



Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

September 4, 2008

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of)
Tennessee Valley Authority)

Docket No. 52-014 and 52-015

**BELLEVILLE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR
ADDITIONAL INFORMATION – PROBABILISTIC RISK ASSESSMENT AND SEVERE
ACCIDENT EVALUATION**

Reference: Letter from Joshi Ravindra (NRC) to Andrea L. Sterdis (TVA), Request for
Additional Information Letter No. 083 Related to SRP Section 19 for the
Belleville Units 3 and 4 Combined License Application, dated July 21, 2008

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory
Commission's (NRC) request for additional information (RAI) items included in the reference
letter.

A response to each NRC request in the subject letter is addressed in the enclosure which also
identifies any associated changes that will be made in a future revision of the BLN application.

If you should have any questions, please contact Phillip Ray at 1101 Market Street, LP5A,
Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7030, or via email at
pmray@tva.gov.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on this 4th day of Sep, 2008.

Andrea L. Sterdis
Manager, New Nuclear Licensing and Industry Affairs
Nuclear Generation Development & Construction

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cc: See Page 2

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NRC

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cc: (w/Enclosure)

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Responses to NRC Request for Additional Information letter No. 083 dated July 21, 2008
(11 pages, including this list)

Subject: Probabilistic Risk Assessment and Severe Accident Evaluation in the Final Safety Analysis Report

<u>RAI Number</u>	<u>Date of TVA Response</u>
19-01	This letter – see following pages
19-02	This letter – see following pages
19-03	This letter – see following pages

<u>Associated Additional Attachments / Enclosures</u>	<u>Pages Included</u>
None	

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NRC Letter Dated: July 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 19-01

STD COL 19.59.10-1 does not appear to fully contain the expectations described in the corresponding COL Information Item in Section 19.59.10.5 of the AP1000 DCD. Most notably, text quoted below was left out of STD COL 19.59.10-1:

The requirements to which the equipment is to be purchased are included in the equipment specifications. Specifically, the equipment specifications include:

1. Specific minimum seismic requirements consistent with those used to define the Table 19.55-1 HCLPF values. This includes the known frequency range used to define the HCLPF by comparing the required response spectrum (RRS) and test response spectrum (TRS). The range of frequency response that is required for the equipment with its structural support is defined.
2. Hardware enhancements that were determined in previous test programs and/or analysis programs will be implemented.

Please justify omitting this text.

BLN RAI ID: 0748

BLN RESPONSE:

The omitted text will be added to FSAR Subsection 19.59.10.5 in a future revision to the COLA as shown below.

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA Part 2, FSAR. Chapter 19, Subsection 19.59.10.5 will be revised to add the following to STD COL 19.59.10-1:

The requirements to which the equipment is to be purchased are included in the equipment specifications. Specifically, the equipment specifications include:

1. Specific minimum seismic requirements consistent with those used to define the Table 19.55-1 HCLPF values. This includes the known frequency range used to define the HCLPF by comparing the required response spectrum (RRS) and test response spectrum (TRS). The range of frequency response that is required for the equipment with its structural support is defined.
2. Hardware enhancements that were determined in previous test programs and/or analysis programs will be implemented.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

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NRC Letter Dated: July 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 19-02

Part of AP1000 DCD COL Information Item 19.59.10-2 calls for the following action by COL applicants:

The Combined License applicant will confirm that the High Winds, Floods, and Other External Events analysis documented in Section 19.58 is applicable to the COL site. Further evaluation will be required if the COL site is shown to be outside of the bounds of the High Winds, Floods, and Other External Events analysis documented in Section 19.58.

The above requirement is replaced by the following words in BLN COL 19.59.10-2:

It has been confirmed that the High Winds, Floods, and Other External Events analysis documented in Section 19.58 is applicable to the site...

Please provide supporting information or appropriate references that ensure that all of the key site-related assumptions in the Section 19.58 External Events analyses are valid for the BLN site.

BLN RAI ID: 0749

BLN RESPONSE:

A generic PRA has been performed by Westinghouse (Reference 1) for the AP1000. The key elements of this PRA are presented in Chapter 19 of the AP1000 DCD. As part of the COLA, applicants are required to demonstrate that the PRA performed for the AP1000 is applicable to the specific site. To facilitate the determination of applicability, Westinghouse developed an External Events Bounding Assessment Worksheet which was used initially in February 2007 to gather information related to external hazard event frequencies for the various AP1000 COLA sites. This information was used in APP-GW-GLR-101 (Reference 2) by Westinghouse to perform an external hazards evaluation that demonstrated the AP1000 PRA remained applicable with bounding site parameters.

To support resolution of AP1000 COL Item 19.59.19-2, Westinghouse gathered site-specific, external event information from the NUSTART utilities interested in the AP1000 design. The process began when Westinghouse developed a list of PRA external events and provided this list to the utilities currently considering the AP1000 design.

External events considered in the AP1000 PRA are those events whose cause is external to all systems associated with normal and emergency operations situations. Some external events may not pose a significant threat of a severe accident. Some external events were considered at the design stage and have sufficiently low contribution to core damage frequency or plant risk.

Based upon the guidelines provided in Generic Letter 88-20, Supplement 4 and NUREG-1407, the following is a list of external events that are considered for evaluation:

- Tornados
- Hurricanes
- External floods;
- Transportation and nearby facility accidents
 - Aviation (commercial/general/military)
 - Marine (ship/barge)

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- Pipeline (gas/oil)
- Railroad
- Truck

Each utility then evaluated each external event for applicability to their proposed sites. Events that were not applicable to any of the surveyed sites were screened from the evaluation. For events determined by the utility to be applicable to their proposed sites, the utility provided to Westinghouse an external event initiating event frequency. Westinghouse gathered initiating event frequencies from the utilities and compiled them. The highest initiating event frequency was selected to "bound" each event. Westinghouse then selected the largest initiating event frequency for each initiating event category and evaluated the frequency versus modified criteria in NUREG-1407.

The criteria developed in the report (Reference 2) are that external events with a frequency of less than $1.0E-07$ events/year can be screened from the evaluation. For external event frequencies greater than $1.0E-07$ events/year, a quantitative evaluation was performed. If the evaluation showed the resulting core damage frequency (CDF) was less than $1.0E-08$ events per year, then that external event was also screened from the evaluation. Events that were not screened from the evaluation were considered for further evaluation.

The values for the external event frequencies for Bellefonte are listed in the External Events worksheet in Table 1. Note that the values listed in Table 1, found on the following page, are bounded by the values in the Westinghouse external hazards report (Reference 2); hence, it can be concluded that the AP1000 PRA is applicable to the Bellefonte site. No further evaluations are required at the COL application stage.

REFERENCES:

1. Westinghouse Electric Company LLC, APP-GW-GL-022, Rev. 8, "AP1000 Probabilistic Risk Assessment," July 30, 2004.
2. Westinghouse Electric Company LLC, APP-GW-GLR-101, Rev. 0, "AP1000 Probabilistic Risk Assessment External Events Evaluation to Support COL Application," May 9, 2007.

Table 1 – External Event Frequencies for BLN

Category	Event	Applicable to site? (Y/N)	Explanation of Applicability Evaluation	Event Frequency	
High Winds	F0 Tornado	Y	<p>Jackson County tornado activity is provided in FSAR Table 2.3-208 from 1950 through 2005. The event frequency was determined for each tornado category using the point probability method presented in FSAR 2.3.1.2.1.2. 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). 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 Jackson County (1,069 mi.² per FSAR Subsection 2.3.1.2.1.2).</p> <p>This computation assumes that tornadoes with a zero path length have an area equal to the average area of the category.</p>	3.68E-06 events/yr	
	F1 Tornado	Y		9.18E-06 events/yr	
	F2 Tornado	Y		1.60E-04 events/yr	
	F3 Tornado	Y		6.63E-05 events/yr	
	F4 Tornado	Y		No Recorded Events	
	F5 Tornado	Y		No Recorded Events	
	Cat. 1 Hurricane	Y		<p>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 Jackson County, or near enough to Jackson County to have a substantial impact (perimeter distance defined as 25 miles). The resulting storms have been sorted to remove duplicate values.</p>	No Recorded Events
	Cat. 2 Hurricane	Y			No Recorded Events
	Cat. 3 Hurricane	Y			No Recorded Events
	Cat. 4 Hurricane	Y			No Recorded Events
	Cat. 5 Hurricane	Y			No Recorded Events

Category	Event	Applicable to site? (Y/N)	Explanation of Applicability Evaluation	Event Frequency
External Flood	External Flood	N	The safety-related facilities at Bellefonte are located/designed to withstand flooding from the PMP/PMF event. The Probable Maximum Precipitation (PMP)/Probable Maximum Flood (PMF) are the probable maximum rainfall and associated flooding event that is statistically possible based on standard guidance. Therefore, a flooding event that would adversely affect the ability to safely shut the plant down is not credible.	N/A
Transportation and Nearby Facility Accidents	Aviation (commercial/general/military)	Y	<p>As discussed in the response to RAI 03.05.01.06-2 (RAI Letter No. 100), a calculation performed in accordance with the guidelines of Standard Review Plan (SRP) Section 3.5.1.6, determined the total probability of an aircraft crash into the plant to be 8.8E-07 per year. The probability of aircraft from the Scottsboro Municipal Airport crashing into the site is 7.8E-07 per year. This meets the criterion provided in APP-GW-GLR-101 that sites that can demonstrate an aviation event frequency less than or equal to 1.21E-06 events/yr for small aircraft accidents are bounded by this evaluation.</p> <p>The probability of a crash from the high altitude airway J73 is conservatively estimated to be 1.0E-07 per year. This meets the commercial aircraft aviation event frequency of 1.0E-07 events per year provided in APP-GW-GLR-101.</p> <p>Therefore, it is concluded that the PRA remains applicable.</p>	8.8E-07 events/year
	Marine (ship/barge)	Y	As discussed in FSAR Subsection 2.2.3.1.1.1, a calculation was done to quantify the risk to the Bellefonte Nuclear Site from barge accidents on the Tennessee River involving either explosions or flammable vapor clouds. The results of the detonation risk assessment (to the site) show a risk value less than 1.9E-08 per year.	1.9E-08 events/yr

Category	Event	Applicable to site? (Y/N)	Explanation of Applicability Evaluation	Event Frequency
			As discussed in FSAR Subsection 2.2.3.1.2, an evaluation determined no deflagrations would be expected at the BLN site resulting from a delayed ignition of a vapor cloud released from a postulated barge accident.	
	Pipeline (gas/oil)	N	As stated in FSAR Subsection 2.2.2.3, there are no major pipelines within 5 miles of the Bellefonte site.	N/A
	Railroad	N	As discussed in FSAR 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 conservative TNT equivalency, which resulted in a safe standoff distance which was less than the distance from the nearest approach of a railroad line to the site boundary. As discussed in FSAR 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.	N/A
	Truck	N	As discussed in FSAR 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 which was less than the distance from the nearest highway to the site boundary. As discussed in FSAR 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.	N/A

This response is PLANT SPECIFIC.

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ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

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NRC Letter Dated: July 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 19-03

Revision 16 to the AP1000 DCD revises COL Information Item 19.59.10-4 with the following provisions:

The Combined License information requested in this subsection has been partially addressed in APP-GW-GLR-070 (Reference 19.59-1), and the applicable changes are incorporated into the DCD. APP-GW-GLR-070 closes the development portion of this COL item. Additional work is required by the Combined License applicant to address the aspects of the Combined License information requested in this subsection as delineated in the following paragraph:

The Combined License **applicant** [emphasis added] will implement the AP1000 Severe Accident Management Guidance from APP-GW-GLR-070 on a site-specific basis.

STD COL 19.59.10-4 states the following:

The AP1000 Severe Accident Management Guidance from APP-GW-GLR-070, Reference 1 to DCD Section 19.59, will be implemented on a site-specific basis.

The Severe Accident Management Guidance (SAMG) implementation will include:

providing the appropriate SAMG information in the control room and TSC; defining the roles and Responsibilities of the plant Emergency Response Organization (ERO) with respect to use of the SAMG; and providing SAMG training for the appropriate ERO members.

The staff did not identify any information in the BLN FSAR to indicate that the COL Information Item as stated (i.e., implementation of AP1000 Severe Accident Management Guidance from APPGW-GLR-070 on a site-specific basis) has been closed.

Please provide a description of the implementation of AP1000 Severe Accident Management Guidance from APP-GW-GLR-070 on a site-specific basis or identify this item as a proposed combined license condition in Part 10 of the Bellefonte Nuclear Plant, Units 3 & 4 COL application.

BLN RAI ID: 0751

BLN RESPONSE:

The AP1000 Severe Accident Management Guidance (SAMG) from APP-GW-GLR-070, Reference 1 of DCD Section 19.59, is implemented on a site-specific basis. Key elements of the implementation include:

- SAMG based on APP-GW-GLR-070 is provided to ERO personnel in assessing plant damage, planning and prioritizing response actions and implementing strategies that delineate actions inside and outside the control room.
- Severe accident management strategies and guidance are interfaced with the EOP's and Emergency Plan.
- Responsibilities for authorizing and implementing accident management strategies are delineated as part of the Emergency Plan.
- SAMG training is provided for ERO personnel commensurate with their responsibilities defined in the Emergency Plan.

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FSAR Subsection 19.59.10.5 will be revised in a future revision to the COLA to include the key elements noted above. In addition, COLA Part 10, Proposed License Condition, item 6 will be revised to include an additional item for the development of a site specific SAMG, and FSAR Table 1.8-202 will be revised to change SAMG from COL APPLICANT (A) to COL HOLDER (H).

This response is expected to be STANDARD for the S-COLAs.

ASSOCIATED BLN COL APPLICATION REVISIONS:

1. COLA Part 2, FSAR Chapter 19, Subsection 19.59.10.5, fifth paragraph will be changed from:

The AP1000 Severe Accident Management Guidance from APP-GW-GLR-070, Reference 1 to DCD Section 19.59, will be implemented on a site-specific basis. The Severe Accident Management Guidance (SAMG) implementation will include: providing the appropriate SAMG information in the control room and TSC; defining the roles and responsibilities of the plant Emergency Response Organization (ERO) with respect to usage of the SAMG; and providing SAMG training for the appropriate ERO members.

To read:

The AP1000 Severe Accident Management Guidance (SAMG) from APP-GW-GLR-070, Reference 1 of DCD Section 19.59, is implemented on a site-specific basis. Key elements of the implementation include:

- SAMG based on APP-GW-GLR-070 is provided to Emergency Response Organization (ERO) personnel in assessing plant damage, planning and prioritizing response actions and implementing strategies that delineate actions inside and outside the control room.
- Severe accident management strategies and guidance are interfaced with the Emergency Operating Procedures (EOP's) and Emergency Plan.
- Responsibilities for authorizing and implementing accident management strategies are delineated as part of the Emergency Plan.
- SAMG training is provided for ERO personnel commensurate with their responsibilities defined in the Emergency Plan.

2. COLA Part 10, Proposed License Condition, item 6 will be revised to include an additional specific item such that it reads (the "x" will be replaced with appropriate next letter):

"6. OPERATIONAL PROGRAM READINESS:

The NRC inspection of operational programs will be the subject of the following license condition in accordance with SECY-05-0197:

PROPOSED LICENSE CONDITION: The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

x. This schedule shall include a schedule for the development of a site specific Severe Accident Management Guidance."

3. COLA Part 2, FSAR Chapter 1, Table 1.8-202, COL ITEM 19.59.10-4 for development of SAMG will be changed from COL APPLICANT (A) to COL HOLDER (H).

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ASSOCIATED ATTACHMENTS/ENCLOSURES:

None