coil is used as an undervoltage coil (Items a, b, and e).

Response

The relays used for Items a, b, and e are under/over voltage relays with one operating coil and double throw contacts.

The left-hand contacts close as the voltage increases to some predetermined value. The right-hand contacts close when the voltage decreases to some lower value. Between these two voltage values, both contacts are open.

Question 3

Justify a Class 1E function initiated from non-Class 1E relays.

Response

The undervoltage protection controls for safety-related systems are designed to be controlled primarily by the signals from a relay located on the E-bus. In addition, back-up control signals sensed by BOP buses are also provided to increase the reliability of the control function as summarized under this section.

NOTES:
1. * denotes primary signal. ** denotes back-up signal.
2. Permissives not performed by undervoltage relays are not shown (i.e., valve limit switches, etc.).

a. Diesel Generator Breaker

Diesel generator breaker closes when:

*(1) Loss of E-bus power sensed by 27HS and DG output voltage sensed by 59D is normal

OR

*(2) Loss of E-bus power sensed by 27/59E and all incoming and tie breakers are open.

b. E-Bus Tie Breaker

E-bus tie breaker trips if:

*(1) Loss of an associated E-bus power sensed by 27/59E

OR

*(2) Loss of emergency power on the other E-bus which is tied with the associated E-bus.

c. E-Bus Inc. Feeder Breaker (Slave)

Slave breaker trips if:

*(1) Degraded voltage on E-bus is sensed by two-out-of-three logic of 27DV relays.

(2) Master breaker trips.

d. Safety-Related Load Shedding

All feeder breakers except for unit substation loads will be tripped when:

*(1) Loss of E-bus power sensed by 27/59E

AND

(2) The associated DG breaker is open.

e. NSW Pump

The following conditions permit sequential loading of the safety-related NSW pump:

*(1) E-bus power sensed by 27-1 and 27-2 is available

(2) LOCA signal exists

AND

*(3) DG feeder breaker closed or E-bus power sensed by 27-59E is available.

f. RHR & RCS Pumps

Sequential Loads

The following conditions permit sequential loading of the safety-related RHR & RCS pumps:

RHR & RCS pumps

*(1) E-bus power sensed by 27-1 is available

AND

(2) LOCA signal occurs

AND

**(3) Loss of BOP-bus power sensed by 27-1

AND

*(4) DG feeder breaker closed or E-bus power sensed by 27/59E is available.

Bypassing Sequential Loads

RHR and RCS loads bypass when:

*(1) E-bus power sensed by 27-1 or 27-2 is available

AND/OR

**(2) BOP-bus power sensed by 27-1 is available.

g. Diesel Generator

Diesel generator starts when:

*(1) Loss of emergency power sensed by 27HS

OR

**(2) Loss of power on BOP-bus sensed by 27HS, 27/59U, or 27/59S.

To reiterate, all required safety-related functions are performed by qualified undervoltage relays located on the E-bus. The BOP-bus relays are utilized to enhance the primary control functions such as for Item f and g above.

B. The following items are to clarify the referenced letter, Enclosure 2:

Question 4

In Section 2.1, what are the equipment ratings? Are they within the analyzed voltages? If outside, assess equipment operation/damage.

Response

The nominal voltage ratings of the devices are 115 V as specified under Section 5.0 of the "Voltage Drop Study for 208/120 Volt Safety-Related Loads," Revision 2, previously forwarded to the NRC.

The recommended operating voltage ranges for relay coils and solenoids are 90%-110% of 115 V (nominal voltage).

The summary of the load study shows that all instrumentation devices will be over 90% of the rated voltage at twice LOCA conditions. (Refer to the table for worst case terminal voltage.)

The maximum overvoltage case could occur at device terminals when a unit is shutdown, resulting in overheating of coils. This overheating could affect the life span of the continuously energized coils. This is not seen as a significant problem and is supported by operating experience.

Furthermore, the actual overvoltage value will be mitigated since this study was based on switchyard voltage of 100%, which is expected to drop to 96% at off-peak and 98% at peak.

Worst Case Terminal Voltage

Unit	Panel	Base Voltage	Actual Voltage	Voltage Drop	Terminal Voltage	Condition
E7	32AB	208	185	0.6	106.2 (92.3%)	2 x (LOCA)
E7	2C	208	185	0.06	132.2 (115%)	SAT Light Load
E8	2B	208	185	3.0	103.8 (90.3%)	2 x (LOCA)
E8	2D	208	185	0.05	132.16 (114.6%)	SAT Light Load

NOTES:

1. Actual panel voltage is line-to-line voltage in 3 phase, 4 wire system.

2. Terminal voltage is phase-to-ground voltage.

   terminal vtg = (actual line vtg/$\sqrt{3}$) = vtg drop

Question 5

Clarify Section 2.3: Have the recommended tap settings been implemented?

Response

The suggested tap changes have been made as per PM-80-246, 247, 257, and 258.

(8592PPC cfr)