CP&L

Carolina Power & Light Company

OCT 11 1982

Office of Nuclear Reactor Regulation
ATTN: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
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
BRUNSWICK EOF/TSC SHIELDING STUDY

Dear Mr. Vassallo:

On August 4, 1982, Carolina Power & Light Company (CP&L) submitted to the NRC for review a radiation shielding study for the proposed Brunswick Emergency Operations Facility/Technical Support Center (EOF/TSC). Since that time, several phone conversations have taken place between CP&L, the NRC Staff and the NRC's contractor (Battelle Northwest Laboratories). Attached please find CP&L's responses to concerns raised by Battelle and the NRC during those conversations.

It is CP&L's belief that the attached information should close out all of the NRC's concerns. Carolina Power & Light Company, therefore, requests your written concurrence on the acceptability of the proposed facility design by October 25, 1982.

If you have any further questions, please contact me or my staff.

Yours very truly,

S. R. Zimmerman
Manager
Licensing & Permits

JJS/mf (5510C4T1)
Attachment

A001

cc: Mr. H. R. Denton (NRC)
Mr. D. O. Myers (NRC-BSEP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. J. A. Van Vliet (NRC)
Mr. E. F. Williams, Jr. (NRC-EPDB)

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NRC Question 1: The report does not indicate which reactor building (Unit 1 or Unit 2) was used for the direct irradiation calculation. Although it is obvious from the site plan that Unit 2 should be used, the difference in results is large enough to warrant identifying the reactor building chosen.

Response: The Unit 2 reactor building which is closest to the TSC/EOF was used as the basis for the analysis of direct radiation from the secondary containment.

NRC Question 2: The 0.5 percent χ/Q mentioned in Section 2.2 should be the 5.0 percent χ/Q as identified in Regulatory Guide 1.145.

Response: Since the χ/Q values are based on explicit directions affecting the TSC/EOF, a sector-dependent approach was used. In accordance with Regulatory Guide 1.145, the proper selection criterion is the 0.5 percentile value within each sector, normalized relative to total observations in all sectors. The 5.0 percentile value mentioned in the question would be appropriate only if direction independent χ/Q values were used.

NRC Question 3: Section 2.2 states that when considering releases from the stack, winds from the E, ESE, and SE affect the TSC/EOF. Although directions are not identified on the site plan (Figure 1-1), reference to the statement on page 1-2 identifying the north wall of the TSC/EOF and to the emergency plan leads to the conclusion that winds from the NNE, NE, and ENE would affect the TSC/EOF. It appears that winds from the ENE would blow a plume from the stack directly over the TSC/EOF and thereby create the highest direct irradiation and χ/Qs. Therefore, the calculated doses attributed to the plume may not be conservative.

Response: The confusion about wind directions arises from the use of different reference frames. The wind directions used in calculating χ/Qs are relative to "true" north, while the wall described on page 1-2 is relative to "plant" north. "True" north is directed approximately forty-five degrees west of "plant" north.

NRC Question 4: The windspeed and stability class used to produce the χ/Qs listed in Table 2-1 are not identified. The orientation of the plume with respect to the TSC/EOF is not identified (and is suspect because of the wind directions chosen). It is not clear from the description of the CYLDOSE program (pg C-15) if any approximations were used to calculate the direct dose from the plume, and if so, whether a single or multiple line sources were used.

Response: The χ/Q values listed in Table 2-1 were obtained by calculating χ/Q for each combination of wind speed, wind direction and atmospheric stability class listed in Appendix A of NUS 4148. For the wind directions representing winds from the E, ESE, and SE, the χ/Q values were ranked, and the joint frequency distributions of Appendix A to NUS 4148 used to ascertain the value of χ/Q within each sector which is exceeded 0.5 percent of the time. Thus no single wind speed and stability class combination is associated with χ/Q values reported.

The CYLDOSE program was used to calculate dose attenuation factors for various concrete thicknesses by using the end cylinder on axis option to approximate an infinite disc source. The attenuation factors calculated were then applied to the semi infinite cloud immersion dose to obtain the contribution from passing plume to the dose rate in the building.

NRC Question 5: Parameters (e.g., geometrical factors) used in the calculations of shine (direct irradiation) from the reactor building and plume are not identified. For example, the distance from the reactor building to the TSC/EOF is not given, the solid angle that the 18" thick wall intercepts is not identified, the height and volume of the reactor building is not included nor is the height of the TSC/EOF. Furthermore, the orientation and distance of the plume relative to the TSC/EOF are not identified.

Response: Both the TSC/EOF building and the secondary containment (reactor building) were modeled explicitly using the KAP-VI point kernel computer program to ascertain direct shine dose. A schematic representation is shown on Figures Q5-1 and Q5-2. The passing plume dose contribution was calculated as described in the response to Question 4.

NRC Question 6: The graph presented in Figure 3-2 implies that 18" of concrete will reduce the 30 day TSC/EOF dose equivalent to 2.2 rem and 14" will allow 11 rem. On page 1-2, the 30 day dose equivalent is stated to be 2.4 rem. To a first approximation then, 98 percent of the shielding is due to the 18" thick wall that accounts for only about 20 percent of the building surface. Information sufficient to confirm the shielding ability of the 18" thick wall is lacking, as described in item 5.

Response: The whole body dose contributions for each radiation source is presented in Table 3-2 (page 3-7) of NUS 4148. The dose contribution due to activity in the secondary containment is primarily due to radiation which passes through the 18" wall on the "plant" north of the TSC/EOF. This is due to the fact that the secondary containment is located on this side of the building (see Figure Q5-1).