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Carolina Power & Light Company

August 1, 1979

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Mr. James P. O'Reilly, Director
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 & 2
LICENSE NOS. DPR-71 AND DPR-62
DOCKET NOS. 50-325 AND 50-324
RESPONSE TO IE BULLETIN 79-12

Dear Mr. O'Reilly:

In response to your letter of May 31, 1979, transmitting IE Bulletin 79-12, Carolina Power & Light Company submits the following response:

We have completed a preliminary review and evaluation of factors relevant to short period scrams and have formulated a program we feel will appropriately and adequately address this problem.

Our evaluation indicates that short period scrams can be generally classified into two types; namely, high notch worth situations usually encountered on start-ups near peak xenon, and rod withdrawal beyond the point of criticality in "notch override." The resultant reactivity input can cause a scram from the intermediate range instrumentation.

We have concluded that this type of occurrence is of operational concern due to lost availability although it has minimal safety significance. This conclusion does not lessen our intention to resolve this concern.

Our preliminary studies for performing accurate estimated critical position (ECP) calculations indicate that this is a complex task and, even if successful, could not be implemented in a short time frame. Due to the complexity of accounting for time varying nodal xenon changes and temperature corrections, the uncertainty in the calculation is anticipated to be large enough to have the potential to give the reactor operator a false sense of security with regard to anticipated criticality. This may result in a short period scram where none would have occurred if the operator was anticipating criticality at any time based on an interpretation of source range level and period instrumentation.

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With regard to short period scrams during high xenon situations, we have already incorporated General Electric's recommended reduced notch worth procedures into our rod withdrawal sequences and have not experienced problems in this regard. In addition, General Electric has advised us that they do not believe there have been any scrams due to xenon induced high notch worths at plants that have incorporated the reduced notch worth procedures.

We have reviewed and evaluated the operability of the "Emergency Rod In" switch and have come to the following conclusions:

1. The "Emergency Rod In Notch Override" switch is a General Electric type SBM switch. In general, the switch is very rugged and reliable although any design is subject to malfunction when excessive force is applied.

2. The bent switch stop is a possible mode of malfunction although this should not preclude the operator's ability to insert rods since in this mode the switch wiper makes contact, then goes past contact due to a bent mechanical stop. The momentary contact deenergizes the reactor manual control timer enabling the "Rod Movement Control" switch to perform the "Emergency In" function. Consequently, the "Emergency In Rod Notch Override" switch, even with a bent mechanical stop, does not preclude rapid rod insertion.

3. We are satisfied with the ruggedness and reliability of the "Emergency In Notch Override" switch. Also, the "In-Off-Out Notch" switch serves as a backup to the "Emergency In Notch Override" switch.

Operator training and awareness appear to be the best short-term methods for prevention of short period scrams due to notching past criticality.

Prior to restarting Unit Nos. 1 and 2 after the most recent refueling, a formal training package was formulated and reviewed by licensed personnel. The material used as a reference for this package was reactor theory with special emphasis given to subcritical multiplication, rod worth, and values of reactivity for rod groups, xenon, heatup, etc. Also stressed were the chart traces obtained through NRC of the short periods experienced at Browns Ferry (dated January 18, 1979) and Hatch (dated January 7, 1970) Plants. This package will become a part of the hot license class as well as all retraining classes scheduled in the future.

Response Summary:

1. Our intention is to use single notch or bank notch withdrawal for groups two through four when criticality is anticipated to occur in groups two through four. Operating procedures have been revised to provide for bank notch withdrawal. Bank notch withdrawal is a General Electric approved method of reducing notch worth.

   We are currently continuing our development program for a calculation of the critical rod pattern. However, we expect it will take six to twelve months to reach the point where the program's accuracy can be checked against actual reactor physics.

2. Operating procedures have already been revised to include General Electric's recommended reduced notch worth procedures and we have not experienced problems due to unusual conditions such as high xenon.

3. We have reviewed our control rod withdrawal sequences and determined that they minimize the notch worths of individual control rods. With rod worth minimizer (RWM) and rod sequence control system (RSCS) restraints imposed, there is little remaining other than banked position withdrawal that can further reduce notch worths.

   a. Due to Technical Specifications requirements for RWM and RCSC, special rod sequences are not appropriate.

   b. Although some general cautions could be made on situations that can result in high notch worth, these cautions do not apply in all cases. For example, one normally expects the first rod(s) to exhibit the highest worth. This is not always the case; in fact, we have a case currently where the highest worth rod in the critical group is the fourth from the last rod in a sixteen-rod group. Such an inaccurate caution in the procedure could cause the reactor operator to believe that he has withdrawn the highest worth rods in that group when, in fact, he has not done so. We feel that the principles of rod worth are better explained in the classroom rather than in the operating procedure so that the general case, as well as the exceptions, can be discussed.

4. Operability of the "Emergency Rod In Notch Override" switch under prolonged severe use has been reviewed and we are satisfied that the switch is sufficiently rugged and reliable.

5. On-shift training has already been completed as previously discussed and the reactor operator training and retraining programs will emphasize the factors relevent to prevention of short period scrams. Again, we feel that training is currently the best solution for prevention of short period scrams.

If our development program for a calculated estimated critical position is successful, we plan to include this in our overall solution to resolve the short period scram problem. However, the problem of providing accurate critical rod position estimation under time varying nodal xenon and temperature changes in the BWR reactor is formidable.

We trust that this information satisfies the requirements of IE Bulletin 79-12.

Very truly yours,

for E. E. Utley
Executive Vice President
Power Supply & Customer Services

MAJ:CSB:dcj*

cc: Mr. Norman C. Moseley