New Hampshire
Yankee

Ted C. Feigenbaum
President and
Chief Executive Officer

NYN- 91055

March 29, 1991

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

References:
(a) Facility Operating License No. NPF-86, Docket No. 50-443

(b) USNRC Letter dated January 31, 1991, "Seabrook Offsite Dose Calculation Manual (TAC No. 77672), G.E. Edison to T.C. Feigenbaum

(c) NHY Letter NYN-90189 dated October 26, 1990, "Request for Offsite Dose Calculation Manual Review", T.C. Feigenbaum to USNRC

(d) October 16, 1990 Meeting between NHY and NRC, Noticed September 28, 1990

(e) NHY Letter SBN-1168 dated July 22, 1986, "Seabrook Station Offsite Dose Calculation Manual, (ODCM); Revised Manual, G.S. Thomas to V.S. Noonan

Subject: Request for Additional Information

Gentlemen:

In response to a request from the NRC Staff [Reference (b)] New Hampshire Yankee (NHY) is providing information regarding Staff comments on the Seabrook Station Offsite Dose Calculation Manual (ODCM). Detailed responses to the Staff comments are provided in the Enclosure. It is anticipated that the ODCM will be revised to incorporate the appropriate items from the Enclosure by July 1991. We trust that this information should satisfactorily address your concerns.

Should you require additional information regarding this matter please contact Mr. James M. Peschel, Regulatory Compliance Manager, at (603) 474-9521, extension 3772.

Very truly yours,

Ted C. Feigenbaum

Ted C. Feigenbaum

TCF:JMP/act
Enclosure

9104040286 910329
PDR ADOCK 05000443
P PDR

040086

A009

cc: Mr. Thomas T. Martin
Regional Administrator
United States Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Mr. Gordon E. Edison, Sr. Project Manager
Project Directorate I-3
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Noel Dudley
NRC Senior Resident Inspector
P.O. Box 1149
Seabrook, NH 03874

New Hampshire Yankee
March 29, 1991

ENCLOSURE 1 TO NYN-91055

RESPONSE TO NRC COMMENTS ON SEABROOK ODCM
DATED OCTOBER 26, 1990

Comment A.1:

When Method II is used to calculate dose rates, a statement should accompany the reported doses which 1) states that Regulatory Guide 1.109 has been followed or 2) explicitly describes any deviations in methodology, assumptions and input parameters from Regulatory Guide 1.109 and the bases for the deviations.

Response A.1:

Dose assessment reports prepared in accordance with the requirements of the ODCM will include a statement indicating that the appropriate portions of Regulatory Guide 1.109 (as identified in the individual subsections of the ODCM for each class of effluent exposure) have been used to determine dose impact from station releases. Any deviation from the methodology, assumptions, or parameters given in Regulatory Guide 1.109 and not already identified in the bases of the ODCM will be explicitly described in the effluent report along with the bases for the deviation.

The next amendment to the Seabrook ODCM will include the above statement as documentation of this commitment.

Comment A.2:

The bases used in determining the occupancy factors of 67 hours/year for the "Rocks" and 12.5 hours/year for the Education Center should be provided and justified.

Response A.2:

The "Rocks" is a boat landing area which provides access to Browns River and Hampton Harbor. The Seabrook FSAR, Chapter 2.1, indicates little boating activity in either Browns River or nearby Hunts Island Creek has been observed upon which to determine maximum or conservative usage factors for this onsite shoreline location. As a result, a default value for shoreline activity as provided in Regulatory Guide 1.109, Table E-5, for maximum individuals was utilized for determining the "Rocks" occupancy factor. The 67 hours/year corresponds to the usage factor for a teenager involved in shoreline recreation. This is the highest usage factor of all four age groups listed in Regulatory Guide 1.109, and has been used in the ODCM to reflect the maximum usage level irrespective of age.

Regulatory Guide 1.109 does not provide a maximum individual usage factor for activities similar to those which would be associated with the Seabrook Education Center. Therefore, the usage factor used in the ODCM for the Education Center reflects the observed usage patterns of visitors to the facility. Individuals in the public who walk in to look at the exhibits on display and pick up available information stay approximately 1.5 hours each. Tour groups who schedule visits to the facility stay approximately 2.5 hours. For conservatism, it was assumed that an individual in a tour group would return 5 times in a year, and stay 2.5 hours on each visit. These assumptions when multiplied together provide the occupancy factor of 12.5 hours/year used in the ODCM for public activities associated with the Education Center.

The next amendment to the ODCM will include the above description as documentation of the bases of the occupancy factors used for onsite receptors.

Comment A.3:

Justification should be provided for displacing the nearest monitor for airborne activity sampling approximately 90 degrees from the direction in which the highest primary vent stack long term annual average site boundary D/Q (Table B.7-4) is calculated.

Response A.3:

The intent of the D/Q value cited in Table B.7-4 of the ODCM is for calculations of dose to man resulting from deposition of radioactivity through the food crop and forage pathways. Since these pathways are open most effectively during the growing season, the maximum 6-month growing season D/Q value (Northwest site boundary) was generated using 6 years of meteorological data (for the months of April through September). This D/Q value is intended only for the specialized purpose of calculating maximum individual doses with pathways that include food ingestion.

For the purpose of siting air sampling stations, a maximum 12-month annual D/Q value has been used. The 12-month D/Q is appropriate for this situation because the air samplers are intended for direct measurement of airborne radioactivity year-round. Using the 12-month D/Qs (based on 6 years of met data), the sector with the highest primary vent stack long term annual average site boundary D/Q shifts to the Southwest sector. A continuous sampler (station AP/CF-03) is currently located near this point at 0.8 km from the Unit 1 Containment in the Southwest sector.

Comment A.4:

The bases for the use of a mixing ratio of 0.10 for Method I and 0.025 for use with Method II for the dose due to liquid effluents should be justified, since Section 4.3 of NUREG-0133 recommends a value of 1.0.

Response A.4:

The requirements for the determination of radiological impacts resulting from releases in liquid effluents is derived from 10 CFR part 50, Appendix I. Section III.A.2 of Appendix I indicates that in making the assessment of doses to hypothetical receptors, "The applicant may take account of any real phenomenon or factors actually affecting the estimate of radiation exposure, including the characteristics of the plant, modes of discharge of radioactive materials, physical processes tending to attenuate the quantity of radioactive material to which an individual would be exposed, and the effects of averaging exposures over time during which determining factors may fluctuate." In assessing the liquid exposure pathways that characterize Seabrook Station, the design and physical location of the circulating water discharge system needs to be considered within the scope of Appendix I.

Seabrook utilizes an offshore submerged multiport diffuser discharger for rapid dissipation and mixing of thermal effluents in the ocean environment. The 22-port diffuser section of the discharge system is located in approximately 50 to 60 feet of water with each nozzle 7 to 10 feet above the sea floor. Water is discharged in a generally eastward direction away from the shoreline through the multiport diffuser, beginning at a location over 1 mile due east of Hampton Harbor inlet. This arrangement effectively prevents the discharge plume (at least to the 1 degree or 40 to 1 dilution isopleth) from impacting the shoreline over the tidal cycle.

Eleven riser shafts with two diffuser nozzles each form the diffuser, and are spaced about 100 feet apart over a distance of about 1000 feet. The diffusers are designed to maintain a high exit velocity of about 7.5 feet per second during power operations. Each nozzle is angled approximately 20 degrees up from the horizontal plane to prevent bottom scour. These high velocity jets passively entrain about 10 volumes of fresh ocean water into the near field jet mixing region before the plume reaches the water surface. This factor of 10 mixing occurs in a very narrow zone of less than 300 feet from the diffuser by the time the thermally buoyant plume reaches the ocean surface. This high rate of dilution occurs within about 70 seconds of discharge from the diffuser nozzles.

The design of the multiport diffuser to achieve a 10 to 1 dilution in the near field jet plume, and a 40 to 1 dilution in the near mixing zone associated with the 1 degree isotherm, has been verified by physical model tests (ref. "Hydrothermal Studies Of Bifurcated Diffuser Nozzles And Thermal Backwashing - Seabrook Station", Alden Research Laboratories, July, 1977).

During shutdown periods when the plant only requires service water cooling flow, the high velocity jet mixing created by the normal circulating water flow at the diffuser nozzles is reduced. However, mixing within the discharge tunnel water volume is significantly increased (factor of about 5) due to the long transit time (approximately 50 hours) for batch waste discharged from the plant to travel the 3 miles through the 19 ft diameter tunnels to the diffuser nozzles. Additional mixing of the thermally buoyant effluent in the near field mixing zone assures that an equivalent overall 10 to 1 dilution occurs by the time the plume reaches the ocean surface.

The dose assessment models utilized in the ODCM are taken from NRC Regulatory Guide 1.109. The liquid pathway equations include a parameter (Mp) to account for the mixing ratio (reciprocal of the dilution factor) of effluents in the environment at the point of exposure. Table 1 in Reg. Guide 1.109 defines the point of exposure to be the location that is anticipated to be occupied during plant lifetime, or have potential land and water usage and food pathways as could actually exist during the term of plant operation. For Seabrook, the potable water and land irrigation pathways do not exist since salt water is used as the receiving water body for the circulating water discharge. The three pathways that have been factored into the assessment models are shoreline exposures, ingestion of invertebrates, and fish ingestion.

With respect to shoreline exposures, both the mixing ratios of 0.1 and 0.025 are extremely conservative since the effluent plume which is discharged over 1 mile offshore never reaches the beach where this type of exposure could occur. Similarly, bottom dwelling invertebrates either taken from mud flats near the shoreline, or from the area of the diffuser, are not exposed to the undiluted effluent plume. The shore area is beyond the reach of the surface plume of the discharge, and the design of the upward directed discharge nozzles along with the thermal buoyancy of the effluent, force the plume to quickly rise to the surface without affecting bottom organisms.

Consequentially, the only assumed exposure pathway which might be impacted by the near field plume of the circulating water discharge is fin fish. However, the mixing ratio of 0.1 is very conservative because fish will avoid both the high exit velocity provided by the discharge nozzles and the high thermal temperature difference between the water discharged from the diffuser and the ambient water temperature in the near field. In addition, the dilution factor of 10 is achieved within 70 seconds of discharge, and confined to a very small area thus prohibiting any significant quantity of fish from reaching equilibrium conditions with radioactivity concentrations created in the water environment.

The mixing ratio of 0.025 which corresponds to the 1 degree thermal near field mixing zone is a more realistic assessment of the dilution to which fin fish might be exposed. However, even this dilution credit is conservative since it neglects the plants operational design which discharges radioactivity by batch mode. Batch discharges are on the order of only a few hours in duration several times per week, and thus the maximum discharge concentrations are not maintained in the environment long enough to allow fish to reach equilibrium uptake concentrations as assumed in the dose assessment modeling. When dose impacts from the fish pathway are then added to the very conservative dose impacts derived for shoreline exposures and invertebrate ingestion, the total calculated dose is very unlikely to have underestimated the exposure to any real individual.

The recommended value for dilution of 1.0 given in NUREG-0133 is a simplistic assumption provided so that a single model could be used with any plant design and physical discharge arrangement. For plants that utilize a surface canal type discharge structure where little entrainment mixing in the environment occurs, a dilution factor of 1.0 is a reasonable assumption. However, in keeping with the guidance provided in Appendix I to 10 CFR 50, Seabrook has determine site specific mixing ratios which factor in its plant design.

The next amendment to the ODCM will include the above description as documentation of the bases of the mixing ratios used in the liquid dose assessment models.

Comment A.5:

Equations that contain the term EL(R) (e.g., in Sections 3.4, 3.5, 3.6, 7.2.1, 7.2.2 and 7.2.3) should be modified to show that there is actually a sum over EL(R)=1.0 and EL(R)="value from Table B.1-15."

Response:

The purpose of the EL(R) term in each of the dose equations in the ODCM is to permit assessment of radiological impacts from plant effluents for both plant vent stack releases, as well as any contribution from ground level sources such as chem lab hoods if they occur. It is not meant to imply that the calculated contribution from different release sources do not need to be added together to determine Station compliance with the Radiological Effluent Technical Specifications. Station procedures which implement the methods given in the ODCM recognize that all plant releases need to be considered in determining offsite dose assessments.

In order to insure that this requirement is clearly understood, the next amendment to the ODCM will include a clarification that states that the sum of doses from both plant vent stack (EL(R)=1.0) and ground level releases (EL(R)= "values from Table B.1-15") must be considered for determination of Technical Specification compliance.