From: Christian Araguas
To: "Amy G. Aughtman" <AGAUGHTM@SOUTHERNCO.COM>,<JTDAVIS@SOUTHERNCO.COM>
Date: 11/21/2006 5:09:24 PM
Subject: December 6-7 Meteorology Site Audit
cc: "Christian Araguas" <CJA2@nrc.gov>,"Stephanie Coffin" <SMC1@nrc.gov>,"Joseph Hoch" <JAH6@nrc.gov>,"R Brad Harvey" <RBH@nrc.gov>,"John Smith" <jms7@nrc.gov>,"Mark Lilly" <MRL1@nrc.gov>,"Stephen Raul Monarque" <SRM2@nrc.gov>

Jim/Amy,

Attached are 3 separate files to support the December site Audit. The first file is the list of 23 information needs to be discussed during the audit. The second file contains the agenda for the audit including site tour details, and the third file contains the proposed schedule for the audit. We will have a total of 7 NRC personnel on this trip (more than originally anticipated). The names are as follows:

Christian Araguas
Stephanie Coffin
Stephen Raul Monarque
Brad Harvey
Joseph Hoch
Mark Lilly
John Smith

Let me know if you have any questions regarding this information. Thanks.

Christian Araguas

Hearing Identifier: Vogtle_Non_Public
Email Number: 2126

Mail Envelope Properties (460917B5.HQGWDO01.TWGWPO04.200.2000007.1.720C1.1)

Subject: December 6-7 Meteorology Site Audit
Creation Date: 11/21/2006 5:09:24 PM
From: Christian Araguas

Created By: CJA2@nrc.gov

Recipients "Christian Araguas" <CJA2@nrc.gov>,"Stephanie Coffin" <SMC1@nrc.gov>,"Joseph Hoch" <JAH6@nrc.gov>,"R Brad Harvey" <RBH@nrc.gov>,"John Smith" <jms7@nrc.gov>,"Mark Lilly" <MRL1@nrc.gov>,"Stephen Raul Monarque" <SRM2@nrc.gov>
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Files	**Size**	**Date & Time**
MESSAGE	639	11/21/2006 5:09:24 PM
SS Site Audit Q's2.wpd	933282	3/27/2007 1:10:13 PM
VEGP 12-06 Site Visit Agenda.wpd	32863	3/27/2007 1:10:13 PM
12-2006 Audit Schedule.wpd	9861	3/27/2007 1:10:13 PM

Options
Priority: Standard
Reply Requested: No
Return Notification: None
None

Concealed Subject: No
Security: Standard

Information and Discussion Needs for December 2006 Safety Review Site Audit

#	SSAR Section	Information Need	Discipline Name	Reviewer Name
1	2.3.1	Table 2.3-1, referenced in SSAR Section 2.3.1.1, lists characteristics of the eight NWS and Cooperative Observing Stations used for the SSAR regional climate analysis. The elevations shown in the SSAR for **Blackville 3W** and **Springfield** appear to be transposed as compared to the elevations reported by the National Climatic Data Center (NCDC).	Meteorology	Brad Harvey / Joseph Hoch
2	2.3.1	Eight climatological observing stations were used to characterize the regional climatology of the Vogtle ESP site. The staff identified a total of seventeen observing stations around (i.e. within a 50 mile radius) the Vogtle ESP site with 13 to 94 years of available data. Please explain the selection process used for the eight observation stations listed in the SSAR.	Meteorology	Brad Harvey / Joseph Hoch
3	2.3.1	Using the eight observing stations identified in SSAR Section 2.3.1.1, regional climatological precipitation statistics of the site are presented in SSAR Section 2.3.1.3.4, "Precipitation Extremes" and summarized in Table 2.3.3, "Climatological Extremes at Selected NWS and Cooperative Observing Stations in the VEGP Site Area." Using climatic data from NCDC, the staff found a higher maximum monthly rainfall observation at Louisville, GA and a higher maximum 24-hr snowfall and maximum monthly snowfall observation at Bamberg, SC as compared to the values in SSAR Table 2.3.3. Please confirm that the values presented are the most extreme values for the proposed Vogtle ESP site.	Meteorology	Brad Harvey / Joseph Hoch
4	2.3.1	SSAR Section 2.3.1.3.5 discusses the occurrence of hail near the Vogtle ESP site. This section reports that on average, hail with diameters of 0.75 inches or greater can be expected about 1 day per year, based on statistics reported in The Climatic Atlas of the United States for Burke County, GA, and Barnwell County, SC. Since hail is a point observation, it is commonly underreported in rural areas. The following figures from The Climate Atlas of the United States show a relationship between hail frequency and population size in that highest reported frequencies of hail with diameters of 0.75 inches or greater and 1.00 inches or greater are clustered around major cities. Statistics reported in rural Burke and Barnwell counties may under-represent actual hail occurrence at the Vogtle ESP site. Please justify the appropriateness of the values presented in the SSAR **(See Attached Figures).**	Meteorology	Brad Harvey / Joseph Hoch

5	2.3.1	SSAR Section 2.3.1.5 states that it is not possible to produce a 100-year return mean coincident wet-bulb (MCWB) temperature for the site because of the statistical approaches utilized. This information will be necessary at the COL stage because MCWB is listed as a Tier 1 Site Parameter in Table 5.0-1 of the AP1000 DCD.	Meteorology	Brad Harvey / Joseph Hoch
6	2.3.1	SSAR Section 1.1 states that SNC has selected the Westinghouse AP1000 certified reactor design for the VEGP ESP application. Table 5.0-1 of the Tier 1 material in the AP1000 DCD lists the maximum historical wet bulb temperature (noncoincident) site parameter as **81°F**. In SSAR Section 2.3.1.5, the 100-year return period maximum wet-bulb temperature (noncoincident) is estimated to be **88°F**. Please discuss the potential implications of the Vogtle ESP site 100-year return period maximum wet bulb temperature exceeding the AP1000 DCD maximum historical wet bulb temperature.	Meteorology	Brad Harvey / Joseph Hoch
7	2.3.1	Section 2.3.1 of RS-002 states that data on severe weather phenomena should be based on standard meteorological records from nearby representative stations with long periods of record and the applicability of these data to represent site conditions during the expected period of reactor operation should be substantiated. Please evaluate recent trends in temperature, humidity, and precipitation extremes in the Vogtle ESP site vicinity and discuss if such trends may be indicative of climatic change.	Meteorology	Brad Harvey / Joseph Hoch
8	2.3.2	SSAR Section 2.3.2.2.1, "Wind", uses five years of onsite meteorological data (1998-2002) to create annual and seasonal wind rose plots (i.e., graphical distributions of the direction from which the wind is blowing). A comparison of seasonal wind roses from the original FSAR for Units 1 and 2 of Plant Vogtle (1972-73, 1977-81) to the current wind roses provided in the Vogtle ESP shows some differences. Please explain the differences in wind direction frequency at 60m and 10m, especially during the spring, summer, and winter seasons **(See Attached Figures)**.	Meteorology	Brad Harvey / Joseph Hoch
9	2.3.2	A comparison of wind direction frequency at 10m and 60m for the five year period of onsite meteorological data (1998-2002) shows differences in wind direction frequency between the two observation heights. Please explain these apparent differences **(See Attached Figures)**.	Meteorology	Brad Harvey / Joseph Hoch
10	2.3.2	SSAR Section 2.3.2.2.2, "Atmospheric Stability," discusses the frequency of stability classes for the Vogtle ESP site, as calculated from the five years of onsite meteorological data (1998-2002). The following chart displays the frequency of stability classes for each individual year **(See Attached Figures)**. Please explain (1) the reduction of A Stability Class (Extremely Unstable) frequency from 1998-2000 to 2001-2002 and (2) the increase of E Stability Class (Slightly Stable) frequency from 2000 to 2001.	Meteorology	Brad Harvey / Joseph Hoch

11	2.3.2	The following plots show the frequency of unstable (stability classes A-C), neutral (stability classes D,E), and stable (stability classes F,G) conditions against the corresponding observation hour for each year 1998-2002. Please explain the following apparent changes in the data from year to year **(See Attached Figures)**. (1) In the 2001, the number of occurrences of stable (stability classes F, G) conditions increases during the daytime, which is not seen in any other years. (2) The number of occurrences of unstable (stability classes A-C) decreases in 2001 and 2002 as compared to 1998 through 2000.	Meteorology	Brad Harvey / Joseph Hoch
12	2.3.2	SSAR Section 2.3.2.2.3 states that "extreme maximum temperatures recorded in the vicinity of the VEGP site have ranged from 105°F to 110°F, with the highest reading observed at the Newington 2NE Station on July 13th, 1980." However, the staff found a higher extreme maximum temperature recorded in the vicinity of the VEGP site, 112°F, which occurred at Louisville 1E on July 24th, 1952.	Meteorology	Brad Harvey / Joseph Hoch
13	2.3.2	The lowest and highest daily mean temperatures and diurnal temperature ranges for a number of stations in the vicinity of the VEGP site are presented in SSAR section 2.3.2.2.3. The staff found larger ranges for both temperature statistics for the Vogtle ESP site as follows **(See Attached Table)**.	Meteorology	Brad Harvey / Joseph Hoch
14	2.3.2	Please clarify in SSAR Section 2.3.2.3 whether any terrain modifications are expected to occur as a result of construction of a nuclear power plant (e.g., removal of trees, leveling of ground, installation of lakes and ponds, etc.) and how these terrain modifications may affect local meteorological characteristics.	Meteorology	Brad Harvey / Joseph Hoch
15	2.3.3	The staff has reviewed the 1998-2002 hourly VEGP onsite meteorological data provided in support of the Vogtle ESP application and has the following questions: a) Please explain the occurrence of 71 hours of delta-temperature data where the calculated lapse rate between 60m and 10m exceeds the autoconvective lapse rate. b) Please explain the occurrence of 102 consecutive hours of 60m winds from the north in 1999. c) Please explain the following occurrences of consecutive hours of stability classes E and F in 2001. **E Stability class** (20hr, 22hr, 23hr, 25hr, 28hr, 35hr, 36hr, 41hr,41hr,42hr,48hr,53hr,56hr,56hr,66hr,70hr,74hr,85hr) **F Stability class** (19hr, 21hr, 25hr, 30hr, 48hr, 90hr) d) The following plot of temperature measurements implies that many hours of 10m temperature data are listed in degrees Fahrenheit instead of degrees Celsius as specified in the recommended hourly meteorological data format presented in Appendix A to Section 2.3.3 of RS-002 **(See Attached Figure)**.	Meteorology	Brad Harvey / Joseph Hoch

16	2.3.3	SSAR Section 2.3.3.2 states that one of the only parameters with annual data recoveries less than 90 percent is dew point temperature (i.e., 89.6 percent). Of the five years of meteorological data provided (1998-2002), the SSAR onsite meteorological database includes no dew point temperatures. Should this be stated as relative humidity instead of dew point temperature?	Meteorology	Brad Harvey / Joseph Hoch
17	2.3.3	The 1998-2000 wind direction data range from 0 degrees to 359 degrees whereas the 2001-2002 wind direction data range from 0 to 360 degrees. Please explain the reason for this change in the wind direction ranges.	Meteorology	Brad Harvey / Joseph Hoch
18	2.3.3	SSAR Section 2.3.3.3 states that "minor structures in the vicinity of the primary meteorological tower have been evaluated as having no adverse effect on the measurements taken at the tower." Please provide a list of distances to nearby obstructions to flow in each downwind sector, including the height of each obstruction.	Meteorology	Brad Harvey / Joseph Hoch
19	2.3.3	SSAR Table 2.3-13 provides monthly data recovery statistics for the Vogtle meteorological monitoring program from January 1998 through December 2002. The staff independently verified these data recovery statistics and found some discrepancies as shown in the following table **(See Attached Table)**: Please confirm that the statistics in the SSAR are correct.	Meteorology	Brad Harvey / Joseph Hoch
20	2.3.4	Please provide a copy of the PAVAN computer code input and output file(s) used to generate the EAB and LPZ ÷/Q values presented in SSAR Section 2.3.4.	Meteorology	Brad Harvey / Joseph Hoch
21	2.3.4	The variability shown in the year-to-year comparisons of various meteorological parameter frequencies as discussed in RAIs 2.3.2-1 through 2.3.2-4 as well as the meteorological database questions presented in RAI 2.3.3-1 create uncertainty as to the representativeness of any given year for making atmospheric dispersion estimates for design basis accidents. Given the variability in the data from year to year, please justify why the short-term (accident) diffusion estimates should not be generated using each annual data set independently and the most conservative resulting x/Q values listed as site characteristics.	Meteorology	Brad Harvey / Joseph Hoch
22	2.3.5	The staff made an independent evaluation of the routine diffusion estimates provided in SSAR Section 2.3.5 and obtained similar results, except for (1) relative deposition (D/Q) at 40 miles and (2) 2.26 day decay undepleted x/Q value at the 1-2 mile segment boundary. Please confirm that these values in the SSAR are correct.	Meteorology	Brad Harvey / Joseph Hoch

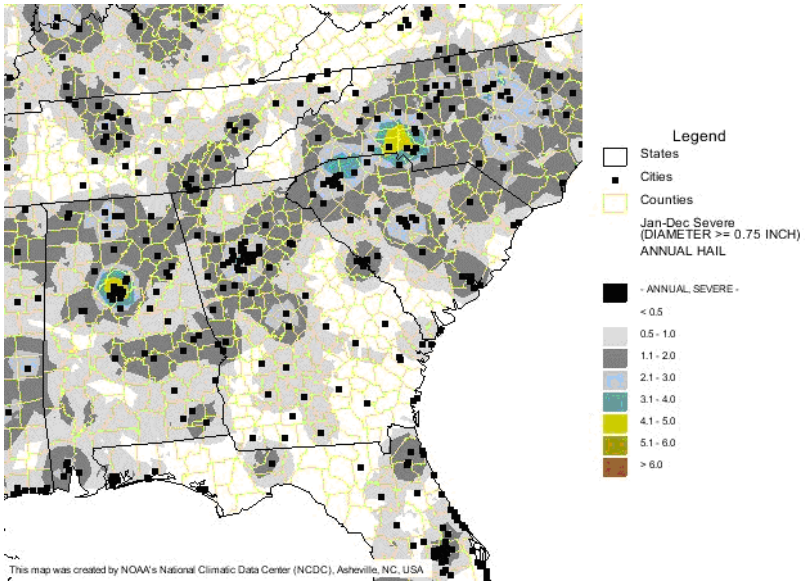
23	2.3.5	The variability shown in the year-to-year comparisons of various meteorological parameter frequencies as discussed in RAIs 2.3.2-1 through 2.3.2-4 as well as the meteorological database questions presented in RAI 2.3.3-1 create uncertainty as to the representativeness of any given year for making atmospheric dispersion estimates for design basis accidents. Given the variability in the data from year to year, please justify why the long-term (routine) diffusion estimates should not be generated using each annual data set independently and the most conservative resulting x/Q values listed as site characteristics.	Meteorology	Brad Harvey/ Joseph Hoch

Attached Figures and Tables

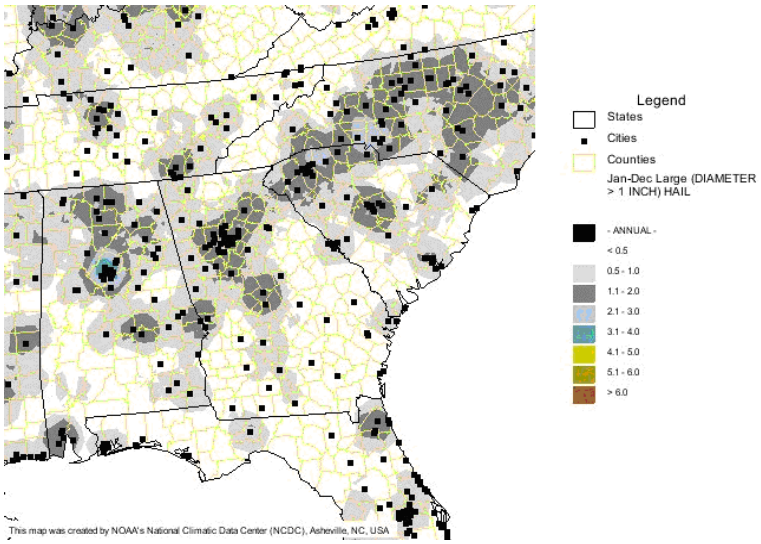
Section 2.3.1

Information Need #4

Annual frequency of hail with diameters of 0.75 inches or greater



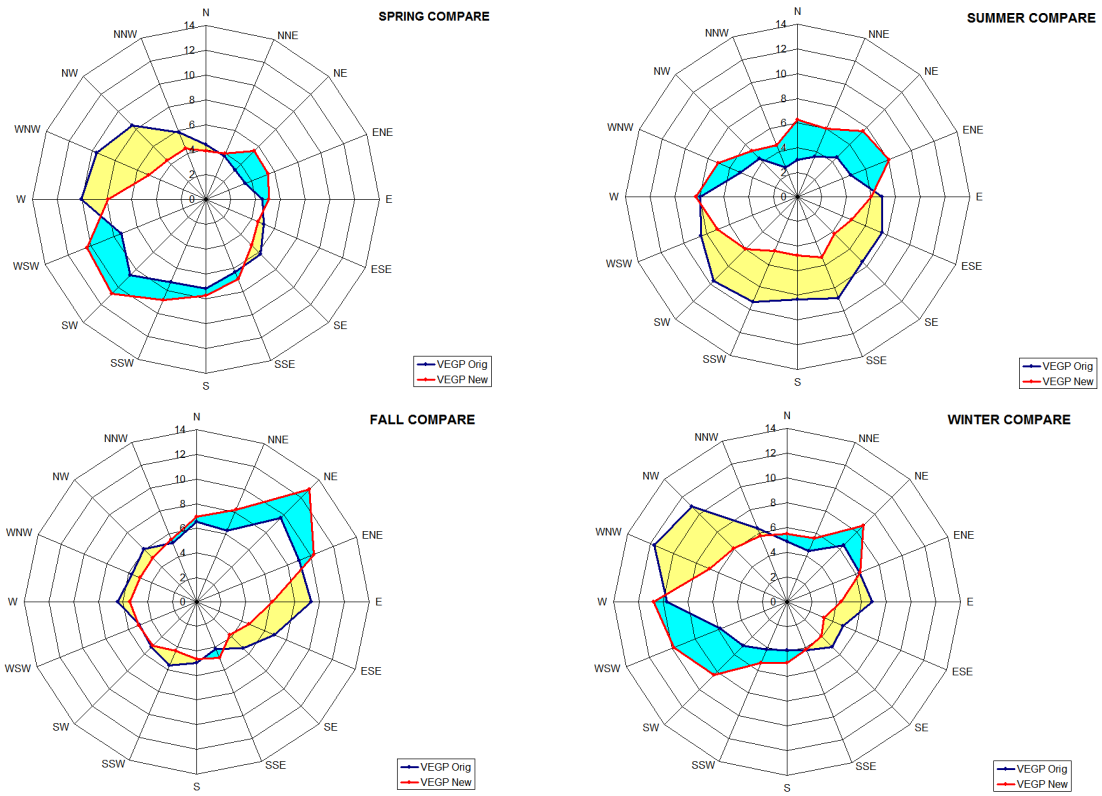
Annual frequency of hail with diameters of 1.0 inches or greater



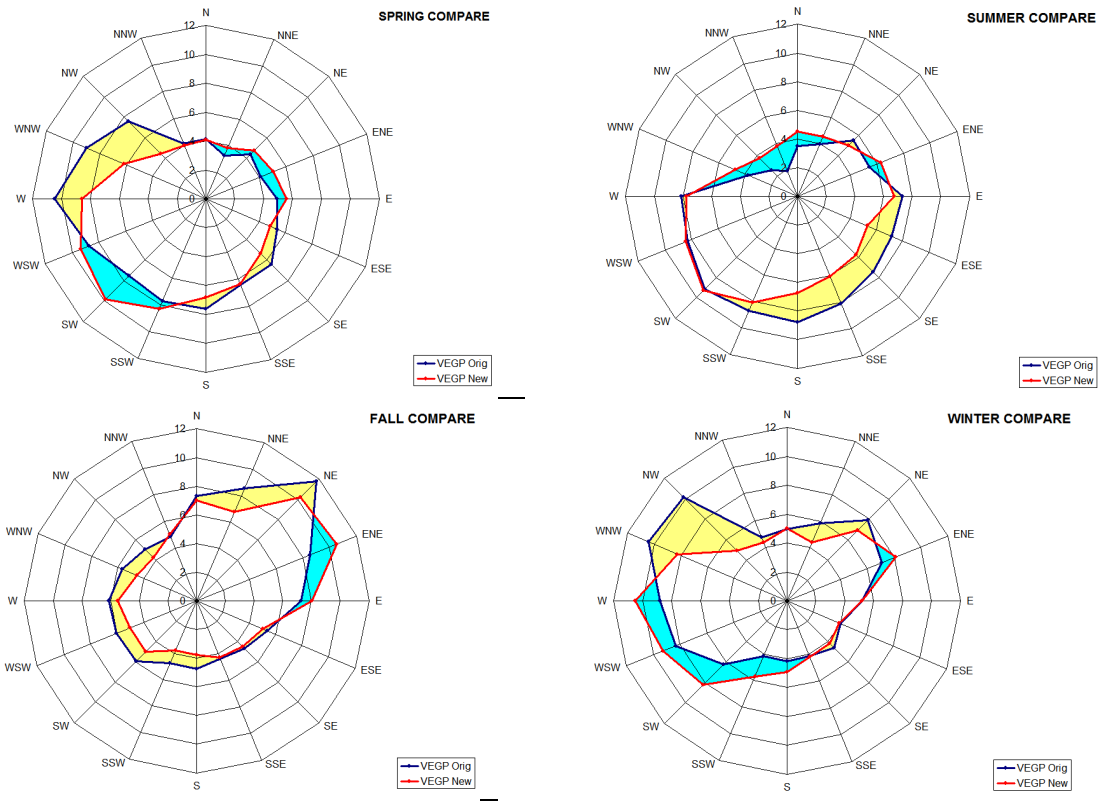
Section 2.3.2

Information Need #8

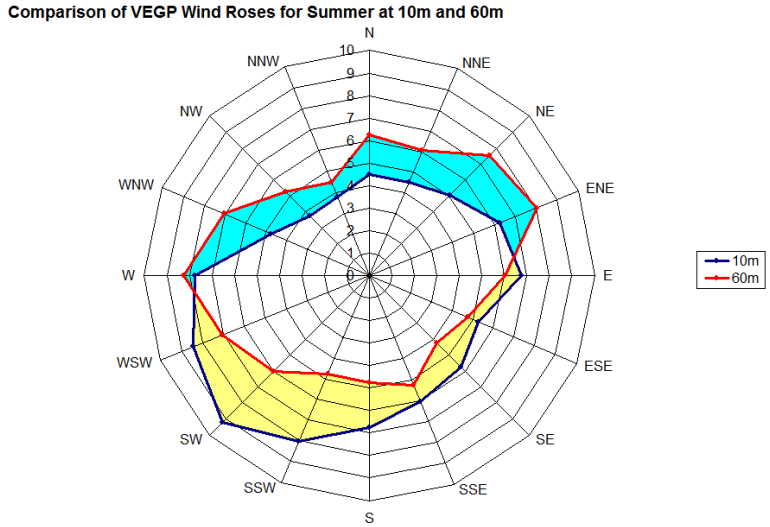
Comparison of the original Vogtle FSAR to the current Vogtle SSAR at the 60 m sensor height



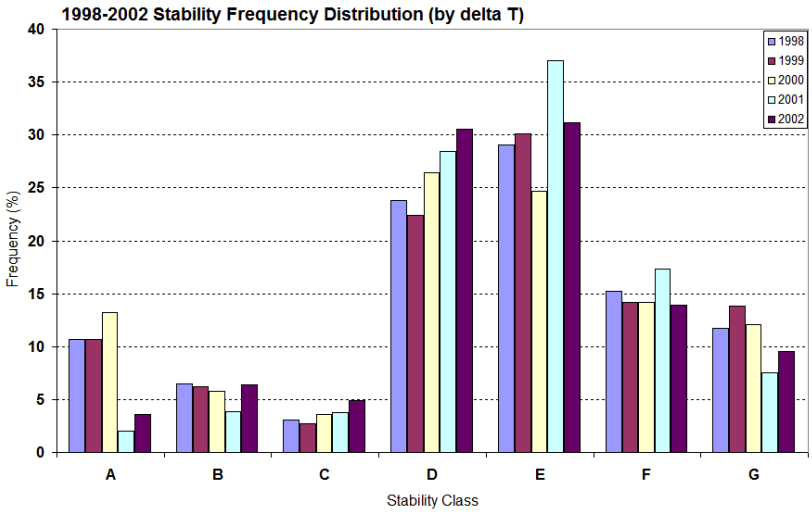
Comparison of the original Vogtle FSAR to the current Vogtle SSAR at the 10 m sensor height



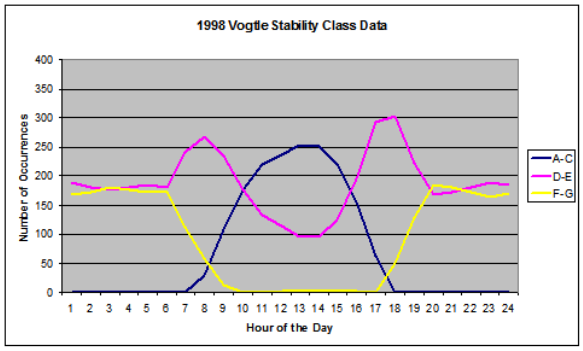
Information Need #9

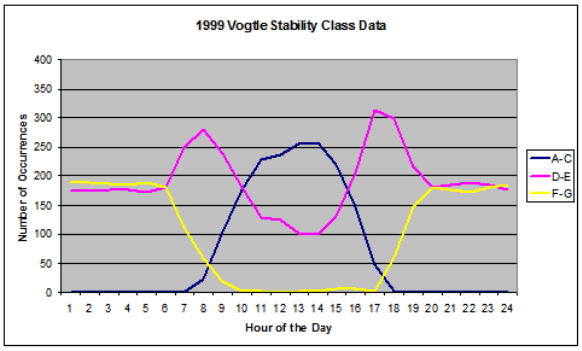


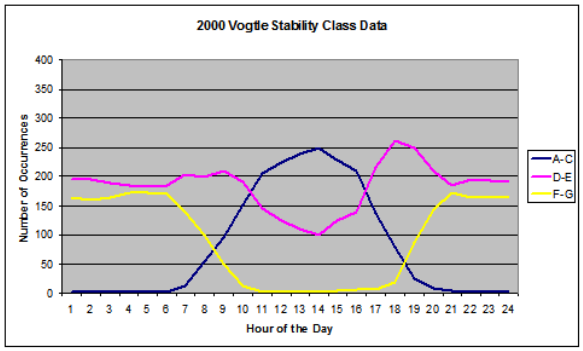
Information Need #10

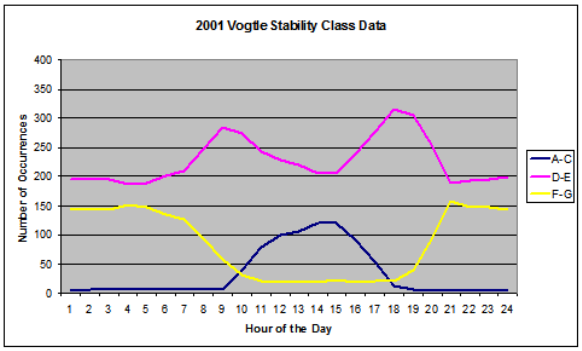


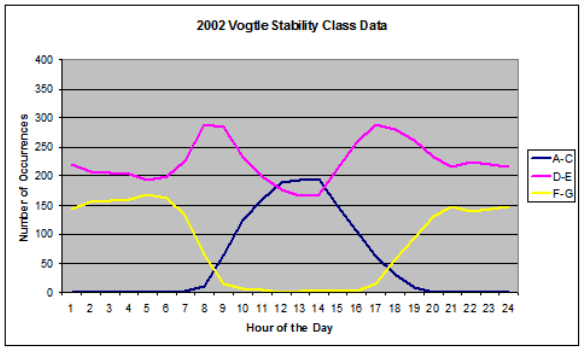
Information Need #11











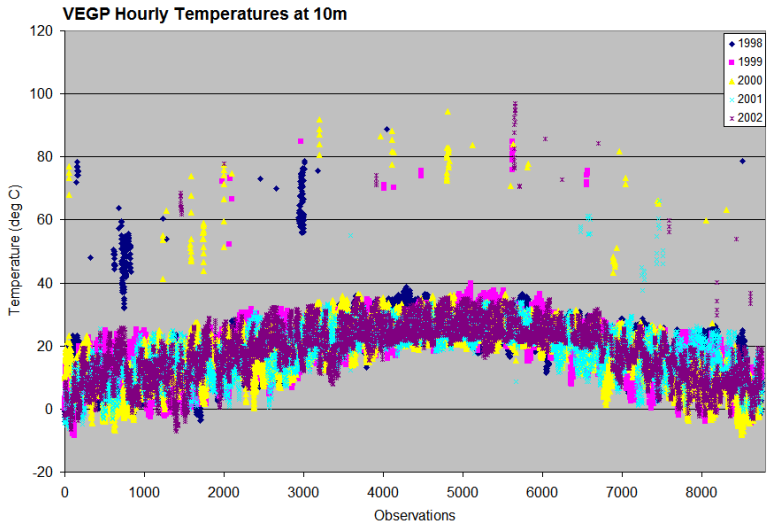
Section 2.3.3

Information Need #13

Daily Mean Range		Diurnal Temperature Range	
SSAR	Staff	SSAR	Staff
63.1°F [1] – 65°F [2]	61.5°F [3] – 65.6°F [4]	23.7°F [5] – 26.3°F [6]	21.9°F [7] – 28°F [8]

1 - Waynesboro
2 - Midville Exp. Station
3 - Appling 2NW
4 - Hampton 1S
5 - Newington 2NE
6 - Aiken 4NE
7 - Bamberg
8 - Clarks Hill 1W

Information Need #15



Information Need #19

Parameter	Year	Percent Date Recovery		
		Applicant	Staff	Difference
Wind Direction (60m)	1998	98.3	88.2	10.1
Wind Direction (60m)	1999	97.7	94.4	3.3
Wind Direction (60m)	2000	98.2	96.6	1.6
Wind Speed (10m)	2000	99.3	98.2	1.1
Wind Speed (60m)	1999	99.0	98.3	0.7
Dew point (10m)	2000	85.5	84.9	0.6
Dew point (10m)	1999	98.7	98.1	0.6

Discussion Items for the Vogtle ESP Site Visit
Meteorological Safety Assessment
December 6-7, 2006

Brad Harvey/Joseph Hoch

The staff requests that the documentation listed below be made available during the site visit. The staff will make a determination after the site visit regarding what documentation should be submitted on the Vogtle Early Site Permit (ESP) application docket to support its review.

Subjects to be discussed

Review the following information related to the onsite meteorological monitoring program and the 1998-2002 onsite meteorological data presented in the SSAR with regards to compliance with Regulatory Guide 1.23 and Standard Review Plan Section 2.3.3.

1. General tower exposure
   - Regional and site topographic features
   - Existing and planned plant structure layout and potential release points
   - Distance and bearing to nearby ground features/obstructions to flow

2. Instrument siting
   - Type of tower
   - Sensor orientation and distance from tower
   - Heat reflection characteristics of surface under tower base
   - Nearby sources of heat and moisture
   - Nearby structures and vegetation

3. Meteorological Sensors
   - Parameters measured and sensor elevations
   - Sensor types, manufacturer and model numbers, performance characteristics

4. Data recording
   - Type of recorders (digital versus analog)
   - Location of recorders (including environmental conditions)
   - Recorder accuracy and performance specifications

5. Instrument Surveillance
   - Inspection, maintenance, and calibration activities and frequencies
   - Maintenance logs and data sheets
   - Historical system problem reports

6. Data acquisition and reduction
   - Sampling frequencies and averaging times/algorithms
   - Overall system accuracy
   - Data review procedures (identification and handling of suspect data)
   - Data reduction process (e.g., reformatting to NRC standard formats)

7. Quality assurance program

8. Additional meteorological data requirements and availability for emergency preparedness planning

Also identify any changes that have been made to the monitoring program since collection of the 1998-2002 onsite data used to derive the atmospheric dispersion estimates presented in Sections 2.3.4 and 2.3.5 of the Vogtle ESP SSAR.

Time Required

Approximately 1½ to 2 days

Expert Functional Area(s)

1. Meteorologist
2. I&C personnel

Documents Required

1. Manufacturer's literature on sensor performance specifications
2. Inspection, maintenance, and calibration procedures
3. Maintenance logs, data sheets, system problem reports
4. Representative meteorological sensor calibration reports/data sheets

Places to see

1. Exclusion area and low population zone (general site tour)
2. Walk-down of the meteorological tower and instrument shed

Special Needs

1. Meeting room
2. Internet Access

Dec. 6 - 7, 2006 Safety Review Site Audit Schedule

Day	Time	Action / Item	Location	Objective
Wednesday, 6 December	8:00 a.m.	Arrive at Vogtle Site / Badging	Main Gate	N/A
	8:30 a.m.	Entrance Meeting, Introduction, Overview	Visitors Center	N/A
	9:00 a.m. - 10:00 a.m.	Site Tour	Vogtle Site	General Site Familiarity
	10:00 a.m. - 12:00 p.m.	Initial Discussions on Meteorology	Visitor Center	Discuss Information Requests
	12:00 p.m. - 1:00 p.m.	Lunch	Visitor Center	N/A
	1:00 p.m. - 3:00 p.m.	Discussions on Meteorology	Visitor Center	Discuss Information Requests
	3:00 p.m. - 5:00 p.m.	Review Supplemental Information Provided by SNC	Visitor Center	Verify Information in The SSAR

Day	Time	Action / Item	Location	Objective
Thursday, 7 December	8:00 a.m.	Arrive at Vogtle Site / Badging	Main Gate	N/A
	8:30 a.m. - 12:00 p.m.	Review Supplemental Information Provided by SNC	Visitor Center	Verify Analysis Referenced in SSAR
	12:00 p.m. - 1:00 p.m.	Lunch	Visitor Center	N/A
	1:00 p.m. - 4:00 p.m.	Discuss Results of Review Conducted By the Staff	Visitor Center	Verify Analysis Referenced in SSAR
	4:00 p.m. - 4:30 p.m.	Wrap Up Discussions/ Audit Close Out	Visitor Center	