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Docket Nos. 50-424/425

MEMORANDUM FOR: Elinor G. Adensam, Chief
Licensing Branch No. 4, DL

FROM: William P. Gammill, Chief
Meteorology and Effluent Treatment Branch, DSI

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION ON METEOROLOGY FOR VOGTLE

Enclosed are requests for additional information (RAI) on meteorology resulting from our review of the Final Safety Analysis Report (FSAR) for the Vogtle Electric Generating Plant. A number of RAIs are identical to those transmitted as part of our acceptance review of the Environmental Report (see my 10/21/83 memorandum to you). The duplicated RAIs are: 451.05 (E451.03); 451.06 (E451.05); 451.07 (E451.04); 451.08 (E451.09); 451.09 (E451.10); 451.10 (E451.06); 451.11 (E451.07); 451.12 (E451.11); 451.13 (E451.12); 451.14 (E451.13); 451.17 (E451.14); 451.18 (E451.15); and, 451.19 (E451.16). We have duplicated the RAIs to maintain continuity on our review of the FSAR. Cross-references to responses to the ER RAIs would be acceptable as responses to the FSAR RAIs.

We are also in the process of extracting meteorological data from a magnetic tape provided by the applicant. Our analyses of these data may result in additional RAIs. If so, we will transmit them as expeditiously as possible.

These RAIs were developed by J. Fairobent, meteorology reviewer for this facility. Any questions should be directed to Mr. Fairobent at x29427.

Original signed by:
William P. Gammill

William P. Gammill, Chief
Meteorology and Effluent Treatment Branch
Division of Systems Integration

Enclosure:
As stated

cc: R. Mattson
D. Muller
R. Capra
M. Miller
I. Spickler
J. Fairobent

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451.0 METEOROLOGY

451.01 The discussion of lightning in Section 2.3.1.2.7 includes an estimate of the number of flashes to earth per thunderstorm-day per square kilometer. According to information presented in NUREG/CR-2252, "National Thunderstorm Frequencies for the Contiguous United States," the area of the Vogtle site experiences about 80 thunderstorms each year. The number of lightning strikes to safety-related structures, systems, and components, is a function of the number of thunderstorms and the "attractive area" of plant structures (see J. L. Marshall, Lightning Protection, 1973).

Provide seasonal and annual estimates of lightning strikes to safety-related structures, systems, and components considering the frequency of thunderstorms and the "attractive area" of plant structures.

451.02 The discussions of snowloads in Section 2.3.1.2.3 and its cross-reference to Section 2.4.2.3 indicate different magnitudes of snowload. Provide the bases for the snowload of 30 psf, referenced in Section 2.4.2.3 as the snowload "applied to the roofs of all Seismic Category I structures," and provide cross-references to other sections of the FSAR where snowloads are considered in various load combinations for severe environmental and extreme environmental loadings on the roofs of safety-related structures.

451.03 The period of record examined for hurricanes (Section 2.3.1.2.5) ended in 1969. Identify any hurricanes, tropical storms, or depressions, which have passed within 100 miles of the Vogtle site since 1969.

451.04 a) Identify meteorological conditions (including extreme temperatures, pressure, humidity, and wind speeds) considered in the design of safety-related auxiliary systems and components (e.g., the heating, ventilating, and air conditioning system, impulse lines, service water valves, steam isolation valves, and the diesel generator air intake and exhaust system).

b) Provide the bases for the selected values, including magnitude and duration.

c) Compare the selected design basis values with severe or extreme meteorological conditions observed in the region through 1983.

d) Compare the selected design basis values with extreme (e.g., 100-year recurrence) meteorological conditions presented in Sections 2.3.1 and 2.3.2, considering magnitude and duration. For extreme temperatures, also compare the selected design basis values with the 100-year recurrence values presented in NUREG/CR-1390, "Probability Estimates of Temperature Extremes for the Contiguous United States."

e) Provide cross-references to appropriate sections of the FSAR where these meteorological conditions are considered in the design of safety-related auxiliary systems and components.

451.05 Meteorological data are provided for four separate periods. According to the text on page 2.3.2-1 of the FSAR, these periods are: December 1972-December 1973; April 1977-April 1979; and April 1980-March 1981. However, in Tables 2.3.2-14, 2.3.2-15, 2.3.2-16, and 2.3.2-17, the first period of record is identified as December 1973-December 1974. Correctly identify the first period of record and provide the bases for the selection of these periods of record. Provide a discussion of the status of the onsite meteorological measurements program during the intervening periods and indicate whether the instrumentation and data recording and reduction procedures in use during these particular periods allow the data sets to be combined. If the data sets can not be combined, provide a discussion of the changes in the data collection and reduction program which preclude combining of the various data sets.

451.06 Provide a comparison of monthly and annual precipitation amounts measured at the site with concurrent data from Augusta, GA and contrast these observations with the climatological normals for Augusta, GA presented in Table 2.3.2-1 of the FSAR. Also, provide

a discussion of the difficulties in measurement of precipitation at the Vogtle site "during the 1980-81 site year" (see page 2.3.2-4 of the FSAR).

451.07 Based on the information presented in Tables 2.3.2-15 and 2.3.2-19 of the FSAR, extremely unstable conditions (Pasquill type "A") occur at an extremely high frequency (almost 19% for the 3-year composite period presented in Table 2.3.2-15 and almost 17% for the period April 1980-March 1981) at the Vogtle site, based on measurements of vertical temperature difference between 150 and 33 feet.

a) Provide the distribution of atmospheric stability conditions for each period of record included in the composite data set presented in Table 2.3.2-15 of the FSAR (see E451.03).

b) Provide a discussion of the year-to-year variability of stability conditions and discuss the reasonableness of the large fraction of extremely unstable conditions observed at the Vogtle site, considering the atmospheric mechanisms for generating thermal instability, the classification scheme used, the location of the meteorological tower and orientation of the temperature sensors, the surface characteristics around the tower, and the location of the site.

451.08 Table 2.3.2-2 of the FSAR presents the parameters measured on the Vogtle meteorological tower, the heights of measurement, and the instrument and/or sensor characteristics. Provide estimates of the overall system accuracy for each parameter, considering errors introduced by the sensor, cable, signal conditioner, and data reduction process, and compare these system accuracies with those presented in Regulatory Guide 1.23.

451.09 The technique for measuring vertical temperature gradient at the Vogtle site is not clear from the information presented in Table 2.3.2-2 of the FSAR. Vertical temperature gradient is most often measured directly (e.g., through a resistance bridge circuit) to obtain the measurement system accuracy for this parameter specified in Regulatory Guide 1.23. Generally, the subtraction of two temperature measurements is considerably less accurate than a direct measure of temperature difference. At other sites reviewed by the NRC an accuracy of vertical temperature gradient determined by the subtraction of two temperatures has often exceeded the specification in Regulatory Guide 1.23.

a) Provide an expanded discussion of the measurement of vertical temperature gradient and clarify the measurement technique.

b) If vertical temperature grandient is determined by subtraction of two temperatures, i) indicate whether the

sensors are matched at installation and replacement; ii) indicate the "drift" between sensors found at instrument calibration; iii) identify the average period considered for the determination of temperature difference; and iv) clarify the computational procedures for the determination of temperature difference computed for each interrogation of the sensors or from a ensemble average of temperature measurements?).

451.10 The topographic features within five miles of the plant, as presented in Figure 2.3.2-55 of the FSAR, are difficult to discern. Either provide a larger, more legible copy of Figure 2.3.2-55, which includes elevation contours, or provide a plot of maximum elevation versus distance out to five miles from the center of the station to each of $22\text{-}1/2^{0}$ compass sectors, similar to the topographic profiles presented in Figure 2.3.2-57 of the FSAR only with an expanded vertical scale.

451.11 Provide a large-scale figure of the plant site and immediate vicinity which identifies the location of the current and proposed (see E451.13) meteorological towers (and all towers used to collect meteorological data at the Vogtle site), the containment buildings and other prominent plant buildings and structures (including the natural draft cooling towers and the

nuclear service cooling water towers), the exclusion area and site boundaries, and significant terrain and vegetation features which could affect meteorological measurements or atmospheric transport and diffusion conditions. This figure should identify true north, contain an appropriate scale, and be of sufficient size to permit independent measurements of distance.

451.12 Provide additional information clarifying the data recording and reduction processes discussed on page 2.3.3-1 of the FSAR, particularly the digital data recording and reduction processes, which specifies averaging and sampling (where appropriate) times and which specifies the data quality checks used to validate the measurements. Also, clarify the respective roles of the analog (strip charts) and digital data recording systems.

451.13 a) Provide a detailed description of the calibration procedures (sensors, electronics, and complete system) used at the Vogtle plant, and identify the dates of calibration since December 1972.

b) Identify periods of extended outage since December 1972 and identify the causes of the outages and the corrective actions taken.

451.14 According to the discussion on page 2.3.3-2 of the FSAR, the onsite meteorological measurements program is to be upgraded and

will include installation of a new meteorological tower. Provide a complete description of the meteorological measurements program to be available during plant operation, including instrument specifications and a determination of system accuracy for each parameter compared to Regulatory Guide 1.23. Identify the date of installation of the new tower, and indicate when one full year of data from this tower will be available.

451.15 Calculations of short-term (accident) relative concentration (X/Q) values are to be made at the exclusion area boundary and the outer boundary of the low population zone (LPZ). Table 2.3.4-1 does not identify the distance or direction for the calculated X/Q values. Table 2.3.4-2 identifies the "assumed distance to site boundary in each direction."

a) Specify the distance and direction for the calculated X/Q values in Table 2.3.4-1, and indicate whether the X/Q values for various time periods at the LPZ distance were calculated with the direction-dependent or direction-independent atmospheric dispersion model.

b) Confirm that the boundary distances presented in Table 2.3.4-2 are distances to the exclusion area boundary. If not, provide the exclusion area boundary distances by direction using the technique described in Regulatory Guide 1.145.

451.16 Provide the bases for determining 2368 mi^2 as the value of A, "the smallest vertical plume cross section area of containment."

451.17 The discussion of the calculation of long-term diffusion estimates presented in Section 2.3.5 of the FSAR requires additional clarification. For example, the statement is made in Section 2.3.5.2.1 on page 2.3.5-1 that "the release is at ground level." However, the discussion in Section 2.3.5.2.3 on page 2.3.5-3 states that "the plant vent release point is elevated." The atmospheric dispersion model presented is for an elevated release.

a) For each release point identified in Table 2.3.5-3, compare the release characteristics with the criteria in Regulatory Guide 1.111 for the determination of release mode (e.g., ground level or a mixture of partially elevated and partially ground level). Also, clarify the heights of release presented in this table to heights above ground, provide the heights of adjacent or nearby structures which could entrain effluents released from these locations, and provide the direction of these structures relative to the release locations.

b) The natural draft cooling towers appear to be less than 2000 feet from the Unit 1 containment structure, and these structures could significantly influence low-level airflow in the vicinity of the main plant release points for a number of wind directions. Furthermore, plant releases, when the wind is blowing toward the cooling towers, could be entrained into the wake of these structures. For these situations, releases which may have been considered as partially elevated could behave more like ground level releases. Provide additional information on the influence of the natural draft cooling towers on routine releases of radioactive material to the atmosphere.

c) Operation of the nuclea· service cooling water towers could also affect releases of radioactive material to the atmosphere. Provide additional information on the frequency of operation of these towers, and provide additional information on the influence of these towers on routine releases of radioactive material to the atmosphere.

d) Provide the numerical value(s) used for the parameter "H" discussed on pages 2.3.5-4 and 2.3.5-5 and defined as the "height of the tallest structure in the nuclear power plant block."

451.18 The discussion of the rationale for not adjusting the straight-line atmospheric dispersion model to consider spatial and temporal variations in airflow out to a distance of 50 miles from the plant (page 2.3.5-1 of the FSAR) requires further elaboration, particularly when other sources of information such as the National Weather Service office at Augusta, GA and the Savannah River Laboratory are available. Provide an assessment of airflow trajectories in the region of the Vogtle plant considering additional concurrent (real-time), meteorological information available in the region to determine the appropriateness of the assumption of straight-line transport.

451.19 The high frequency of occurrence of extremely unstable conditions (see E451.04) could increase the likelihood of fumigation if a large fraction of these conditions are immediately preceded by moderately or extremely stable conditions. Fumigation could then occur a sufficient amount of time to be considered in estimating the annual average relative concentration (X/Q) and relative deposition (D/Q) values for releases assumed to be elevated. Provide an assessment of the occurrences of fumigation conditions at the Vogtle site and provide an estimate of the increase to annual average X/Q and D/Q values, if appropriate.