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

August 29, 2008

10 CFR 52.79

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

In the Matter of) Docket No. 52-014 and 52-015
Tennessee Valley Authority)

BELLEFONTE COMBINED LICENSE APPLICATION – RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – SHORT TERM DIFFUSION ESTIMATES

Reference: Letter from Joseph M. Sebrosky (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 94 Related to SRP Section 2.3.4 for the Bellefonte Units 3 and 4 Combined License Application, dated August 1, 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 reference 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 Tom Spink at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7062, or via email at tespink@tva.gov.

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

Executed on this 29th day of AUG, 2008.

Jack A. Bailey

Jack A. Bailey
Vice President, Nuclear Generation Development

Enclosure
cc: See Page 2

D085
NRO w/2 CD-Roms

cc: (Enclosures)
J. P. Berger, EDF
J. M. Sebrosky, NRC/HQ
E. Cummins, Westinghouse
S. P. Frantz, Morgan Lewis
M. W. Gettler, FP&L
R. Grumbir, NuStart
P. S. Hastings, NuStart
P. Hinnenkamp, Entergy
M. C. Kray, NuStart
D. Lindgren, Westinghouse
G. D. Miller, PG&N
M. C. Nolan, Duke Energy
N. T. Simms, Duke Energy
K. N. Slays, NuStart
G. A. Zinke, NuStart

cc: (w/o Enclosure)

B. C. Anderson, NRC/HQ
M.M.Comar, NRC/HQ
B. Hughes/NRC/HQ
R. G. Joshi, NRC/HQ
R. H. Kitchen, PGN
M. C. Kray, NuStart
A. M. Monroe, SCE&G
C. R. Pierce, SNC
R. Reister, DOE/PM
L. Reyes, NRC/RII
T. Simms, NRC/HQ

Enclosure
TVA letter dated August 29, 2008
RAI Responses

Responses to NRC Request for Additional Information letter No. 94 dated August 1, 2008
(9 pages, including this list)

Subject: Short Term Diffusion Estimates in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.03.04-01	This letter – see following pages
02.03.04-02	This letter – see following pages
02.03.04-03	This letter – see following pages
02.03.04-04	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
02.03.04-01A	1
02.03.04-03A	1

Enclosure
TVA letter dated August 29, 2008
RAI Responses

NRC Letter Dated: August 1, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.04-01

Regulatory Guide 1.206 states that the applicant should discuss the effects of topography on the short-term dispersion estimates. Please provide a revision to the Bellefonte FSAR that discusses the hill and valley topography near the Bellefonte site with respect to calculation of the short term atmospheric dispersion factors (χ/Q values). Were terrain recirculation factors or other adjustments used in the PAVAN calculations? What is the basis for the selected assumptions and inputs? The information provided should be sufficient to allow the NRC staff to perform its own confirmatory calculations. Consider providing the computer input files as part of the response.

BLN RAI ID: 0706

BLN RESPONSE:

A revision to the Bellefonte FSAR has been prepared, as requested, which addresses the hill and valley topography near the Bellefonte site with respect to calculation of the short term atmospheric dispersion factors (χ/Q values). The revisions are shown in the Application Revisions section below.

The computer program, PAVAN (see NUREG/CR-2858), was used to determine the Bellefonte short term atmospheric dispersion factors. The PAVAN input file that was used is provided as Attachment 02.03.04-01A.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA Part 2, FSAR. Chapter 2, Subsection 2.3.4.1, second paragraph, last sentence will be revised from:

A straight-line trajectory is assumed between the point of release and the distances for which χ/Q values are calculated in accordance with NUREG/CR-2858 and Regulatory Guide 1.145.

To read:

A straight-line trajectory is assumed between the point of release and the distances for which χ/Q values are calculated in accordance with NUREG/CR-2858 and Regulatory Guide 1.145.

NUREG/CR-2858 refers to Regulatory Guide 1.111 for discussion of the effects of spatial and temporal variations in airflow in the region of a site. These effects are not described by the constant mean wind direction model. Consequently, the effects of hill and valley topography on airflow characteristics near the Bellefonte site were examined to identify any variation of atmospheric transport and diffusion conditions. The wind and stability characteristics of the site were compared with the same parameters at the Huntsville and Chattanooga airports. The representativeness of the observed meteorology in the region of interest (within 2 miles) was assessed. No long term trends were observed that would bias short term diffusion estimates. Therefore, no adjustments to represent non-straight line trajectories were applied.

Enclosure
TVA letter dated August 29, 2008
RAI Responses

ASSOCIATED ATTACHMENTS/ENCLOSURES:

Attachment 02.03.04-01A – PAVAN Input File (on enclosed CD)

Enclosure
TVA letter dated August 29, 2008
RAI Responses

NRC Letter Dated: August 1, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.04-02

Please provide a revision to the Bellefonte FSAR to justify use of the Bellefonte site center point as the point of reference when calculating the distance from the postulated release locations to the outer boundary of the LPZ, rather than use of the circumference of the 160-meter radius circle assumed in the EAB calculation.

BLN RAI ID: 0707

BLN RESPONSE:

A revision to the Bellefonte FSAR has been prepared, as requested, which justifies the use of the Bellefonte site center point as the point of reference for calculating the distance from the postulated release locations to the outer boundary of the LPZ. The revisions are shown in the Application Revisions section below.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

COLA Part 2, FSAR, Chapter 2, Subsection 2.3.4.1, third paragraph, last two sentences, will be revised from:

The minimum exclusion area boundary (EAB) distances are reported in Table 2.3-318. The low population zone (LPZ) boundary is defined by a circular area with a radius of two miles from the plant center.

To read:

The minimum EAB distances are reported in Table 2.3-318. The EAB distances are conservatively determined from a circular release boundary with a radius of 160 m (525 ft). The release boundary conservatively encompasses all release locations for both units. By contrast, the release boundary for a single unit, encompassing only accident release locations, would have a radius of approximately 40 m (130 ft).

The low population zone (LPZ) boundary is defined by a circular area with a radius of two miles from the plant center. LPZ distances are not determined relative to the release boundary because the radius of the release boundary, 160 m (525 ft), is not significant in comparison to the LPZ distance of 3219 m (10,561 ft). This is a reasonable conclusion given the conservative definition of the release boundary described above and the conservative nature of the accident atmospheric dispersion calculations done in accordance with Regulatory Guide 1.145.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

NRC Letter Dated: Augsust 1, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.04-03

Page 2.3-32 of the Bellefonte FSAR states that releases to the control room were assumed to be point ground level releases. However, footnote d on page 2.0-11 notes that the ground level containment release point X/Q values shown on page 2.0-10 model the containment shell as a diffuse area source. Page 2.3-201 provides the distance and direction from each postulated release location to the control room HAVC. Please provide a revision to the Bellefonte FSAR listing all other inputs used in generating the control room X/Q values to clarify how the X/Q values for each source/receptor pair were calculated. Consider providing the computer input files as part of the response.

BLN RAI ID: 0708

BLN RESPONSE:

Releases were conservatively assumed to be ground level point source releases except for the containment shell, which was modeled as a diffuse area source. No credit was taken for elevated or vent releases in the determination of control room χ/Qs in accordance with the guidance provided in Regulatory Guide 1.194. The discussion in the BLN FSAR is revised to clarify this point and to provide additional information needed in the determination of control room χ/Qs. The ARCON96 input files and the meteorological data file are provided in Attachment 02.03.04-03A of this RAI.

This response is PLANT-SPECIFIC

ASSOCIATED BLN COL APPLICATION REVISIONS:

1. COLA Part 2, FSAR, Chapter 2, Section 2.3.4.3 will be revised from:

The atmospheric dispersion estimates for the BLN Control Room were calculated based on the guidance provided in Regulatory Guide 1.194. The control room χ/Qs were calculated for the release points to the control room emergency air intake using the ARCON96 computer code (NUREG/CR-6331) based on the hourly meteorological data. The distances and directions from the assumed release points to the Control Room HVAC Intake are shown on Table 2.3-320. In each case, the intervening structures between the release point and the control room intake were ignored for calculational simplicity, thereby underestimating the true distance to the control room intakes. Atmospheric stability was determined by the vertical temperature difference (ΔT) measured over the difference in measurement height and the stability classes given in Regulatory Guide 1.23. The releases were assumed to be point ground level releases. For each of the source-to-receptor combinations, the χ/Q value that is not exceeded more than 5.0 percent of the total hours in the meteorological data set (e.g., 95-percentile χ/Q) was determined. The χ/Q values for source-receptor pairs are shown in Table 2.3-321.

To read:

The atmospheric dispersion estimates for the BLN Control Room were calculated based on the guidance provided in Regulatory Guide 1.194. The control room χ/Q values were calculated for the release points to the control room emergency air intake and Auxiliary Building access using

the ARCON96 computer code (NUREG/CR-6331) based on the hourly meteorological data. The distances and directions from the assumed release points to the Control Room HVAC intake are shown on Table 2.3-320. In each case, the intervening structures between the release point and the control room intake were ignored for calculational simplicity, thereby underestimating the true distance to the control room intakes. The building area controls the distance downwind in which the building wake effects will be felt. The atmospheric dispersion calculation used the smallest vertical-plane cross-sectional area of the AP1000 Nuclear Island as given in Table 2.3-320. The atmospheric stability class was determined using the vertical temperature difference (ΔT) based on the classification system defined in Table 1 of Regulatory Guide 1.23. The releases were assumed to be point ground level releases except for the containment shell which is modeled as a diffuse area source. For each of the source-to-receptor combinations, the χ/Q value that is not exceeded more than 5 percent of the total hours in the meteorological data set (e.g., 95-percentile χ/Q) was determined. The χ/Q values for source-receptor pairs are shown in Table 2.3-321.

2. COLA Part 2, FSAR, Chapter 2, Table 2.3-320 will be revised to read as shown below.

TABLE 2.3-320 (Sheet 1 of 2)
CONTROL ROOM χ/Q INPUT DATA

Control Room HVAC Intake (El. 19.9 m) Distances and Directions

Release Point[1]	Direction to Source (degrees)
Plant Vent	53
PCS Air Diffuser	84
Fuel Building Blowout Panel	38
Radwaste Building Truck Staging Area Door	28
Steam Vent	126
PORV/Safety Valves	136
Condenser Air Removal Stack	226
Containment Shell	75

Notes:
1: Distances and elevations are as presented in DCD Table 15A-7.

Annex Building Access (El. 1.5 m) Distances and Directions

Release Point[1]	Direction to Source (degrees)
Plant Vent	57
PCS Air Diffuser	68
Fuel Building Blowout Panel	49
Radwaste Building Truck Staging Area Door	44
Steam Vent	72
PORV/Safety Valves	74
Condenser Air Removal Stack	108
Containment Shell	62

Notes:
1: Distances and elevations are as presented in DCD Table 15A-7.

TABLE 2.3-320 (Sheet 2 of 2)
CONTROL ROOM χ/Q INPUT DATA

Containment Shell Inputs	
Vertical Diffusion Coefficient (m)	5.6
Horizontal Diffusion Coefficient (m)	7.4
Release Height (m above grade)	35.4
Total Cross-Sectional Area (m^2)	2842
Other ARCON96 Inputs	
Surface Roughness Length (m)	0.2
Wind Direction Window (degrees)	90
Minimum Wind Speed (m/s)	0.45
Averaging Sector Width Constant	4.3
Total Cross-Sectional Area (m^2)	2842

Note: The vertical and horizontal diffusion coefficients are set to zero for release locations other than the containment shell.

ATTACHMENTS:

Attachment 02.03.04-03A – ARCON96 input files and the meteorological data file (on enclosed CD)

NRC Letter Dated: August 1, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.04-04

Regulatory Guide 1.206 states that, for the purposes of control room radiological habitability analyses, the applicant should provide a site plan showing true north and indicating locations of all potential accident release pathways and control room intake and unfiltered in-leakage pathways. Bellefonte FSAR Figure 2.1-201 provides a site plot plan but does not highlight the location of each of the postulated source and receptor locations. Therefore, please update the Bellefonte FSAR to provide a more detailed figure drawn to scale showing true north and the source and receptor locations.

BLN RAI ID: 709

BLN RESPONSE:

Westinghouse AP1000 DCD Figure 15A-1 (as modified by Westinghouse TR134) shows the locations of the postulated sources and receptors. A revised FSAR Table 2.3-320 (which identifies the distances between the sources and receptors as well as the directions with respect to true north from the receptors to each source) is included in the response to the previous NRC RAI (i.e., NRC RAI No. 02.03.04-03). In addition, a general arrangement site plan drawn to scale is shown in FSAR Figure 1.1-202. The figure contains a scale, state plane coordinate system, and true north orientation arrow. Finally, Subsection 1.2.2 of the FSAR identifies that "plant North" orientation is 219° from true North. This combination of existing FSAR information provides the necessary information for the purposes of control room radiological habitability analyses, and thus an additional scaled figure is not included.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

Attachment 02.03.04-01A

(1 page)
PAVAN Input File: `BLN06-07.iR1`

(electronic file on enclosed CD)

Attachment 02.03.04-03A

(1 page)

Compact Disk Containing ARCON96 Input File
and Meteorological Data File

(electronic files on enclosed CD)

ARCON96:

- B0607.met
- BAN-CAR3.rsf
- BAN-CNT3.rsf
- BAN-FBP3.rsf
- BAN-PCS3.rsf
- BAN-PRV3.rsf
- BAN-PV3.rsf
- BAN-RWD3.rsf
- BAN-SV3.rsf
- BCR-CAR3.rsf
- BCR-CNT3.rsf
- BCR-FBP3.rsf
- BCR-PCS3.rsf
- BCR-PRV3.rsf
- BCR-PV3.rsf
- BCR-RWD3.rsf
- BCR-SV3.rsf
- BLN_CARAN.LOG
- BLN_CARCR.LOG
- BLN_CNTAN.LOG
- BLN_CNTCR.LOG
- BLN_FBPAN.LOG
- BLN_FBPCR.LOG
- BLN_PCSAN.LOG
- BLN_PCSCR.LOG
- BLN_PRVAN.LOG
- BLN_PRVCR.LOG
- BLN_PVAN.LOG
- BLN_PVCR.LOG
- BLN_RBDAN.LOG
- BLN_RBDCR.LOG
- BLN_SVAN.LOG
- BLN_SVCR.LOG