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August 17, 2009

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

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the William States Lee III
Nuclear Station Units 1 and 2
Partial Response to Request for Additional Information
(RAI No. 2744)
Ltr# WLG2009.08-03

Reference: Letter from Manny Comar (NRC) to Peter S. Hastings (Duke Energy),
*Request for Additional Information Letter No. 071 Related to SRP 19-
Probabilistic Risk Assessment and Severe Accident Evaluation for the
William States Lee III Units 1 and 2 Combined License Application,*
dated July 15, 2009 (ML091960539)

Letter from Bryan J. Dolan (Duke Energy) to NRC Document Control
Desk, *Response to Request for Additional Information (RAI No. 711)*
Ltr# WLG2008.10-10, dated October 17, 2008 (ML082950295)

This letter provides Duke Energy's partial response to the Nuclear Regulatory
Commission's requests for additional information (RAIs) in the referenced letter.
Responses to RAI Numbers 19-3 thru 19-13, and 19-15 are provided in this letter.

The response to the NRC information requests described in the referenced letter are
addressed in separate enclosures, which also identify associated changes, when
appropriate, that will be made in a future revision of the Final Safety Analysis Report for
the Lee Nuclear Station.

If you have any questions or need any additional information, please contact Peter S.
Hastings, Nuclear Plant Development Licensing Manager, at 980-373-7820.

Bryan J. Dolan
Vice President

Nuclear Plant Development

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Enclosures:

- 1) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-3
- 2) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-4
- 3) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-5
- 4) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-6
- 5) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-7
- 6) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-8
- 7) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-9
- 8) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-10
- 9) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-11
- 10) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-12
- 11) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-13
- 12) Duke Energy Response to Request for Additional Information Letter 071, RAI 19-15

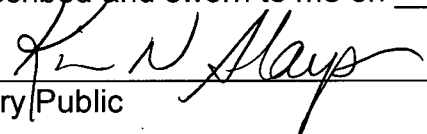
AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.



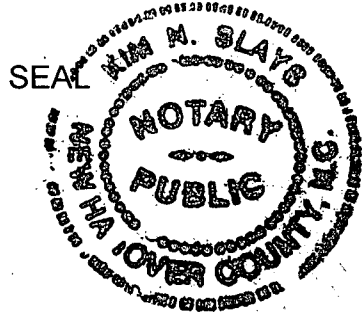
Bryan J. Dolan

Subscribed and sworn to me on August 17, 2009



Notary Public

My commission expires: April 19, 2010



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August 17, 2009
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xc (w/o enclosures):

Loren Plisco, Deputy Regional Administrator, Region II
Stephanie Coffin, Branch Chief, DNRL

xc (w/ enclosures):

Manny Comar, Senior Project Manager, DNRL
Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-3

NRC RAI:

(Follow-up to Question 19-1) The response to Question 19-1 provides information on screening of high winds, external floods, and transportation and pipeline accidents for inclusion in the William States Lee III, Units 1 and 2 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 (1) include a discussion of the external events screening approach used and results of the approach, and (2) discuss why the expected core damage frequency and large release frequency of the screened events is insignificant compared to the quantitative results from other initiators. 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 each external event should be clearly identified. Examples are the five criteria in the American Society of Mechanical Engineers (ASME) combined PRA standard, RA-s, and the Westinghouse approach of an initiating event frequency (IEF) less than 1E-1 per year (/yr) or associated core damage frequency (CDF) of less than 1E-8/yr. 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 (for an example, see non-mandatory Appendix 4-A of ASME RA-S. 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 five criteria identified above; however, this screening should be documented in the FSAR.
- c. The basis for the numerical values generated as part of the screening process should be discussed.

Duke Energy Response:

As documented in the AP1000 DCD Subsection 19.58.1 and Westinghouse Technical Report APP-GW-GLR-101, Section 2.0 (Reference 1), the guidelines used to determine the external events considered in the AP1000 PRA are NRC Generic Letter 88-20, Supplement 4 (Reference 2), and NUREG-1407 (Reference 3).

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 WLS Units 1 and 2 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 WLS screening criterion 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 (for example, storage areas, on-site storage tanks, external fires, and radiological hazards) that have been specifically evaluated in the COLA because of their potential to impact WLS Units 1 and 2. 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 NUREG-0800 Standard Review Plan criteria and current regulatory guidance. In all cases these bounding analyses determined that these events did not adversely affect WLS Units 1 and 2. Consistent with NUREG-1407, Section 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 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). Additional external events applicable to the WLS 1 and 2 site were added to Table 19.58-201. Meteorological conditions for the WLS Units 1 and 2 site are discussed in detail in COLA FSAR Section 2.3 and no unique vulnerabilities have been identified. The events listed in ASME/ANS RA-Sa-2009 (Reference 4) were reviewed. Additional external events applicable to the WLS Units 1 and 2 site were added to Attachment 2 to this response. Therefore, it is concluded that the appropriate external events, as recommended in NRC Generic Letter 88-20, Supplement 4, NUREG-1407, and ASME/ANS RA-Sa-2009, have been considered.

Table 1 "External Event Frequencies for WLS," which was provided in the response to RAI 19-1 (ML082950295), will be revised to include the results of other RAIs in this letter. Table 1 details the screening basis and assumptions used in the PRA results and will be added to the FSAR as new table 19.58-201 in a future revision to the FSAR. The bases for the numerical values generated as part of the screening process are discussed in FSAR Table 19.58-201.

References:

- 1) Westinghouse Electric Company LLC, AP1000 Probabilistic Risk Assessment Site-Specific Considerations, Document Number APP-GW-GLR-101, Revision 1, October 2007.
- 2) NRC Generic Letter 88-20, Supplement 4, Individual Plant Examination for Severe Accident Vulnerabilities – 10 CFR 50.54(f), June 28, 1991.
- 3) NUREG-1407, Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities, June 1991.
- 4) ASME/ANS RA-Sa-2009, Addenda to ASME/ANS-RA-S-2008, Standard for Level 1/ Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications.

Associated Revisions to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Section 19.58

FSAR Subsection 19.59.10.5

New FSAR Table 19.58-201

Attachments:

- 1) Revised FSAR Section 19.58
- 2) New FSAR Table 19.58-201
- 3) Revised FSAR Subsection 19.59.10.5

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 19-3

Revised FSAR Subsection 19.58

FSAR Chapter 19, Section 19.58 will be revised as follows:

This section of the referenced DCD is incorporated by reference with ~~no departures or supplements.~~ the following departures and/or supplements.

19.58.3 Conclusion

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

WLS SUP 19.58-1 Table 19.58-201 documents the site-specific external events evaluation that has been performed for WLS Units 1 and 2. This table provides a general explanation of the evaluation and resultant conclusions and provides a reference to applicable sections of the COL where more detailed supporting information (including data used, methods and key assumptions) regarding the specific event is located. Based upon this evaluation, it is concluded that the WLS Units 1 and 2 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.

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.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 19-3

New FSAR Table 19.58-201

FSAR Section 19.58, will add a new table as follows:

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
<u>High Winds</u>	<u>EF0 Tornado</u>	<u>A, C</u>	<u>Y</u>	Cherokee County tornado activity is provided in Table 2.3-204 from 1950 through 2005. The event frequency was determined for each tornado category using the point probability method presented in Subsection 2.3.1.2.2. First, the average impacted area was calculated by averaging the area of each category of tornado activity (events with an area of zero value were conservatively disregarded in determining the average area). Second, the tornado frequency was calculated by dividing the total count of tornado events in each category including those with zero area by the measured duration (56 years). Third, the point probability of a tornado impacting a square mile (site area estimated as 1 mi ²) is calculated by taking the product of the average impacted area and the average tornado frequency and dividing by the total area of Cherokee County (392.7 mi. ² per Subsection 2.3.1.2.2). This computation	<u>2.13E-05</u>
	<u>EF1 Tornado</u>	<u>A, C</u>	<u>Y</u>		<u>3.42E-05</u>
	<u>EF2 Tornado</u>	<u>A, C</u>	<u>Y</u>		<u>1.25E-05</u>
	<u>EF3 Tornado</u>	<u>A, C</u>	<u>Y</u>		<u>5.17E-05</u>
	<u>EF4 Tornado</u>	<u>A, C</u>	<u>Y</u>		<u>5.43E-05</u>
	<u>EF5 Tornado</u>	<u>D</u>	<u>Y</u>		<u><1.00E-03</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>assumes that tornadoes with a zero path length have an area equal to the average area of the category.</u></p> <p><u>As shown in Table 2.3-204, there are no recorded category EF5 tornados in the region. A conservative event frequency of <1.00E-03 was assigned for EF5 tornado events, consistent with APP-GW-GLR-101 (Reference 201).</u></p> <p><u>These event frequencies are bounded by the limiting initiating event frequencies given in Table 3.0-1 of APP-GW-GLR-101.</u></p> <p><u>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 WLS Units 1 and 2.</u></p>	
	<u>Cat.1 Hurricane</u>	<u>D</u>	<u>Y</u>	<u>Historical data for tropical weather is archived by the National Coastal Services Center, and dates back to 1851. This data was used to analyze the occurrence of tropical weather traveling directly over Cherokee County, or near enough to</u>	<u>1.27E-02</u>
	<u>Cat.2 Hurricane</u>	<u>A, C</u>	<u>Y</u>		<u>1.27E-02</u>
	<u>Cat.3 Hurricane</u>	<u>D</u>	<u>Y</u>		<u>1.00E-02</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
	<u>Cat.4 Hurricane</u>	<u>D</u>	<u>Y</u>	<p><u>Cherokee County to have a substantial impact (distance defined as 100 statute miles radius from plant). The resulting storms have been sorted to remove duplicate values. The event frequency is determined by dividing the measured duration (157 years) by the number of occurrences of tropical weather.</u></p> <p><u>Figure 6-1B of ASCE/SEI 7-05 shows the basic wind speed for the eastern part of the Gulf of Mexico, including the state of South Carolina. WLS is located in the northwest part of the state beyond the 90 mph contour. Thus, it is concluded that WLS is not located in a Hurricane Prone Region.</u></p> <p><u>There were no recorded events for Category 3, 4, or 5 hurricanes. However, a conservative event frequency of 1.00E-02 was assigned for these events, consistent with APP-GW-GLR-101 for Category 4 and 5 hurricanes (Reference 201).</u></p> <p><u>These event frequencies are bounded by the</u></p>	<u>1.00E-02</u>
	<u>Cat.5 Hurricane</u>	<u>D</u>	<u>Y</u>		<u>1.00E-02</u>
	<u>Extratropical Cyclones</u>	<u>D</u>	<u>Y</u>		<u>9.55E-02</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>limiting initiating event frequencies given in Table 3.0-1 of APP-GW-GLR-101. 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 WLS Units 1 and 2.</u></p> <p><u>Winds below 74 mph (storms) are not considered to have an adverse impact of WLS Units 1 and 2 as the switchyard and non-safety buildings will be designed to function at a higher wind speed (96 mph). Therefore, no additional PRA considerations are required for winds below hurricane force.</u></p>	
<u>External Flood</u>	<u>External Flood</u>	<u>D</u>	<u>Y</u>	<p><u>As discussed in Subsections 2.4.2.2 and 2.4.5, specific analysis of Broad River flood levels resulting from surges, seiches, snowmelt, ice effects, flood-waves from landslides, and tsunamis is not required for the Lee Nuclear Station.</u></p> <p><u>As discussed in Subsection 2.4.4, failure of</u></p>	<u>N/A</u>

<u>Table 19.58-201</u>					
<u>External Event Frequencies for WLS</u>					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>the on-site reservoirs would not affect the safety-related facilities.</u></p> <p><u>As discussed in Subsections 2.4.1.2.2.6 and 2.4.3.6, the Probable Maximum Flood (PMF) event on the Make-Up Pond B watershed with the added effects of coincident wind wave activity results in a flood elevation of 584.6 ft. The Lee Nuclear Station safety-related plant elevation is 590 ft. This result shows a margin exceeding 5 ft. between the calculated flood elevation and the point where safety-related SSCs could be impacted.</u></p> <p><u>As discussed in Subsection 2.4.4.3, the PMF event on the Broad River, including effects of dam failures and the coincident wind wave activity, results in a flood elevation of 582.01 ft. Thus, the Make-Up Pond B event described above remains the bounding event for external flooding and provides reasonable assurance that the plant has</u></p>	

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>adequate protection from external flooding.</u></p> <p><u>As discussed in Subsection 2.4.4.1, the Make-Up Pond C peak dam failure outflow was combined with the maximum historical flow recorded on the Broad River. The resulting combined peak outflow does not exceed the critical dam failure event for the Broad River watershed, and, even if routed to the Lee Nuclear Station without attenuation, the resulting water surface elevation would not exceed the elevation determined from the critical multiple dam failure scenario coincident with the Broad River watershed PMF. Thus, the consequences of the Make-Up Pond C failure event are bounded and would not adversely affect safety related structures.</u></p> <p><u>The above discussion and results for “External Floods” are consistent with the evaluation presented in Section 4.0 of APP-GW-GLR-101 (Reference 201), which states that the AP1000 is protected against floods up to the 100 ft level (590 ft msl for</u></p>	

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				Lee Nuclear Station). Therefore, it is concluded that this event frequency is bounded by the CDF of 5.85E-15 events per year given in APP-GW-GLR-101, Section 4.0 and the safety features of the AP1000 are unaffected.	
<u>Transportation and Nearby Facility Accidents</u>	<u>Aviation (commercial/general/military)</u>	<u>A, B</u>	<u>Y</u>	<p>As discussed in Subsection 3.5.1.6, a calculation performed in accordance with the guidelines of Standard Review Plan (SRP) Section 3.5.1.6, determined the general aviation probability of aircraft accidents that hit safety related structures is less than 1.8E-7 per year. Note, the calculated event frequency is based entirely on the general aviation crash rate, including use of low altitude Airway V54. This event frequency is bounded by the limiting value of 1.21E-6 events/year for small aircraft in APP-GW-GLR-I01.</p> <p>As discussed in Subsection 3.5.1.6, no airports having more than 500 D² movements per year are located within 10</p>	<p>1.8E-07 (general aviation)</p> <p><1.0E-7 (commercial aircraft)</p>

Table 19.58-201

External Event Frequencies for WLS

<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>miles of the site, and no airports beyond 10 miles of the site have more than 1000 D² movements per year. Thus, the aircraft hazard probability does not need to be calculated because it is considered to be less than an order of magnitude of 1.0E-7 per year.</u></p> <p><u>Subsection 2.2.2.7.2 identifies two high altitude airways used by commercial aircraft in the vicinity of the site. The centerline of the nearer, J208, is located approximately 9 miles from the site. Given the total width of the airway is 8 nautical miles (9.2 statute miles), the nearest edge of the airway more than 4 statute miles from the site, which exceeds the screening criterion of 2 statute miles given in SRP 3.5.1.6.</u></p> <p><u>Based on the above discussion, the commercial aircraft hazard probability is considered to be less than an order of magnitude of 1.0E-7 per year, and the APP-GW-GLR-101 criterion of an impact frequency of less than 1.0E-7 per year is</u></p>	

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				met for the site. Thus, the commercial aircraft hazard for WLS Units 1 and 2 is bounded by the limiting initiating event frequencies given in subsection 5.1 of APP-GW-GLR-101.	
	<u>Marine (ship/barge)</u>	<u>E</u>	<u>N</u>	As discussed in Subsection 2.2.3.1.3.1, the nearby Broad River is not navigable by barges and does not transport commercial traffic. No risk-important events related to marine transportation have been identified for WLS Units 1 and 2. This is consistent with the evaluation provided in Subsection APP-GW-GLR-101. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operations of WLS Units 1 and 2.	<u>N/A</u>
	<u>Pipeline (gas/oil)</u>	<u>B</u>	<u>N</u>	As discussed in Subsection 2.2.3.1.1.2, the releases from postulated rupture of the natural gas pipelines and refined petroleum pipelines within 5 miles of WLS do not	<u>N/A</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p>pose a credible hazard to the site. As discussed in Subsection 2.2.3.1.2, <u>unconfined vapor clouds with delayed ignition were evaluated for various energetic combustible materials, and determined to not result in any significant damage to the plant.</u></p> <p><u>Based upon the quantitative consequence evaluations performed, the limiting initiating event is conservatively estimated to be 1.0E-7 events per year. This is consistent with the evaluation provided in Subsection 5.3 of APP-GW-GLR-101. Thus, the pipeline accident hazard for WLS Units 1 and 2 is bounded by the limiting initiating event frequencies given in Subsection 5.3 of APP-GW-GLR-101.</u></p>	
	<u>Railroad</u>	<u>D</u>	<u>N</u>	<p><u>As discussed in Subsection 2.2.3.1.1.1, 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</u></p>	<u>N/A</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>conservative TNT equivalency, which resulted in a safe standoff distance that was less than the distance from the nearest approach of a railroad line to the site boundary.</u></p> <p><u>As discussed in Subsection 2.2.3.1.2, unconfined vapor clouds with delayed ignition were also evaluated for various energetic combustible materials, and determined to not result in any significant damage to the plant.</u></p> <p><u>Based upon the quantitative consequence evaluations performed, no risk-important events related to rail transportation have been identified for WLS Units 1 and 2. This is consistent with the evaluation provided in Subsection 5.4 of APP-GW-GLR-101. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation WLS Units 1</u></p>	

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<u>and 2.</u>	
	<u>Truck</u>	<u>D</u>	<u>N</u>	<p><u>As discussed in Subsection 2.2.3.1.1.1, 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 less than the distance from the nearest highway to the site boundary.</u></p> <p><u>As discussed in Subsection 2.2.3.1.2, unconfined vapor clouds with delayed ignition were also evaluated for various energetic combustible materials, and determined to not result in any significant damage to the plant.</u></p> <p><u>Based upon the quantitative consequence evaluations performed, no risk-important events related to truck transportation have been identified for WLS Units 1 and 2. This is consistent with the evaluation provided in Subsection 5.4 of APP-GW-GLR-101.</u></p>	<u>N/A</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation of WLS Units 1 and 2.	
	<u>Nearby Facility Accidents</u>	<u>D</u>	<u>Y</u>	<u>Subsection 2.2.3.1.1.3 discusses potential design basis events associated with accidents at nearby facilities. Subsection 2.2.3.2 concludes that the effects of events from these facilities on the safety-related components of the plant are insignificant. Therefore, because no risk-important consequences were identified, the potential for hazards from these sources are minimal and will not adversely affect safe operation of WLS Units 1 & 2.</u>	<u>N/A</u>
<u>Other events</u>	<u>A number of external events beyond those evaluated in</u>			<u>Based on the evaluations below, these events do not pose a credible threat to the safe operation of the station. Thus, these events are not considered to be risk-important and it can be concluded that the</u>	

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
	<u>DCD Subsection 19.58 and APP-GW-GLR-101 (Reference 201) were evaluated for the WLS site. These events are discussed below.</u>			<u>WLS Units 1 and 2 site is within the bounds of the Floods and Other External Events analysis documented in DCD Section 19.58 and APP-GW-GLR-101 (Reference 201).</u>	
	<u>External Fires</u>	<u>D</u>	<u>Y</u>	<u>Subsection 2.2.3.1.4 discusses external fires and concludes that fires originating from accidents at nearby facilities or transportation routes, and brush and forest fires will not endanger the safe operation of the station. Additionally, this subsection states that fire and smoke from accidents at nearby homes, industrial facilities, transportation routes, or from area forest or brush fires do not jeopardize the safe operation of the plant due to the separation</u>	<u>N/A</u>

<u>Table 19.58-201</u>					
<u>External Event Frequencies for WLS</u>					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				<p><u>distance from the plant.</u></p> <p><u>Therefore, because no risk-important consequences were identified, the potential for hazards from external fires is minimal and will not adversely affect safe operation of WLS Units 1 & 2.</u></p>	
	<u>Toxic Chemical Releases</u>	<u>D</u>	<u>Y</u>	<p><u>Based on the evaluations provided in Subsections 2.2.3.1.3 and 6.4.4.2, release of toxic chemicals from stationary industrial sources and mobile sources in the vicinity of WLS does not pose a credible threat to the control room operators. Based the quantitative consequence evaluations performed, toxic chemical release events at the Lee Nuclear Station are not considered to be risk-important. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation of WLS Units 1 and 2.</u></p>	<u>N/A</u>
	<u>On-Site</u>	<u>D</u>	<u>Y</u>	<u>FSAR Subsection 2.2.3.1.3.2.1, "Stationary</u>	<u>N/A</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
	<u>Chemical Storage</u>			<p>Sources,” states that there are no site-specific sources of airborne hazardous materials stored on the Lee Nuclear Station site in sufficient quantity to affect control room habitability.</p> <p>Based the quantitative consequence evaluations performed on-site chemical storage at the Lee Nuclear Station is not considered to be risk-important. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation of WLS Units 1 and 2.</p>	
	<u>Major Depots and Storage Areas Releases</u>	<u>D</u>	<u>Y</u>	<p>Based on the discussion in Subsection 2.2.2.2.4, none of the listed mines poses a credible threat to the site, because none of the mines uses explosives. Also, there are no military facilities within 5 mi, so no further evaluation is required. Based upon the quantitative consequence evaluations performed, no risk-important events related</p>	<u>N/A</u>

Table 19.58-201					
External Event Frequencies for WLS					
<u>Category</u>	<u>Event</u>	<u>Evaluation Criteria</u> (See Notes)	<u>Applicable to Site?</u> (Y/N) ¹	<u>Explanation of Applicability Evaluation</u>	<u>Event Frequency</u> (Events/yr)
				to major depots and storage areas releases have been identified for WLS Units 1 and 2. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation WLS Units 1 and 2.	

Notes:

1. All events that are physically possible are considered to be “applicable” and are discussed. Those events that are physically not possible are considered not applicable to the site.

Evaluation Criteria

A: The initiating event frequency (IEF) is less than the IEF in DCD Tier 2 Section 19.58 or Table 19.58-3 for the event.

B: IEF is less than 1.0E-07.

C: Core damage frequency (CDF) is less than 1.0E-08.

D: 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 WLS 1 and 2. Additional details are provided in the "Explanation of Applicability Evaluation" with references to the applicable FSAR Subsections.

E: The event is not physically possible for the site.

More than one screening note may apply to a given type of event.

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 3 to RAI 19-003

Revised FSAR Subsection 19.59.10.5

FSAR Chapter 19, Subsection 19.59.10.5, fourth paragraph will be revised as follows:

As discussed in Subsection 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, ~~Chapter 19~~ Section 19.58 of the AP1000 DCD is applicable to this design.

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-4

NRC RAI:

(Follow-up to Question 19-1) In its response to RAI 19-1, the applicant did not appear to provide information about extratropical cyclones. The DCD calls for an evaluation of the frequency of such storms, and provides a bounding value, which applicants are to confirm bounds their sites. Please address this issue in the FSAR.

Duke Energy Response:

Westinghouse requested in 2007 that NuStart utilities complete an "External Hazard 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 (Reference 1). The Saffir-Simpson scale for hurricanes starts at 74 mph wind speeds 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, Loss of offsite power (LOSP) occurs and all non-safety-related systems are unavailable.
- For all wind events that did not have a wind speed greater than 145 mph, LOSP occurs (non-safety-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 LOSP occurs for all these events, the results 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, it is unreasonable to assume, for the APP-GW-GLR-101 evaluation, that all these weather systems cause a LOSP. 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 against high wind velocities. As shown in FSAR Table 2.0-201, the site characteristics operating basis wind speed is 96 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 LOSP because there are other factors, such as lightning and precipitation, which occur during a storm that influence the LOSP frequency and likely dominate the effect of wind speeds at the lower end of the wind speed range. The AP1000 PRA includes LOSP as an initiating event and the frequency of LOSP includes events due to lightning, precipitation and other factors. The probability of LOSP 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 LOSP 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 eight LOSP events due to high winds (defined in this report as wind speeds less than 125 mph) during 1,984.7 reactor-years (including both Critical and Non-critical conditions for all reactors in the United States). This yields a frequency of 4.0E-3 LOSP events per reactor-year due to high wind events with speeds less than 125 mph (enveloping extratropical cyclones, 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. A frequency of 4.0E-3 LOSP events per reactor year is bounded by the frequency of 3E-02 events per year discussed above. Therefore, the evaluation of Wind Events in APP-GW-GLR-101 remains applicable for the AP1000 at the Lee site.

Based on the above, it is concluded that winds below 74 mph are not considered to have an adverse impact on WLS Units 1 and 2 as the switchyard and non-safety buildings will be designed to function at a higher wind speed (96 mph). Therefore, no additional PRA considerations are required for winds below hurricane force, and the resultant CDFs given in Table 3.0-1 of Reference 1 for these events are applicable to the Lee Nuclear Station.

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (ML082950295), will be revised to present the risks associated with extratropical cyclones and submitted as Table 19.58-201 in a future revision to the FSAR.

References:

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

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to include the risks associated with extratropical cyclones in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
 Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-5

NRC RAI:

(Follow-up to Question 19-1) Section 19.58 of the AP1000 Design Control Document (DCD) classifies tornadoes according to the enhanced Fujita (EF) scale. To allow direct comparison between the FSAR and the referenced DCD, please re-classify tornadoes reported in the FSAR using the EF scale.

Duke Energy Response:

Texas Tech University (TTU) Wind Science and Engineering Center Research Publication, "A Recommendation for an Enhanced Fujita Scale (EF-Scale)," June 2004, correlates the Fujita-Scale wind speeds with the EF-Scale wind speeds. The TTU publication states that a tornado rated according to the Fujita-Scale will have the same "F-Number" in the EF Scale, e.g. F3 translates into EF3, although the wind speed ranges are different. TTU developed the linear regression function demonstrating the correlation between the two scales, as shown below and in the resulting table. Values have been rounded to avoid implying more accuracy than justified.

$$Y = 0.6246X + 36.393$$

Fujita Scale		EF Scale	Derived EF Scale	Recommended EF Scale
Fujita Scale	3second Gust Speed, mph	EF Scale	3second Gust Speed, mph	3-Second Gust Speed, mph
F0	45-78	EF0	65 - 85	65 - 85
F1	79 - 117	EF1	86 - 109	86 - 110
F2	118 - 161	EF2	110 - 137	111 - 135
F3	162 - 209	EF3	138 - 167	136 - 165
F4	210 - 261	EF4	168 - 199	166 - 200
F5	262 - 317	EF5	200 - 234	>200

Y is the EF-Scale wind speed and X is the Fujita-Scale wind speed (both are 3-second gust in mph).

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295) will be revised to present the tornado event classifications using the EF-Scale and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to include the risks associated with tornado events in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-6

NRC RAI:

(Follow-up to Question 19-1) (a) Please expand your risk results discussion for external flooding by addressing all potential causes of elevated water levels (e.g., pond, lake or reservoir surges/seiches, precipitation, dam failure), including credible combinations of sources. (b) Please revise the FSAR to more fully 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 expected CDF from an external flood is less than $1E-8/yr$), including the basis for the numerical values used. (c) Please discuss the impact on the external flooding analysis from the site-specific modifications (e.g., addition of another pond at the Lee site since the last revision to the FSAR.)

Duke Energy Response:

Parts (a) and (c):

As discussed in FSAR Subsection 2.4.2.2 and 2.4.5, specific analysis of Broad River flood levels resulting from surges and tsunamis is not required because of the inland location and elevation characteristics of the Lee Nuclear Station. Seiche effects were determined to present no risk to the station's safety-related facilities. Snowmelt and ice effect considerations are unnecessary because of the temperate zone location of the Lee Nuclear Station. As addressed in FSAR Subsection 2.4.6, significant landslide generated waves triggered by hill slope failure are not plausible for the on-site Ponds A and B. In addition, elevation characteristics of the vicinity relative to the Broad River, combined with the limited storage volume availability of nearby upstream reservoirs, prohibit significant landslide-induced flood waves.

There are no onsite water control or storage structures located above site grade whose failure may induce flooding. As discussed in Subsection 2.4.4.3 as revised by letter dated July 31, 2009 (Reference 1), the Lee Nuclear Station's safety-related facilities are located above the resulting water surface elevation. Therefore, no safety-related structures could be affected by waterborne missiles.

As discussed in FSAR Subsection 2.4.4, as revised by Duke Energy letter WLG2009.07-08 (Reference 1), the Upper Broad River drainage basin above Ninety-Nine Islands Dam derives water from several tributaries that contain a considerable number of dams. According to the U.S. Army Corps of Engineers (USACE), National Inventory of Dams, there are approximately 131 upstream dams, not including the proposed Make-Up Pond C dam. Most of the dams in the drainage basin have small to insignificant storage capacity. The six largest reservoirs in the basin, including the proposed Make-Up Pond C dam, represent about 88 percent of the total storage capacity for the basin. Two other dams, Cherokee Falls and Gaston Shoals, located

immediately upstream from the Lee Nuclear Station, possess less than 2 percent of the total storage capacity for the basin.

Make-Up Pond A and Make-Up Pond B are located at elevations much lower than the Lee Nuclear Station's safety-related facilities. Failure of the dams associated with Make-Up Pond A and Make-Up Pond B would result in a discharge to smaller ponds and then directly to the Broad River. The respective volumes are small compared to the available capacity of the Broad River and the freeboard available at the site. Failure of the on-site reservoirs would not affect the safety-related facilities.

As discussed in FSAR Subsections 2.4.1.2.2.6 and 2.4.3.6, as revised by the Duke Energy response to RAI 02.04.03-006 (Reference 2), the maximum flood level from the most limiting surface water body is elevation 584.6 ft. msl. This elevation would result from a Probable Maximum Flood (PMF) event on the Make-Up Pond B watershed with the added effects of coincident wind wave activity. The Lee Nuclear Station safety-related plant elevation is 590 ft. This result shows a margin exceeding 5 ft. between the calculated flood elevation and the point where safety-related SSCs could be impacted.

As discussed in FSAR Subsection 2.4.4.3, as revised by Duke Energy letter WLG2009.07-08 (Reference 1), the PMF event on the Broad River, including effects of dam failures and the coincident wind wave activity, results in a flood elevation of 582.01 ft. Thus, the PMF event on the Make-Up Pond B watershed described above remains the bounding event for external flooding and provides reasonable assurance that the plant, as proposed, has adequate protection from external flooding.

As discussed in FSAR Subsection 2.4.4.3, as revised by Duke Energy letter WLG2009.07-08 (Reference 1), the Make-Up Pond C reservoir is located on a tributary of the Broad River, west of the Lee Nuclear Station, such that a postulated failure of Make-Up Pond C dam would release water to the Broad River prior to reaching the Lee Nuclear Station. As discussed in FSAR Subsection 2.4.4.1, as revised by Duke Energy letter WLG2009.07-08 (Reference 1), the Make-Up Pond C peak dam failure outflow was combined with the maximum historical flow recorded on the Broad River to account for any coincidental flow in the Broad River. The resulting combined peak outflow does not exceed the critical dam failure event for the Broad River watershed, and, even if routed to the Lee Nuclear Station without attenuation, the resulting water surface elevation would not exceed the elevation determined from the critical multiple dam failure scenario coincident with the Broad River watershed PMF. Thus, the consequences of the Make-Up Pond C failure event are bounded and would not adversely affect safety related structures.

As discussed in FSAR Subsection 1.2.2, the Lee Nuclear Station site design grade of 590 ft. msl corresponds to DCD grade elevation 100 ft. Based upon the quantitative evaluations performed, the Lee Nuclear Station site is not susceptible to any external floods which would adversely impact safe operation of Lee Nuclear Station Units 1 and 2.

Part (b):

The above discussion and results are consistent with the evaluation presented in Section 4.0 of APP-GW-GLR-101 (Reference 3), which states that the AP1000 is protected against floods up to the 100 ft level (590 ft msl for the Lee Nuclear Station). Therefore, it is concluded that the resultant CDF of $5.85E-15$ events per year given in APP-GW-GLR-101, Section 4.0 is bounding.

Table 1 "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295) will be revised to present the risks associated with external flooding and submitted as Table 19.58-201 in a future revision to the FSAR.

References:

- 1) Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission (NRC), Supplemental Information Addressing Hydrology Associated with Off-Site Water Storage, dated July 31, 2009, Duke Energy Ltr # WLG2009.07-08.
- 2) Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission (NRC), Response to Request for Additional Information (RAI No. 2680), dated June 19, 2009, Duke Energy Ltr # WLG2009.06-06.
- 3) Westinghouse Electric Company LLC, AP1000 Probabilistic Risk Assessment Site-Specific Considerations, Document Number APP-GW-GLR-101, Revision 1, October 2007.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to provide the requested information in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-7

NRC RAI:

(Follow-up to Question 19-1) In the response to Question 19-1, the applicant indicates that the total probability of aircraft accidents is less than $1.8E-7$ per year. This value appears to be based entirely on the general aviation crash rate. Please discuss your analysis for commercial aircraft, and how the DCD criterion of an impact frequency of less than $1.0E-7$ per year is met for the site. Please include the basis for numerical values used.

Duke Energy Response:

As discussed in FSAR Subsection 3.5.1.6, a calculation performed in accordance with the guidelines of Standard Review Plan (SRP) Section 3.5.1.6, determined the probability of an aircraft crash into the effective plant areas of the safety-related structures on the Lee Nuclear Station site. The only safety-related structures of the AP1000 design are the containment and the auxiliary building.

In accordance with SRP 3.5.1.6, if the plant-to-airport distance (D) is between five and ten statute miles and the projected annual number of operations is less than $500 D^2$; or, the plant-to-airport distance is greater than ten statute miles and the projected annual number of operations is less than $1000 D^2$ an aircraft hazard probability does not need to be calculated because it is considered to be less than an order of magnitude of 10^{-7} per year. As discussed in Final Safety Analysis Report (FSAR) 3.5.1.6, no airports having more than $500 D^2$ movements per year are located within ten (10) miles of the site, and no airports beyond ten (10) miles of the site have more than $1000 D^2$ movements per year.

FSAR subsection 2.2.2.7.2 identifies two high altitude airways (J208 and J14) used by commercial aircraft in the vicinity of the site. The centerline of J208, the nearer airway, is located approximately nine (9) miles from the site. Given that the total width of this airway is eight nautical miles (9.2 statute miles); the nearest edge of the airway is more than four (4) statute miles from the site, which exceeds the screening criterion of two (2) statute miles given in SRP 3.5.1.6.

Based on these criteria, the aircraft hazard probability for commercial aircraft is considered to be less than an order of magnitude of 10^{-7} per year, and the Westinghouse Technical Report (APP-GW-GLR-101) criterion of an impact frequency of less than $1.0E^{-7}$ per year is met for the site.

As discussed in FSAR Subsection 3.5.1.6, the total aircraft hazard probability for the site is based on the probability of aircraft crashing from low altitude federal airway, V54. This low altitude route is primarily flown by small, light general aviation aircraft. Because of low airspeed, short distance landing capability, high maneuverability and low penetration capability light general aviation aircraft are not considered a significant hazard. But, because low altitude

airway V54 did not meet the site criterion of two (2) statute miles beyond the nearest edge of a federal airway, holding or approach pattern an aircraft crash probability was performed based on general aviation aircraft activity.

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295) will be revised to present the risks associated with commercial aircraft hazards and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to include the risks associated with aircraft hazards in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachment:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-8

NRC RAI:

(Follow-up to Question 19-1) The DCD calls for an 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 does not address external fires. Please provide a discussion of your evaluation and document this reevaluation or assessment in the FSAR.

Duke Energy Response:

FSAR Subsection 2.2.3.1.4 discusses external fires and concludes that fire and smoke from accidents at nearby homes, industrial facilities, transportation routes, or from area forest or brush fires, does not jeopardize the safe operation of the plant due to the separation distance of potential fires from the plant.

Therefore, because no risk-important consequences were identified, the potential for hazards from external fires is minimal and does not need to be evaluated further as their contribution to core damage frequency is expected to be less than 1% of the total AP1000 plant CDF given in Section 2 of the Westinghouse Technical Report (APP-GW-GLR-101).

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295), will be revised to present the risks associated with external fires and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to present the risks associated with external fires in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-9

NRC RAI:

(Follow-up to Question 19-1) The response to Question 19-1 does not appear to discuss the risk associated with on-site chemical storage at Lee. Please provide a discussion of your evaluation of this hazard, and 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.

Duke Energy Response:

FSAR Subsection 2.2.3.1.3, "Toxic Chemicals," indicates that accidents involving the release of toxic chemicals from on-site storage facilities and nearby mobile and stationary sources are addressed in FSAR Subsection 6.4. For each postulated event, the concentration at the site is determined for use in evaluating the control room habitability. The analyses and results described in FSAR Subsection 6.4 are discussed in the response to RAI 19-11 (this letter).

As indicated in FSAR Subsection 2.2.3.1.1.4, "Onsite Chemicals," the AP1000 uses small amounts of combustible gases for normal plant operation. Most of these gases are used in limited quantities and are associated with plant functions or activities that do not jeopardize any safety-related equipment. These gases are found in areas of the plant that are removed from the nuclear island. The exception to this is the hydrogen supply line to the chemical and volume control system (CVS). The CVS is the only system on the nuclear island that uses hydrogen gas. Hydrogen is supplied to the AP1000 CVS inside containment from a single hydrogen bottle. The release of the contents of an entire bottle of hydrogen in the most limiting building volumes, both inside containment and in the auxiliary building would not result a volume percent of hydrogen large enough to reach a detonable level.

FSAR Subsection 2.2.3.1.3.2.1, "Stationary Sources," states that there are no site-specific sources of airborne hazardous materials stored on the Lee Nuclear Station site in sufficient quantity to affect control room habitability.

Based the quantitative consequence evaluations performed, no risk-important events related to on-site chemical storage have been identified. Therefore, because no risk-important consequences were identified in the evaluation, the potential for hazards from these sources are minimal and will not adversely affect safe operation of WLS Units 1 and 2.

Table 1, "External Event Frequencies for WLS," which was provided in the response to RAI 19-1 (Accession# ML082950295) will be revised to present the risks associated with on-site chemical storage and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to present the risks associated with on-site chemical storage in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-10

NRC RAI:

(Follow-up to Question 19-1) The response to Question 19-1 does not appear to discuss the risks associated with nearby facilities, including major depots and nearby storage areas. 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.

Duke Energy Response:

FSAR Subsection 2.2.3.1 discusses potential design basis events associated with accidents at nearby facilities. FSAR 2.2.3.2 concludes that the effects of events from these facilities on the safety-related components of the plant are insignificant. Therefore, because no risk-important consequences were identified, the potential for hazards from these sources is minimal and will not adversely affect safe operation of WLS Units 1 & 2.

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295) will be revised to present the risks associated with nearby facilities and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to include clarification of "nearby facility accidents" in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-11

NRC RAI:

(Follow-up to Question 19-1) The response to Question 19-1 does not address hazards associated with toxic materials (rail, truck, and pipeline). The DCD discusses these hazards and provides an assumed bounding analysis. Please provide a discussion of your evaluation of this hazard, and revise the FSAR to discuss the level of risk associated with release of toxic materials and the systematic method used to assess or screen the hazard, including the basis for numerical values used.

Duke Energy Response:

FSAR Subsection 2.2.3.1.3, Toxic Chemicals, evaluates releases of toxic chemicals from stationary industrial sources and mobile sources. FSAR Subsection 2.2.3.1.3.3, Analysis of Hazardous Materials, indicates that a release of chlorine could potentially result in elevated concentrations at the control room intake. Therefore, an analysis of chlorine concentrations inside the control room was conducted.

An analysis of a tractor-trailer based chlorine release at the closest point of passage of Route 329 was performed using the methodology of the EXTRAN code contained in the HABIT software package, as specified in Regulatory Guide 1.78 to establish a guideline for further evaluation. FSAR Subsection 2.2.3.1.3.3 discusses the model's parameters.

The results of the HABIT EXTRAN analysis indicate that under worst case meteorological conditions for the site, a pressurized liquid chlorine tractor-trailer burst type accident would cause the HVAC intake outside the control room to exceed the IDLH values. However, the habitability analysis discussed in FSAR Subsection 6.4.4.2 concludes that the concentration inside the control room would be less than the chlorine IDLH value.

Chlorine is one of the most hazardous DOT approved chemicals, and was used to model a worst case DOT 2.3 release. It is highly toxic with an IDLH of 10 PPM, and is heavier than air so it can travel laterally without significant dispersion under calm conditions. Other chemicals that may be transported down the roadways are bounded by the properties of chlorine, thus are precluded from further analysis.

Based on these evaluations, release of toxic chemicals from stationary industrial sources and mobile sources in the vicinity of WLS do not pose a credible threat to the control room operators. Thus, these events are not considered to be risk-important.

Table 1, "External Event Frequencies for WLS," provided in the response to RAI 19-1 (Accession# ML082950295), will be revised to present the hazards associated with toxic materials and submitted as Table 19.58-201 in a future revision to the FSAR.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

FSAR Chapter 19, Subsection 19.58 will be revised to present the hazards associated with toxic materials in FSAR Table 19.58-201 as described in the response to RAI 19-3 (this letter).

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-12

NRC RAI:

Please discuss the basis for concluding that the site-specific systems described in the COL application (e.g., raw water system, turbine building closed cooling water system) that are modeled in the Lee PRA are consistent with the assumptions made in the development of IEFs and support system failure probabilities in the AP1000 PRA.

Duke Energy Response:

The site-specific systems described in the COLA (e.g. raw water system, turbine building closed cooling water system, circulating water system) are designated as Class E systems (AP1000 DCD Tier 2 Table 3.2-3). A Class E system has no safety-related function and does not contain sufficient radioactive material such that a release could exceed applicable limits (AP1000 DCD Tier 2 Subsection 3.2.2.7).

Additional information on how non-safety systems are credited is provided in the responses to RAI Numbers 09.02.01-006 and 09.02.01-007 (Reference 1), which specifically address the raw water system.

WLS COLA Part 10, COL Holder Item 19.59.10-2, as revised in the response to RAI 19-14 (this letter), states: "The Combined License holder referencing the AP1000 certified design will review differences between the as-built plant and the design used as the basis for the AP1000 PRA and DCD Table 19.59-18 prior to fuel load. The plant specific PRA-based insight differences will be evaluated and the plant specific PRA model modified as necessary to account for the plant specific-design and, any design changes or departures from the design certification PRA."

Reference:

- 1) Letter from B. J. Dolan, Duke Energy, dated May 15, 2009, to Document Control Desk, U.S. Nuclear Regulatory Commission, Request for Additional Information (RAI No. 1922), Ltr # WLG2009.05-08, (Accession# ML091400207).

Associated Revisions to the Lee Nuclear Station Final Safety Analysis Report:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-13

NRC RAI:

Please discuss the basis for determining that the loss-of-offsite-power (LOSP) frequencies and recovery probabilities assumed in the AP1000 PRA (both at power and during shutdown including internal and external events) bound the expected site-specific values for Lee.

Duke Energy Response:

An assessment of AP1000 internal events was performed using an AP1000 Internal Events Checklist that was distributed to COL applicants by Westinghouse in early 2007. This assessment concluded that the Probabilistic Risk Assessment (PRA) internal events for the AP1000 were determined to be applicable to WLS.

PRA assumptions for the postulated AP1000 loss of off-site power (LOSP) event, both at power and during shutdown, are discussed in AP1000 DCD Section 19.59. The loss of offsite power initiating event frequency of 0.12 events per year is selected for the AP1000 design as a conservative value that is expected to bound the site referencing the design certification. This value was derived from Annex A of the Advanced Light Water Reactor Utility Requirements Document (Reference 1). This frequency is conservative (high) with respect to the frequency for the other Duke nuclear sites. The loss of offsite power initiating event frequencies used in PRAs are estimated based on a combination of industry and plant specific experience and do not require switchyard design or transmission line reliability information as inputs.

The current AP1000 PRA does not take credit for full load rejection capability. The AP1000 PRA conservatively assumes loss of power from a switchyard without reserve power sources, both at power and during shutdown, even though the AP1000 has a unit auxiliary transformer (UAT) and a reserve transformer (RAT) installed. As a result of this conservative assumption, there is no requirement to evaluate details of the AP1000 LOSP design.

The AP1000 DCD Section 19.58 external events conclusions are bounding for a specific site if any of the following is true: the IEFs are lower than those assumed in DCD section 19.58; the IEFs are less than $1E-7$; or the CDF for a specific type of event is less than $1E-8$. The response to RAI 19-3 (this letter) describes the analyses for high winds, floods, and other external events, as documented in DCD Section 19.58, and confirms that they are applicable to the WLS site.

Based on the above evaluation, it was concluded that the AP1000 PRA is applicable to the WLS site.

References:

- 1) Advanced Light Water Reactor Utility Requirements Document (URD), Vol. III, ALWR Passive Plant, Chapter 1, Annex A, Revision 8, Electric Power Research Institute, March 1999.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

None

Attachments:

None

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 071

**NRC Technical Review Branch: PRA Licensing, Operations Support and Maintenance
Branch 1 (AP1000/EPR Projects) (SPLA)**

Reference NRC RAI Number(s): 19-15

NRC RAI:

(Follow-up to Question 19-1) The risk assessments for high winds and external floods events assume that there is no damage to Seismic Category I structures housing important safety equipment. The most important consequence of these events appears to be an extended loss of offsite power (LOSP). The staff requests the following specific information to understand the site-specific actions that must be performed to meet the post-72-hour Regulatory Treatment of Non-Safety Systems (RTNSS) requirements following a high wind or external flood event.

- (a) Electrical power must be supplied to monitoring instrumentation and hydrogen igniters post-72 hours.
 - (i) Discuss the site-specific source(s) of electrical power (i.e., ancillary diesel generator (DG), transportable engine-driven generator), as well as any required support systems.
 - (ii) Describe the requirements that ensure these sources are available following high wind and external flood events and the procedures for their use.
 - (iii) Discuss whether the location where the power source(s) connects electrically to the plant is in a location capable of withstanding high winds (including tornado missiles) and external floods.
 - (iv) Discuss how it is ensured that an off-site provided generator's connections fit the connections on site.
 - (v) What are the bases for the assumed reliability and availability of the power source, and how are those parameters ensured?

- (b) If an external flood above plant grade level can induce additional failures (e.g., spurious valve openings inside containment), makeup water must be provided to the passive containment cooling system (PCS) storage tank to maintain external containment cooling water flow.
 - (i) Discuss the credibility of such a scenario for Lee Units 1 and 2.
 - (ii) Discuss the site-specific methods and water supplies for providing makeup water to the PCS, as well as required support systems.
 - (iii) Describe the requirements that ensure these sources are available following high wind and external flood events and the procedures for their use.
 - (iv) Discuss whether the location where the makeup water supply connects to the plant, as well as the piping that carries the water from the source to the pump and any required power cables, are in a location capable of withstanding high winds (including tornado missiles) and external floods.
 - (v) What is the basis for the assumed reliability and availability of the makeup method, and how are those parameters ensured?

- (c) Based on the discussion requested above, please revise the Final Safety Analysis Report (FSAR) to describe the level of risk associated with external-event-induced long-term LOSP 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 any numerical values used.

Duke Energy Response:

In support of the AP1000 Design Certification Amendment Application, Westinghouse Electric Company has submitted a generic response to these questions in its response to RAI-SRP19.0-SPLA-20 (Reference 1).

The Duke Energy FSAR incorporates by reference AP1000 DCD Sections 1.9.5.4 and 8.3.1.1.3. As such, the applicable sections of the AP1000 DCD, as reviewed and approved, will be incorporated into the WLS FSAR.

In addition, as discussed in the response to RAI 19-4 (this letter), the event frequencies for external events associated with high winds are bounded by the limiting initiating event frequencies given in Table 3.0-1 of APP-GW-GLR-101 (Reference 2). Thus, these events are not considered to be risk-important.

FSAR Subsection 1.2.2 states the site design grade of 590 ft. msl corresponds to DCD grade elevation 100 ft. Based upon the quantitative evaluations discussed in the response to RAI 19-6 (this letter), the Lee Nuclear Station site is not susceptible to any external floods which exceed 590 ft. Thus, external floods above plant grade level are not credible.

This is consistent with the evaluation presented in Section 4.0 of APP-GW-GLR-101 (Reference 2), which states that the AP1000 is protected against floods up to the 100 ft level. Therefore, it is concluded that the resultant CDF of $5.85E-15$ events per year given in APP-GW-GLR-101, Section 4.0 is bounding for the Lee Nuclear Station.

References:

- 1) Letter from Robert Sisk (Westinghouse) to Document Control Desk (NRC), AP1000 Response to Request for Additional Information (SRP 19), dated July 15, 2009.
- 2) Westinghouse Electric Company LLC, AP1000 Probabilistic Risk Assessment Site-Specific Considerations, Document Number APP-GW-GLR-101, Revision 1, October 2007.

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

None

Attachments:

None