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

January 16, 2009

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 – ATMOSPHERIC DISPERSION ESTIMATES FOR ACCIDENT RELEASES

Reference: Letter from Joseph M. Sebrosky (NRC) to Andrea L. Sterdis (TVA), Request for Additional Information Letter No. 141 Related to SRP Section 02.03.04 for the Bellefonte Units 3 and 4 Combined License Application, dated December 12, 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 the NRC request in the subject letter is addressed in the enclosure which does not identify any associated changes to be made in a future revision of the BLN application. Please note that this transmittal includes a CD data disk that contains input files necessary for the NRC Staff to perform confirmatory analyses.

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 16th day of Jan, 2009.

Jack A. Bailey
Vice President, Nuclear Generation Development
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Enclosure
cc: See Page 2

D085
NRO

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Enclosure
TVA letter dated January 16, 2009
RAI Response

Responses to NRC Request for Additional Information letter No. 141 dated December 12, 2008
(6 pages, including this list)

Subject: Atmospheric Dispersion Estimates for Accident Releases in the Final Safety Analysis Report

RAI Number	Date of TVA Response
02.03.04-06	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
Attachment 02.03.04-06A	Cover page only

Enclosure
TVA letter dated January 16, 2009
RAI Response

NRC Letter Dated: December 12, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.03.04-06

The NRC staff is attempting to correlate the meteorological data provided in the ARCON96 computer code format with the joint frequency distribution data (JFD) provided for use with the PAVAN and XOQDOQ computer codes. Were the two data sets derived independently of each other from a single set of raw data or were the ARCON96 formatted data used to generate the JFD data? For both data sets, provide examples of how each value was rounded or truncated to determine into which wind speed category it should be assigned.

BLN RAI ID: 2656

BLN RESPONSE:

The ARCON96 meteorological data input was obtained directly from the original BLN site meteorological data set. Likewise, the joint frequency distribution (JFD) for use in the PAVAN and XOQDOQ computer codes was derived from the original BLN site meteorological data set.

ARCON96 uses meteorological data in the form of electronic data files. The meteorological data files require one record per hour. Each record must include the day of the year, the hour of the day, the stability classification, the wind direction, and the wind speed at the lower measurement level. The record also includes a five character location identifier and a wind direction and speed for the upper measurement level. The design basis ARCON96 meteorological data was obtained from the hourly meteorological data for the year beginning April 1, 2006 and ending March 31, 2007 as provided and validated by TVA.

A sample of the original BLN meteorological data provided for the 10 and 55 m instrument levels is given below:

Year	Day	Hour	Wind Direction 55m (degree)	Wind Speed 55m (mph)	Wind Direction 10m (degree)	Wind Speed 10m (mph)	Temperature 55m (DegF)	Temperature 10m (DegF)
2006	91	100	99999.999	99999.999	214	4.6	64.23	64.42
2006	91	200	99999.999	99999.999	200	4.9	64.24	64.63
2006	91	300	99999.999	99999.999	193	4.9	63.59	64.18
2006	91	400	99999.999	99999.999	206	4.8	63.94	64.25
2006	91	500	99999.999	99999.999	192	4.1	63.78	64.26
2006	91	600	99999.999	99999.999	197	4.3	63.63	63.94
2006	91	700	99999.999	99999.999	208	4.1	63.76	64.35
2006	91	800	99999.999	99999.999	215	5.1	65.12	66.09
2006	91	900	99999.999	99999.999	210	6.7	67.5	68.64
2006	91	1000	99999.999	99999.999	198	7.4	69.48	70.6
2006	91	1100	99999.999	99999.999	222	7.2	72.06	73.11
2006	91	1200	99999.999	99999.999	238	8.7	74.65	75.91
2006	91	1300	99999.999	99999.999	241	8.4	76.88	78.08
2006	91	1400	99999.999	99999.999	257	7	78.29	79.34
2006	91	1500	99999.999	99999.999	259	8	79.3	80.35
2006	91	1600	99999.999	99999.999	268	8.1	79.56	80.61

2006	91	1700	99999.999	99999.999	268	7.4	79.17	79.97
2006	91	1800	99999.999	99999.999	277	4.6	78.03	78.34
2006	91	1900	99999.999	99999.999	229	1.8	76.06	74.9
2006	91	2000	99999.999	99999.999	176	1.1	75.05	69.99
2006	91	2100	99999.999	99999.999	220	1.1	73.51	65.52
2006	91	2200	99999.999	99999.999	187	1.1	69.11	63.22
2006	91	2300	99999.999	99999.999	59	1.2	66.4	61.43
2006	91	2400	99999.999	99999.999	206	1.2	64.1	60.14
2006	92	100	99999.999	99999.999	112	1	62.85	58.88
2006	92	200	99999.999	99999.999	65	1	60.75	58.29
2006	92	300	99999.999	99999.999	99999.999	99999.999	99999.999	99999.999

Note: missing data is indicated by 99999.999 in the original data set.

The process of formatting the original BLN meteorological data for use in the ARCON96 code consists of the following steps:

1. Converting the wind speed to meters/second by multiplying by 0.44704 [$\frac{mi}{hr} \times \frac{5280\ ft/mi}{3600\ sec/hr} \times 0.348\ m/ft$] and multiplying by 10 (alternatively, the wind speed can also be entered in mph by selecting the appropriate units in the ARCON96 input screen)
2. Rounding the wind speed and direction to the nearest integer
3. Changing the bad data indicator from "99999.999" to "999" for wind speed, wind direction and stability class
4. Changing temperature differential (°F/45m) to temperature differential (°C/100m), as follows:

$$\frac{\Delta T\ (^{\circ}C \text{ based on } 100\ m \text{ separation})}{100m} = \frac{\Delta T\ (^{\circ}F \text{ based on } 45\ m \text{ separation}) * \frac{5\ ^{\circ}C}{9\ ^{\circ}F}}{45\ m}, \text{ or,}$$

$$\text{Temperature Difference (in } ^{\circ}C/100\ m) = \text{Temperature Difference (in } ^{\circ}F/45\ m) * 1.2346$$

5. Changing temperature differential (°C/100m) to stability class using the classification system from Regulatory Guide 1.23. [Stability Class A is 1 in the ARCON96 input format]

Classification of Atmospheric Stability

Stability Classification	Pasquill Categories	Temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

6. Formatting data in accordance with the ARCON96 manual as shown below.

The first few lines of the resulting ARCON96 meteorological data input file are given below. [note: the first day of recorded BLN data was day 91 which becomes day 1 in the ARCON96 format]

```
b0607     1 0  214  21  5  999 999
b0607     1 1  200  22  5  999 999
b0607     1 2  193  22  4  999 999
b0607     1 3  206  21  5  999 999
b0607     1 4  192  18  4  999 999
b0607     1 5  197  19  5  999 999
b0607     1 6  208  18  4  999 999
b0607     1 7  215  23  4  999 999
b0607     1 8  210  30  4  999 999
b0607     1 9  198  33  4  999 999
b0607     110  222  32  4  999 999
b0607     111  238  39  3  999 999
b0607     112  241  38  4  999 999
b0607     113  257  31  4  999 999
b0607     114  259  36  4  999 999
b0607     115  268  36  4  999 999
b0607     116  268  33  4  999 999
b0607     117  277  21  5  999 999
b0607     118  229   8  5  999 999
b0607     119  176   5  7  999 999
b0607     120  220   5  7  999 999
b0607     121  187   5  7  999 999
b0607     122   59   5  7  999 999
b0607     123  206   5  7  999 999
```

During the preparation of this RAI response, it was noted that under certain conditions, the wind speed was not correctly converted to m/sec. This occurred for approximately 60 hours of data. The corrected ARCON96 input file is attached (file: B0607C.met).

The joint frequency distribution (JFD) tables provided for use with the PAVAN and XOQDOQ computer codes were also generated from the original BLN meteorological data. The process of developing the JFD tables from the original BLN meteorological data for use in the PAVAN and XOQDOQ computer codes consists of the following steps:

1. Flagging the hourly data as bad if the lower wind direction, lower wind speed, or temperature differential is missing from the original data set. If only upper level wind direction or wind speed is missing, the hourly data is still considered valid because the upper level data is not used.

2. Converting the wind speed from mph to meters/second
   Wind speed (m/sec) = Wind speed (mph) * 0.44704 $\frac{m/sec}{mph}$
3. Subtracting 360 from lower level wind direction for wind directions greater than 360, if applicable.
4. Changing temperature differential (°F/45m) to temperature differential (°C/100m), as follows:

$$\frac{\Delta T\,(^{\circ}C \text{ based on } 100\,m \text{ separation})}{100m} = \frac{\Delta T\,(^{\circ}F \text{ based on } 45\,m \text{ separation}) * \frac{5}{9}\frac{^{\circ}C}{^{\circ}F}}{45\,m}, \text{ or,}$$

$$\text{Temperature Difference}(\text{in } ^{\circ}C/100\ m) = \text{Temperature Difference}(\text{in } ^{\circ}F/45\,m) * 1.2346$$

5. Changing the temperature differential (°C/100m) to the stability class using the classification system from Regulatory Guide 1.23. A numeric stability class for each hour of valid data was assigned using the classification scheme from Regulatory Guide 1.23 given above [Class 1 is the same as Stability Class A in Regulatory Guide 1.23]
6. Assigning a wind direction bin for each hour of valid data based on the following scheme.

Wind Direction	Wind Direction Bin
>348.75	1
≤348.75	16
≤326.25	15
≤303.75	14
≤281.25	13
≤258.75	12
≤236.25	11
≤213.75	10
≤191.25	9
≤168.75	8
≤146.25	7
≤123.75	6
≤101.25	5
≤78.75	4
≤56.25	3
≤33.75	2
≤11.25	1

7. Assigning a wind speed bin for each hour of valid data based on the following scheme. Wind speeds less than the anemometer start speed of 0.45 m/sec were classified as calms.

Wind Speed	Wind Speed Bin
≤10	12
≤8	11
≤6	10
≤5	9
≤4	8
≤3	7
≤2	6
≤1.5	5
≤1.25	4
≤1	3
≤0.75	2
≤0.6	1

8. Counting the total number of hours for each stability class by wind speed and wind direction for the valid hourly data.

9. Weighting the resulting JFD table entries by the ratio of the possible yearly hours to the total valid data hours thereby, determining JFD tables for a representative year.

10. Adding 0.5 to the JFD table entries and rounding the resulting values to the nearest integer.

The JFDs for the first year of BLN meteorological data are given in FSAR Section 2.3 and the JFDs for the two year BLN data set were provided in response to BLN-RAI-LTR-096, NRC RAI No. 02.03.03-05.

This Response is PLANT SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

None

ASSOCIATED ATTACHMENTS/ENCLOSURES:

Attachment 02.03.04-6A: Corrected ARCON96 input file (file: B0607C.met)

Attachment 02.03.04-06A

Corrected ARCON96 input file

(Electronic file: B0607C.met)