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ND-09-0795

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555-0001

Southern Nuclear Operating Company  
Vogtle Electric Generating Plant Units 3 and 4 Combined License Application  
Response to Request for Additional Information Letter No. 033

Ladies and Gentlemen:

By letter dated March 28, 2008, Southern Nuclear Operating Company (SNC) submitted an application for combined licenses (COLs) for proposed Vogtle Electric Generating Plant (VEGP) Units 3 and 4 to the U.S. Nuclear Regulatory Commission (NRC) for two Westinghouse AP1000 reactor plants, in accordance with 10 CFR Part 52. During the NRC's detailed review of this application, the NRC identified a need for additional information, involving severe accident evaluations, required to complete their review of the COL application's Final Safety Analysis Report (FSAR) Chapter 19, "Probabilistic Risk Assessment." By letter dated April 22, 2009, the NRC provided SNC with Request for Additional Information (RAI) Letter No. 033 concerning this information need. This RAI letter contains seven RAI questions numbered 19-3 through 19-9. The enclosure to this letter provides the SNC response to these RAIs.

If you have any questions regarding this letter, please contact Mr. Wes Sparkman at (205) 992-5061.

DO92  
NRW

Mr. J. A. (Buzz) Miller states he is an Executive Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY



Joseph A. (Buzz) Miller

Sworn to and subscribed before me this 22 day of May, 2009

Notary Public: Gloria H. Bui

My commission expires: 04-01-13

JAM/BJS/dmw

Enclosure: Response to NRC RAI Letter No. 033 on the VEGP Units 3 & 4 COL  
Application Involving Severe Accident Evaluations

cc: Southern Nuclear Operating Company

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**Southern Nuclear Operating Company**

**ND-09-0795**

**Enclosure**

**Response to NRC RAI Letter No. 033**

**on the**

**VEGP Units 3 & 4 COL Application**

**Involving**

**Severe Accident Evaluations**

## **FSAR Chapter 19, Severe Accident Evaluations**

### **eRAI Tracking No. 2306**

#### **NRC RAI Number 19-3:**

(Follow-up to Question 19-1) The response to Question 19-1 provides detailed information on screening of high winds, external floods, and transportation and pipeline accidents for inclusion in the Vogtle Electric Generating Plant (VEGP) Units 3 and 4 probabilistic risk assessment (PRA). Regulatory Guide (RG) 1.206 indicates that combined license (COL) applicants' final safety analysis reports (FSAR) should include a description of the external events evaluated and the methods used to conduct screening and bounding analyses. Therefore, please revise section 19.58 of the FSAR to include the external events screening approach and results. In addition, the response to Question 19-1 should be supplemented in the following areas before inclusion in the FSAR:

- a. The criteria used to screen the external events should be clearly identified. These criteria should be consistent with the expectation stated in Standard Review Plan (SRP) section 19.0 that results of the PRA should indicate that the design represents a reduction in risk compared to existing operating plants.
- b. The screening should address a broad set of potential site-specific contributors, not only the events identified in APP-GW-GLR-101. Additional events include biological effects, temperature and drought effects on the ultimate heat sink, and turbine missiles. Many of these events can be screened based on the criteria identified above; however, this screening should be documented in the FSAR.

#### **SNC Response:**

As documented in the AP1000 DCD Subsection 19.58.1 and Westinghouse Technical Report APP-GW-GLR-101, Section 2.0, the guidelines used to determine the external events considered in the AP1000 PRA are NRC Generic Letter 88-20, Supplement 4, dated June 28, 1991, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities – 10 CFR 50.54(f)" and NRC NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," June 1991.

The above guidelines conclude that five events need to be included by all licensees in the IPEEE: seismic events, internal fires, high winds, floods and transportation and nearby facility accidents. As discussed in DCD Subsection 19.58.1 and APP-GW-GLR-101, Section 2.0, seismic events and internal fires are addressed in the AP1000 PRA. The VEGP Units 3 and 4 COL incorporates those evaluations by reference as documented in Sections 19.55 and 19.57; therefore, no further evaluation of these events is required. The remaining three events are included in the DCD and APP-GW-GLR-101 external events evaluations. For these events the VEGP screening criteria is to determine if the site specific event is bounded by the existing AP1000 PRA to ensure that no site specific vulnerability exists. In all cases the AP1000 PRA has been determined to be bounding.

There are also a number of additional external hazards (major depots and storage areas, on-site storage tanks, external fires and radiological hazards) that have been specifically evaluated in the ESPA and COLA because of their potential to impact VEGP Units 3 and 4. These events

were not included in the external events that were evaluated in the AP1000 DCD or APP-GW-GLR-101. For these events, bounding analyses were performed using conservative criteria consistent with NRC Review Standard RS-002 (Processing Applications for Early Site Permits) and NUREG-0800 Standard Review Plan criteria and current regulatory guidance. In all cases these bounding analyses determined that these events did not adversely affect VEGP Units 3 and 4. Consistent with NUREG-1407, Sections 2.5 and 2.9, there is no significant vulnerability to severe accidents from these events. Therefore, these events were excluded from further PRA consideration.

The site does not require any plant-unique evaluations outside of the above external events. Consistent with the guidance in NUREG-1407, the site is not located in the vicinity of any volcanic activity. The site has no unique vulnerability to extra-terrestrial activity (meteorite strikes and satellite falls) and these events can be dismissed on the basis of their low initiating event frequency (less than  $1E-09$  per the NUREG). Meteorological conditions for the VEGP Units 3 and 4 site are discussed in detail in ESPA SSAR and COLA FSAR Section 2.3 and no unique vulnerabilities have been identified. Therefore, it is concluded that the appropriate external events, as recommended in NRC Generic Letter 88-20, Supplement 4 and NUREG-1407 have been considered.

"Table 1 – External Event Frequencies for VEGP" provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to detail the screening basis and assumptions used in the PRA results. Additionally, the table will include the results of other RAIs in this letter. The revised table will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

1. COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to read:

"This section of the referenced DCD is incorporated by reference with the following departures and/or supplements."

2. COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to add new Subsection 19.58.3 that reads:

"19.58.3 Conclusion

Add the following information at the end of DCD Subsection 19.58.3:

VEGP SUP 19.58-1      Table 19.58-201 documents the site-specific external events evaluation that has been performed for VEGP Units 3 and 4. This table provides a general explanation of the evaluation and resultant conclusions and provides a reference to applicable sections of the COL where more supporting information (including data used, methods and key assumptions) regarding the specific event is located. Based upon this evaluation, it is concluded that the VEGP Units 3 and 4 site is bounded by the High Winds, Floods and Other External Events analysis documented in DCD Section 19.58 and

APP-GW-GLR-101 (Reference 201) and no further evaluations are required at the COL application stage.”

3. COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to add new Subsection 19.58.4, that reads:

“19.58.4 References

201. Westinghouse Electric Company LLC, “AP1000 Probabilistic Risk Assessment Site-Specific Considerations,” Document Number APP-GW-GLR-101, Revision 1, October 2007.”

4. COLA Part 2, FSAR Chapter 19, Section 19.58, add new Table 19.58-201 as shown in Attachment 1.
5. COLA Part 2, FSAR Chapter 19, Subsection 19.59.10.5, revise fourth paragraph to read:

“As discussed in Section 19.58.3, it has been confirmed that the Winds, Floods and Other External Events analysis documented in DCD Section 19.58 is applicable to the site. The site-specific design has been evaluated and is consistent with the AP1000 PRA assumptions. Therefore, Section 19.58 of the AP1000 DCD is applicable to this design.”

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-4:**

(Follow-up to Question 19-1) Section 2.3.1.3.3 of the Site Safety Analysis Report (SSAR) prepared for the VEGP early site permit (ESP) lists 77 “tropical cyclones” of lesser magnitude than hurricanes occurring over a 154-year period. Of these, five are the “extra-tropical storms,” identified in the response to Question 19-1. However, the impact of hurricanes downgraded to tropical storms (or less) before reaching the VEGP site is not addressed in the response. Please revise the FSAR to discuss the level of risk associated with these storms and the systematic method used to assess or screen the hazard (for example, by demonstrating that the resulting CDF is less than 1E-8/yr), including the basis for numerical values used.

**SNC Response:**

Westinghouse requested in 2007 that NuStart utilities complete an “External Hazards Checklist” with a goal to determine “bounding” initiating event frequencies for external events used in the AP1000 PRA. The evaluation of any category of events requires that the full spectrum of intensity or magnitude of that phenomenon be included. For the Wind Events category, that means evaluating the effects of all wind speeds up to the maximum credible value.

The External Hazards Checklist requested information on hurricane and tornado frequencies associated with the proposed AP1000 plant sites. This information was used in the development of the external events write-ups in DCD Section 19.58 and Westinghouse

Technical Report APP-GW-GLR-101. The Saffir-Simpson scale for hurricanes starts at 74 mph wind speed which is the lower bound for the "hurricane" category of storms.

APP-GW-GLR-101 evaluated the CDF associated with high wind events using the following conservative assumptions:

- For all wind events that had, at any time during the life of that storm, a wind speed greater than 145 mph, LOOP occurs and all nonsafety-related systems are unavailable.
- For all wind events that did not have a wind speed greater than 145 mph, LOOP occurs (nonsafety-related systems remain available).

The "Extratropical Cyclone" subcategory of storms, used in APP-GW-GLR-101, was assigned an initiating event frequency of  $3E-02$  events per year. Even applying the conservative assumption that a LOOP occurs for all of these events, the result of the Wind Events evaluation showed that the Wind Events category of external events could be screened out from further PRA consideration. For proposed AP1000 sites that have a history of wind events with maximum wind speeds less than 74 mph (ESPA Subsection 2.3.1.3.3 indicates 77 such storms for the VEGP Units 3 and 4 site), it is unreasonable to assume, for the APP-GW-GLR-101 evaluation, that all of these weather systems cause a LOOP. The logic of the APP-GW-GLR-101 assumption that offsite power is lost as a result of a high wind event is that the switchyard is vulnerable because it is not designed to withstand hurricane-force winds. As shown in FSAR Table 2.0-201, the site characteristic operating basis wind speed for VEGP Units 3 and 4 is 104 mph. This site characteristic value provides confidence that the switchyard can withstand wind speeds at least up to 74 mph. It is also unreasonable to assign a threshold value to a storm wind speed that causes a LOOP because there are other factors, such as lightning and precipitation, which occur during a storm that influence the LOOP frequency and likely dominate the effect of wind speeds at the lower end of the wind speed range. The AP1000 PRA includes LOOP as an initiating event and the frequency of LOOP includes events due to lightning, precipitation and other factors. The probability of LOOP due to the wind portion of the "Extratropical Cyclone" subcategory of wind events is conservatively estimated by the frequency of  $3E-02$  events per year used in APP-GW-GLR-101.

An alternate representation of the LOOP frequency due to wind events of lower than hurricane intensity is presented in the data reported in NUREG/CR-6890, Volume 1, "Reevaluation of Station Blackout Risk at Nuclear Power Plants - Analysis of Loss of Offsite Power Events: 1986-2004." That report shows four LOOP events due to high winds (defined in this report as wind speed less than 125 mph) during 1,984.7 reactor years (including both critical and non-critical conditions) which yields a frequency of  $2E-03$  LOOP events per reactor year due to high wind events with less than 125 mph wind speed. This wind speed range includes Category 1 and Category 2 hurricanes and would therefore be a conservative value to apply to the range of wind speeds less than 74 mph. Applying this value of  $2E-03$  LOOP events per reactor year to the "Extratropical Cyclone" subcategory of wind events in the APP-GW-GLR-101 evaluation would reduce the CDF calculated in APP-GW-GLR-101. Therefore, the evaluation of Wind Events in APP-GW-GLR-101 remains applicable for the AP1000 at the Vogtle site.

Based on the above, it is concluded that winds below 74 mph (tropical storms, depressions, etc.) are not considered to have an adverse impact on VEGP Units 3 and 4 as the switchyard and non-safety buildings will be designed to function at a higher wind speed (104 mph). Therefore no additional PRA considerations are required for winds below hurricane force.

“Table 1 – External Event Frequencies for VEGP” provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the high winds information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-5:**

(Follow-up to Question 19-1) The response to Question 19-1 addresses external flooding only with respect to the Savannah River maximum flood elevation (178.10 feet) and the probable maximum precipitation (PMP) flood level (219.45 feet), compared to site grade of 220 feet. For risk from external flooding, expand the discussion to address all potential causes of elevated water levels (e.g., precipitation, dam failure), including credible combinations of sources. Please revise the FSAR to discuss the level of risk associated with external flooding and the systematic method used to assess or screen the hazard (for example, by demonstrating that the frequency of a flood higher than site grade is less than  $1E-7/yr$  or that the resulting CDF is less than  $1E-8/yr$ ), including the basis for any numerical values used.

**SNC Response:**

External flooding in general is discussed in COLA FSAR Subsection 2.4.10 and ESPA SSAR Section 2.4. As stated in ESPA SSAR Subsection 2.4.2.2, the design basis flood for the VEGP site was determined by selecting the maximum flood elevation on the Savannah River obtained by considering all flooding scenarios applicable to the location, including an approximate estimate of the probable maximum flood (PMF), flooding due to probable maximum precipitation (PMP) over local drainage courses, and potential dam failures coincident with wind set-up and wave run-up. Flood surge from ocean storms and tsunami caused flooding were not considered because the VEGP site is approximately 151 river miles inland.

Each applicable flooding scenario was evaluated following guidelines provided in Regulatory Guide 1.59, “Design Basis Floods for Nuclear Power Plants”, 1977 and ANSI/ANS-2.8, “Determining Design Basis Flooding at Power Reactor Sites,” as detailed in ESPA SSAR Subsections 2.4.3 through 2.4.7.

The controlling PMF event for the VEGP Unit 3 and 4 site was determined to be from the breach of the upstream dams, estimated as described in Subsection 2.4.4, using the Standard Project Flood discharge as a starting condition, including wind set-up and wave run-up. The design basis flooding level derived from this event, including wave setup, is El. 178.10 ft msl, which is 41.9 ft below the proposed site grade elevation of 220.0 ft msl. Therefore, significant margin exists with respect to flooding from the Savannah River.

As stated in ESPA SSAR Subsection 2.4.2.3, the Probable Maximum Precipitation (PMP) event is defined as the "greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of year". No specific probability is assigned to it. The PMP is a localized event which evaluates flooding potential from heavy precipitation that falls directly on to the plant site and immediate environs. It is completely independent of the river flooding scenario. Local PMP flooding is driven by the intensity and duration of the rainfall event and the ability of the site to drain the rainfall away from the plant. Site grading and drainage systems are specifically designed to carry away this rainfall to ensure that safety-related facilities are not adversely impacted.

An evaluation of localized flooding due to effects of local intense precipitation is addressed in COLA FSAR Subsection 2.4.2.3. This evaluation determined that the maximum water level in the power block area due to a local PMP flood event is 219.45 ft. msl. The methodology and data used in this evaluation is consistent with the requirements of the Standard Review Plan (NUREG-0800, Subsection 2.4.2). Even though the calculated freeboard for PMP flooding is approximately one-half foot, it is important to recognize that the PMP model itself contains significant conservatism, and that the design of the plant drainage system was modified as necessary during the modeling process to ensure appropriate margin exists. PMP model conservatisms include:

- A 50-percent PMP storm has occurred 3 days prior to the start of the rainfall associated with the actual PMP event
- The PMP storm uses high intensity point rainfall
- Extremely fast time of concentration (feeding of feeder ditches)
- Extremely high runoff percentage
- One dimensional model (i.e. no lateral spreading credited)
- Steady state modeling (i.e. on-site storage not credited)
- All culverts in the power block area have been assumed to be blocked by debris
- Alternate drainage paths are not allowed in the model

In summary, there is no return-period associated with the PMP event; it is the absolute maximum rainfall that can occur at this site. Based on the conservative assumptions above, the flooding associated with this rainfall event is over-predicted and is still below the plant grade; therefore no further PRA considerations apply.

The flooding evaluations performed in support of the ESP application have been reviewed by the NRC and accepted as documented in Section 2.4 of the Vogtle ESPA FSER. Flooding due to the local intense precipitation event was not fully addressed in the ESP application because the site drainage plans were still in development at that time. This evaluation was subsequently added in the COL application in Subsection 2.4.2.3 and is currently undergoing NRC review.

This event is discussed in the AP1000 DCD Subsection 19.58.2.2 and APP-GW-GLR-101 Section 4.0. As stated in the DCD and APP-GW-GLR-101, the AP1000 is protected against

floods up to the 100 ft. grade elevation. As stated in COLA FSAR Subsection 1.2.2, the VEGP site grade elevation of 220 ft. msl corresponds to the AP1000 DCD grade elevation of 100 ft. Based upon the evaluations performed above, there are no external flood events that would cause flooding above this elevation. Therefore, it is concluded that the VEGP Units 3 and 4 site is bounded by the AP1000 DCD and APP-GW-GLR-101 evaluations and no site specific PRA considerations are required.

“Table 1 – External Event Frequencies for VEGP” provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the flooding information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-6:**

(Follow-up to Question 19-1) The DCD calls for the applicant to “reevaluate the qualitative screening of external fires” and perform a risk assessment if it cannot be demonstrated that the frequency of hazard is less than  $1E-7/yr$ . However, the response to Question 19-1 includes only a reference to the external fires section of the SSAR. Please document this reevaluation or assessment in the FSAR.

**SNC Response:**

A quantitative evaluation of the potential hazards from external fires has been performed in ESPA SSAR Subsection 2.2.3.3 and in COLA FSAR Subsections 2.2.3.3.1 and 2.2.3.3.2. External fires related to transportation accidents and on-site storage tank spills are addressed in the ESPA/COLA evaluations for those specific hazards. Transportation hazards are addressed in ESPA SSAR Subsection 2.2.3.1.1 (truck accidents) and Subsection 2.2.3.1.4 (railroad accidents). Waterway transportation hazards are addressed in ESPA SSAR Subsection 2.2.3.1.3 and have been eliminated from consideration because there is no barge traffic in the vicinity of VEGP Units 3 and 4. For truck and railroad accidents it has been determined that VEGP Units 3 and 4 are sufficiently distant from the hazard that there are no adverse impacts to the units. The evaluations performed are consistent with the requirements of NRC Review Standard RS-002 and Standard Review Plan Chapter 2.

Forest fires are addressed in detail in ESPA SSAR Subsection 2.2.3.3 and COLA FSAR Subsection 2.2.3.3.1. These evaluations addressed heat flux, temperature rise and the impact of toxic chemicals (smoke) on the control room. Since VEGP Units 3 and 4 are approximately adjacent to VEGP Units 1 and 2 and vegetation in the vicinity remains the same even after

revegetation of the Units 3 and 4 construction site, it is concluded that a forest fire will not adversely impact VEGP Units 3 and 4.

Fire due to an accident at an offsite industrial storage facility (Plant Wilson) is addressed in COLA FSAR Subsection 2.2.3.3.2. Similar to the forest fire evaluation discussed above, a VEGP Unit 1 and 2 evaluation is used to address a Plant Wilson fire. The VEGP Unit 1 and 2 evaluation addresses heat flux, temperature rise and the effects of smoke (toxic chemicals) on VEGP Units 1 and 2 control room personnel. This evaluation has been extended to include VEGP Units 3 and 4. VEGP Units 3 and 4 are located further away from Plant Wilson than VEGP Units 1 and 2. The evaluation concludes that any industrial fire due to diesel oil or miscellaneous oils stored at Plant Wilson will not have an impact on control room habitability or cause thermal damage to any safety-related structures at VEGP Units 3 and 4.

Based on the above, it is demonstrated through bounding analyses that there are no external fire events that adversely affect VEGP Units 3 and 4. Therefore, no further consideration of external fires is required in the PRA analysis.

Westinghouse APP-GW-GLR-101, Section 2.0 indicates that per Chapter 58 of the NRC approved AP1000 PRA and AP1000 DCD Chapter 19; external fires are not required to be evaluated in the AP1000 PRA. AP1000 DCD Section 19.58 does state however that the COL applicant should re-evaluate the qualitative screening of external fires and should include external fires in the site specific PRA if any site specific susceptibilities are found. Based upon the evaluations performed in the VEGP ESPA SSAR and COLA FSAR, as summarized above, it is concluded that there are no site specific susceptibilities to external fires for VEGP Units 3 and 4 and no site specific PRA consideration is required.

"Table 1 – External Event Frequencies for VEGP" provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the external fire hazard information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-7:**

(Follow-up to Question 19-1) The response to Question 19-1 refers to the discussion of on-site chemical storage in SSAR subsection 2.2.3.2.3, but on-site chemical storage is not explicitly addressed in the treatment of external events. The SSAR was supplemented by the COL application in this area (COL items 2.2-1 and 2.2-2). Please revise the FSAR to discuss the level of risk associated with on-site chemical storage and the systematic method used to assess or screen the hazard, including the basis for numerical values used.

**SNC Response:**

A quantitative evaluation of the potential hazards from on-site storage tanks has been performed in ESPA SSAR Subsection 2.2.3.2.3 and COLA FSAR Subsection 2.2.3.2.3.1.

As discussed in ESPA SSAR Subsection 2.2.3.2.3, chemicals stored on-site with low toxicity or volatility were excluded from further consideration. Chemicals that were not excluded were evaluated. As applicable, chemicals with potential explosion or flammable vapor cloud hazards to VEGP Units 3 and 4 were evaluated using the methodology of Regulatory Guide 1.91.

Chemicals with potential toxic hazards to control room habitability were evaluated using the methodology of Regulatory Guide 1.78 and NUREG-0570.

All chemicals except hydrazine were evaluated under the ESPA SSAR Subsection 2.2.3.2.3. Hydrazine has been similarly addressed in COLA FSAR Subsection 2.2.3.2.3.1. Based upon the quantitative evaluations performed, no adverse impacts to safe operation of VEGP Units 3 and 4 have been identified.

The evaluations performed for this external event meet the criteria in the NRC Review Standard RS-002 and Standard Review Plan (NUREG-0800, Section 2.2.3) and demonstrate through a bounding analysis that the hazard does not adversely affect the plant. Therefore, the hazard can be excluded from further consideration in the PRA analysis.

This event is not specifically addressed in the AP1000 DCD Section 19.58 or in Westinghouse APP-GW-GLR-101. As discussed above, this event screens out from further PRA analysis, therefore no site specific PRA consideration is required.

“Table 1 – External Event Frequencies for VEGP” provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the on-site chemical storage information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-8:**

(Follow-up to Question 19-1) The response to Question 19-1 refers to the discussion of major depots and storage areas in SSAR subsection 2.2.3.2.2, but “nearby facility accidents” (identified in the DCD as manmade external hazards) are not explicitly addressed in the treatment of external events. Please revise the FSAR to discuss the level of risk associated with nearby facilities and the systematic method used to assess or screen the hazard, including the basis for numerical values used.

**SNC Response:**

A quantitative evaluation of the potential hazards from major depots and storage areas has been performed in ESPA SSAR Subsection 2.2.3.2.2. As discussed, there are no major depots located within 5 miles of the VEGP Units 3 and 4 site. The only chemical storage areas within 5 miles of the VEGP site exist at the Savannah River Site (SRS) and the Wilson combustion turbine plant. There were no chemicals identified at SRS that would be hazardous to the VEGP site or would require further evaluation. The chemicals stored at the Plant Wilson combustion turbine plant (6,000 feet from the VEGP Units 3 & 4 power blocks), consist of fuel oil, sulfuric acid, and several other chemicals kept in small quantities. These chemicals have low volatility and toxicity, and there would be no potential hazard to the new AP1000 unit control rooms habitability from these substances. An analysis, based on the methodology of NUREG-0570, has shown that a postulated release of fuel oil from an accidental spill at Plant Wilson will result in a concentration of less than 50 ppm at the air intake for the control room for VEGP Units 3 or 4. This is less than the 300 ppm toxicity limit. Therefore, the Plant Wilson fuel oil storage tanks do not pose a toxicity hazard to the VEGP Units 3 and 4 control room personnel. Note that the effect of an external fire at the Plant Wilson fuel oil storage tanks is addressed in the response to NRC RAI 19-6 above.

The evaluation performed for this external event meets the criteria in NRC Review Standard RS-002 and demonstrates through a bounding analysis that the hazard does not adversely affect the plant. Therefore, the hazard can be excluded from further consideration in the PRA analysis.

This event is not specifically addressed in the AP1000 DCD Section 19.58 or in Westinghouse APP-GW-GLR-101. As discussed above, this event screens out from further PRA analysis, therefore no site specific PRA consideration is required.

"Table 1 – External Event Frequencies for VEGP" provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009, (ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the major depots and storage area information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**NRC RAI Number 19-9:**

(Follow-up to Question 19-1) In APP-GW-GLR-101, the assessment of railroad and truck accidents states that toxic material releases were considered in the marine accident evaluation; however, the marine accident evaluation uses an IEF of 1E-6/yr and a CCDP of 6.26E-8/yr (reactor trip without operator actions) to develop a CDF below the screening value of 1E-8/yr.

As the response to Question 19-1 refers only to the evaluation in the SSAR, it is unclear whether the IEF and associated CDF for toxic releases from marine accidents are bounding for toxic releases from railroad and truck accidents near the VEGP site. Please revise the FSAR to discuss the level of risk associated with toxic material releases from railroad and truck accidents and the systematic method used to assess or screen the hazard, including the basis for numerical values used.

**SNC Response:**

A quantitative evaluation of the potential hazards from truck and railroad accidents has been performed in the ESPA SSAR.

Potential explosion and flammable vapor cloud hazards to VEGP Units 3 and 4 are discussed in detail in ESPA SSAR Subsection 2.2.3.1.1 for the truck hazards and 2.2.3.1.4 for the rail hazards. These evaluations were performed using the methodology of NRC Regulatory Guide 1.91. These evaluations concluded that the acceptance criteria in NRC Regulatory Guide 1.91 relative to these transportation events are met (overpressure at VEGP Units 3 and 4 is less than 1 psi). Therefore, these events have no adverse impact on VEGP Units 3 and 4.

The potential toxic hazards to the VEGP Units 3 and 4 control room are discussed in detail in ESPA SSAR Subsection 2.2.3.2.1 for both the truck and rail hazards. This hazard was evaluated using the methodology of NRC Regulatory Guide 1.78. These evaluations concluded that the control room toxicity limits for the evaluated toxic hazards are not exceeded in these events.

The evaluations performed for these external events are consistent with the criteria presented in NRC Review Standard RS-002 and demonstrate through bounding analyses that these hazards do not adversely affect the plant. Therefore, the hazards can be excluded from further consideration in the PRA analysis.

No truck or railroad accidents have been identified for VEGP Units 3 and 4 that have potential consequences serious enough to affect the safety of the plant to the extent that 10 CFR 100 guidelines are exceeded. Therefore, it is concluded that the AP1000 site selection criterion has been met. VEGP Units 3 and 4 are considered to be bounded by the AP1000 DCD and Westinghouse Technical Report APP-GW-GLR-101, Section 5.4 and no site specific PRA considerations are required for this event.

DCD Subsection 19.58.2.3.4 and APP-GW-GLR-101, Section 5.4 reference the toxic material release related to the marine accident evaluation to address railroad accidents. The evaluation indicates that the toxic material release is not important to AP1000 plant risk and implies that the railroad accident would be bounded by that assessment. In the marine accident assessment, discussed in DCD Subsection 19.58.2.3.2 and APP-GW-GLR-101, Section 5.2, the evaluation of CDF models a reactor trip followed by a guaranteed failure of all PRA credited operator actions. For VEGP, the evaluations performed, as summarized above, demonstrate that there are no credible truck or railroad accidents that could result in incapacitation of the plant operators, therefore VEGP Units 3 and 4 are bounded by the AP1000 PRA.

“Table 1 – External Event Frequencies for VEGP” provided in response to NRC Request for Additional Information Letter No. 20, SNC letter no. ND-09-0004, dated February 10, 2009,

ND-09-0795  
Enclosure  
Response to RAI Letter No. 033

(ADAMS No. ML090490095) RAI 19-1 is revised in this response to reflect this discussion and will be added to the FSAR as new table 19.58-201 in a future revision to the COLA.

**Associated VEGP COL Application Revisions:**

COLA Part 2, FSAR Chapter 19, Section 19.58 will be revised to include the railroad and truck accident information in FSAR Table 19.58-201. Refer to the response to RAI 19-3 for the details of COLA changes.

**Attachments/Enclosures:**

See attached table 19.58-201.

**Table 19.58-201 – External Event Screening for VEGP**

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
High Winds	F0 Tornado	Y	<p>The tornado strike probability for the VEGP site area is discussed in VEGP ESPA SSAR Subsection 2.3.1.3.2. Vogtle has conservatively assumed that the strike probability for a tornado of a given intensity is equal to the overall strike probability for any tornado. Since the event frequencies are all greater than 1E-07, this event is applicable to the VEGP site.</p> <p>These event frequencies are bounded by the limiting initiating event frequencies given in Table 3.0-1 of APP-GW-GLR-101. Also, as documented in FSAR Table 2.0-201 the VEGP site characteristic tornado wind loadings are equal to the AP1000 DCD site characteristic tornado wind loadings.</p> <p>Therefore, the safety features of the AP1000 are unaffected and the CDFs given in APP-GW-GLR-101 Table 3.0-1 for these events are applicable to VEGP Units 3 and 4.</p>	7.74E-05
	F1 Tornado	Y		7.74E-05
	F2 Tornado	Y		7.74E-05
	F3 Tornado	Y		7.74E-05
	F4 Tornado	Y		7.74E-05
	F5 Tornado	Y		7.74E-05
	Cat. 1 Hurricane	Y	<p>Tropical cyclones are discussed in VEGP ESPA SSAR Subsection 2.3.1.3.3. The event frequencies are based on the number of recorded events over the 154 year period of record. There were no recorded events for Category 4 or 5 hurricanes. However a conservative event frequency of &lt;1E-02 was assigned for these events. These event frequencies were provided to Westinghouse during the development of APP-GW-GLR-101. In 3 of the categories (Cat. 1, 3 Hurricanes and Extra-tropical storms) the event frequencies slightly exceed those given in Table 3.0-1 of APP-GW-GLR-101. This has been attributed to rounding of the values originally provided to Westinghouse by SNC. This change does not impact the conclusion in APP-GW-GLR-101 that none of the limiting event frequencies are sufficiently low to be removed from further consideration.</p> <p>As documented in FSAR Table 2.0-201 the VEGP site characteristic tornado wind loadings are equal to the AP1000 DCD site characteristic tornado wind loadings. The VEGP site characteristic operating basis wind</p>	1.04E-01
	Cat. 2 Hurricane	Y		2.60E-02
	Cat. 3 Hurricane	Y		3.25E-02
	Cat. 4 Hurricane	Y		<1E-02
	Cat. 5 Hurricane	Y		<1E-02

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
	Extra-tropical storms	Y	<p>speed (104 mph) is below the DCD site characteristic operating basis wind speed of 145 mph. Therefore, it is concluded that the safety features of the AP1000 are unaffected and the resultant CDFs given in APP-GW-GLR-101 Table 3.0-1 for these events are bounding to VEGP Units 3 and 4.</p> <p>Winds below 74 mph (tropical storms, depressions) are not considered to have an adverse impact on VEGP Units 3 and 4 as the switchyard and non-safety buildings will be designed to function at a higher wind speed (104 mph as discussed above). Therefore, no additional PRA considerations are required for winds below hurricane force.</p>	3.25E-02
External Flood	External Flood	N	<p>External flooding is addressed in Section 2.4 of the COLA FSAR and ESPA SSAR. The design basis flood event for flooding from the Savannah River is described in SSAR Section 2.4.2.2 and is based on dam failures coincident with wind set-up and wave run-up. The design basis flood level derived is El. 178.10 ft. msl which is well below the site grade of 220 ft msl.</p> <p>Flooding due to a local Probable Maximum Precipitation (PMP) event is addressed in FSAR Subsections 2.4.2 and 2.4.10. The maximum water level in the power block area due to this event is 219.45 ft msl, which is below the entrance and openings to all safety related structures (elevation 220 ft msl). The PMP is the maximum rainfall that can physically occur at the site and the analysis performed contains significant conservatisms such that this value represents a bounding maximum flood elevation.</p> <p>As discussed in COLA FSAR Subsection 1.2.2, the VEGP site grade elevation of 220 ft. msl corresponds to DCD grade elevation 100 ft. Because no external flooding event exceeds this elevation it is concluded that the VEGP site is not susceptible to any external floods which would adversely impact safe operation of VEGP Units 3 and 4. The site is within the bounds of the external flooding events as documented in DCD Subsection 19.58.2.2 and Section 4.0 of APP-GW-GLR-101. No site specific external flood vulnerabilities have been identified and no further site specific PRA considerations are required.</p>	Note 2

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
Transportation and Nearby Facility Accidents	Aviation (commercial/general/military)	N	<p>Aircraft hazards are addressed in VEGP ESPA SSAR Subsection 3.5.1.6. All airports, airways, and military training routes, with the exception of commercial airway V185, were determined to be below the NRC Review Standard RS-002 screening threshold of 1E-07 for evaluating aircraft hazards.</p> <p>Due to the unavailability of traffic data for Airway V185, an evaluation was performed to calculate the maximum number of airway flights per year, above which the acceptance guideline of 1E-07 per year contained in RS-002 and NUREG-0800 are exceeded. The evaluation determined that approximately 51,100 flights per year would be required to reach the limiting crash probability of 1E-07. This value is higher than the total of all projected itinerant flights expected to utilize the airway. Therefore, based on the regulatory screening criteria and the airway traffic analysis, it can be concluded that the probability of a crash that would adversely impact VEGP Units 3 and 4 is less than 1.0E-07. This event frequency is bounded by the limiting value of 1.21E-06 events/year given in APP-GW-GLR-101.</p>	<1.0E-07
	Marine (ship/barge)	N	<p>As discussed in VEGP ESPA SSAR Subsection 2.2.3.1.3, there is no barge traffic past the VEGP site; therefore this event is not applicable to the VEGP site. Since the CDF given in APP-GW-GLR-101 Section 5.2 is based on the premise that a marine accident is a concern the CDF value given in APP-GW-GLR-101 is considered bounding.</p>	Note 2
	Pipeline (gas/oil)	N	<p>As discussed in VEGP ESPA SSAR Subsection 2.2.3.1.2, there are no natural gas pipelines within 10 miles of the VEGP site. No other pipelines carrying potentially hazardous materials are located within 5 miles of the VEGP site.</p> <p>APP-GW-GLR-101 evaluates a 30" gas pipeline approximately 1 mile from the AP1000 and concludes that the initiating event frequency for an event is expected to be less than 1E-07. Because the pipeline hazards at VEGP are well beyond this distance, it is concluded that the APP-GW-GLR-101 evaluation is bounding.</p> <p>Therefore, the potential for hazards from these sources are minimal and will not adversely affect the safe operation of VEGP Units 3 and 4.</p>	Note 2

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
	Railroad	N	<p>Potential explosion and flammable vapor cloud hazards to VEGP Units 3 and 4 resulting from railroad accidents are discussed in VEGP ESPA SSAR Subsection 2.2.3.1.4. The potential hazard resulting from railroad cars was evaluated using the methodology of RG 1.91. The maximum probable cargo based on RG 1.91 was used, along with a conservative TNT equivalency, which resulted in a safe standoff distance that was significantly less than the actual distance from the nearest railroad line to the site boundary (approximately 4.5 miles).</p> <p>Potential toxic hazards to control room habitability due to a release of hazardous chemicals resulting from a railcar accident are addressed in VEGP ESPA SSAR Subsection 2.2.3.2.1. This hazard was evaluated using the methodology of RG 1.78. The results of this evaluation concluded that no adverse impacts to VEGP Units 3 and 4 are expected.</p> <p>Based upon the quantitative consequence evaluations performed, no risk-important events related to railroad transportation have been identified for VEGP Units 3 and 4. Therefore, the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2
	Truck	N	<p>Potential explosion and flammable vapor cloud hazards to VEGP Units 3 and 4 resulting from truck accidents are discussed in VEGP ESPA SSAR Subsection 2.2.3.1.1. The potential hazard resulting from trucks was evaluated using the methodology of RG 1.91. The maximum probable cargo based on RG 1.91 was used, along with a conservative TNT equivalency, which resulted in a safe standoff distance that was significantly less than the actual distance from the nearest highway to the site boundary (approximately 4.7 miles).</p> <p>Potential toxic hazards to control room habitability due to a release of hazardous chemicals resulting from a truck accident are addressed in VEGP ESPA SSAR Subsection 2.2.3.2.1. This hazard was evaluated using the methodology of RG 1.78. The results of this evaluation concluded that no adverse impacts to VEGP Units 3 and 4 are expected.</p> <p>Based upon the quantitative consequence evaluations performed, no risk-important events related to truck transportation have been identified for VEGP Units 3 and 4. Therefore, the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
Other events included in ESPA and COLA:	Major Depots and Storage Areas	N	<p>Potential hazards from major depots and storage areas have been addressed in ESPA Subsection 2.2.3.2.2. The evaluation determined that the only potential hazard that required further evaluation was a postulated release of fuel oil from an accident spill at Plant Wilson. Based upon the evaluation performed it was determined that the postulated spill will not pose a toxicity hazard to VEGP Units 3 and 4. Note that the effect of an external fire at Plant Wilson is evaluated under the External Fire event.</p> <p>The evaluations performed for this external event meet the criteria in NRC Review Standard RS-002 and demonstrate through bounding analysis that the hazard does not adversely affect VEGP Units 3 and 4. Therefore, the hazard can be excluded from further consideration in the PRA analysis.</p> <p>This event is not specifically addressed in DCD Section 19.58 or in APP-GW-GLR-101. As discussed, the event screens out from further PRA considerations, therefore the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2
	On-site Storage Tanks	N	<p>Potential hazards from on-site storage tanks are addressed in ESPA Subsection 2.2.3.2.3 and COLA Subsection 2.2.3.2.3.1. Chemicals stored on site with low toxicity or volatility have been excluded from further consideration. Chemicals not excluded have been specifically evaluated. Chemicals with potential explosion or flammable vapor cloud hazards have been evaluated using the methodology of Regulatory Guide 1.91. Chemicals with potential hazards to control room personnel have been evaluated using the methodology of Regulatory Guide 1.78 and NUREG-0570. Based upon the quantitative evaluations performed, it is concluded that these evaluations demonstrate through bounding analyses that these hazards do not adversely affect VEGP Units 3 and 4. Therefore, the hazard can be excluded from further consideration in the PRA analysis.</p> <p>This event is not specifically addressed in DCD Section 19.58 or in APP-GW-GLR-101. As discussed, the event screens out from further PRA considerations, therefore the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2

Category	Event	Applicable to site? (Y/N) <sup>1</sup>	Explanation of Applicability Evaluation	Event Frequency
	External Fires	N	<p>External fires have been addressed in ESPA Subsection 2.2.3.3 and in COLA Subsections 2.2.3.3.1 and 2.2.3.3.2. The external fire hazards evaluated included forest fires and fire due to an accident at an offsite industrial facility (Plant Wilson). Fire hazards related to on-site chemical storage and transportation accidents are evaluated separately under those specific hazard evaluations. The evaluations performed assessed heat flux, temperature rise and the effects of smoke (toxic chemicals) on control room personnel.</p> <p>Based on the above, it is demonstrated through bounding analysis that there are no external fire events that adversely affect VEGP Units 3 and 4. Therefore, no further consideration of external fires is required in the PRA analysis.</p> <p>This event is not specifically addressed in DCD Section 19.58 or in APP-GW-GLR-101, though AP1000 DCD Section 19.58 does state that the COL applicant should re-evaluate and include external fires in the site specific PRA if any site specific susceptibilities are found. As discussed above, no site specific susceptibilities have been identified for the VEGP Units 3 and 4 site, therefore the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2
	Radiological Hazards	N	<p>An evaluation of potential radiological hazards to VEGP Units 3 and 4 from a postulated design basis accident in VEGP Unit 1 or 2 has been performed (ESPA Subsection 2.2.3.4) based on a LOCA in Unit 1 or 2, at uprated conditions, using the releases produced from the alternate source term (AST) methodology. The resultant dose from this analysis is comparable to the dose reported in DCD Tier 2, Table 15.6.5-3 for a postulated LOCA in the AP1000 and is less than the GDC 19 limits.</p> <p>As stated, the event is of equal or lesser damage potential than the dose reported for a LOCA in the AP1000, therefore the hazard can be excluded from further consideration in the PRA analysis.</p> <p>Note that this event is not specifically discussed in DCD Section 19.58 or in APP-GW-GLR-101. As discussed, the event screens out from further PRA considerations, therefore the evaluations presented in DCD Section 19.58 and APP-GW-GLR-101 are bounding to the VEGP Units 3 and 4 site.</p>	Note 2

Notes:

1. An event is applicable (Y) to the VEGP site if the initiating event frequency is greater than  $1E-07$ , or if a quantitative consequence evaluation has demonstrated that there are site specific parameters that exceed the parameters used APP-GW-GLR-101. An event is not applicable (N) to the VEGP site if the initiating event frequency is less than  $1E-07$  or if the quantitative consequence evaluation performed in the FSAR/SSAR has demonstrated that the event will not adversely impact the safe operation of VEGP Units 3 and 4.
2. A specific event frequency for this event has not been determined. A deterministic quantitative consequence evaluation has been performed that has demonstrated that the event does not adversely impact the safe operation of VEGP Units 3 & 4. Additional details are provided in the "Explanation of Applicability Evaluation" along with references to the applicable FSAR/SSAR Subsections.