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September 15, 2010

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**BELL BEND NUCLEAR POWER PLANT**
**BBNPP PLOT PLAN CHANGE COLA**
**SUPPLEMENT: PART 3 (ER) SECTION 6.4**
**STATUS: PART 3 (ER) SECTION 2.1**
**BNP-2010-232 Docket No. 52-039**

References: 1) BNP-2010-175, T. L. Harpster (PPL Bell Bend, LLC) to U.S. NRC, "July2010BNPP Schedule Update", dated July 16, 2010

2) BNP-2010-155, R. R. Sgarro (PPL Bell Bend, LLC) to U.S. NRC, "Submittal of BBNPP RAI Schedule Information", dated August 4, 2010

In References 1 and 2, PPL Bell Bend, LLC (PPL) provided the NRC with schedule information related to the intended revision of the Bell Bend Nuclear Power Plant (BBNPP) footprint within the existing project boundary which has been characterized as the Plot Plan Change (PPC). As the NRC staff is aware, the plant footprint relocation will result in changes to the Combined License Application (COLA) and potentially to new and previously responded to Requests for Additional Information (RAIs).

Accordingly, PPL has committed to provide the NRC with COLA supplements, consisting of revised COLA Sections and associated RAI responses/revisions, as they are developed. These COLA supplements will only include the changes related to that particular section of the COLA and will not include all conforming COLA changes. Conforming changes for each supplement necessary for other COLA sections will be integrated into the respective COLA supplements and provided in accordance with the schedule, unless the supplement has already been submitted. In the latter case, the COLA will be updated through the normal internal change process. The revised COLA supplements will also include all other approved changes since the submittal of Revision 2. All COLA supplements and other approved changes will ultimately be incorporated into the next full COLA revision.

In Reference 1, a forecast date of September 15, 2010 was provided for submittal of a supplement for BBNPP COLA, Part 3 (ER) Section 2.1. Additional time will be required to complete the development of this supplement. PPL will provide ER Section 2.1 by October 6, 2010.

The enclosure provides the revised BBNPP COLA Supplement, Part 3 (Environmental Report), Section 6.4, Revision 2a. The revised BBNPP COLA section supersedes previously submitted information in its entirety. No departures and/or exemptions to this BBNPP COLA section have been revised as a result of the PPC.

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Previously submitted NRC RAI responses which refer directly to the enclosed COLA section were also reviewed for impact from the PPC. The following previously submitted RAI responses were reviewed for impacts:

| RAI No. | Response Impacted? (Yes/No) |
|---|---|
| MET 6.4-1 | No |
| MET 6.4-2 | No |

The only new regulatory commitments are to include the revised COLA section (Enclosure) in the next COLA revision and to submit ER Section 2.1 by October 6, 2010.

If you have any questions, please contact the undersigned at 570.802.8102.

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

Executed on September 15, 2010

Respectfully,

Rocco R. Sgarro

RRS/dw

Enclosure: 1) Revised BBNPP COLA Part 3 (ER); Chapter 6.4, Revision 2a

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Enclosure

Revised BBNPP COLA Part 3 (ER), Chapter 6.4, Revision 2a

## 6.4 METEOROLOGICAL MONITORING

This section describes the meteorological monitoring program that will be implemented for ~~the~~ BBNPP. It includes the pre-application and pre-operational meteorological monitoring program consisting of the existing meteorological monitoring program for SSES Units 1 and 2 and the operational meteorological monitoring program utilizing the BBNPP meteorological tower. There are no unusual circumstances anticipated during site preparation and construction that require additional meteorological monitoring.

~~The other source of meteorological data used was from the U.S. National Weather Service (NWS). This data is certified by the National Climate Data Center (NCDC, 2007).~~

### 6.4.1 Pre-Application and pre-Operational Meteorological Measurement program

The pre-application and pre-operational meteorological monitoring program for BBNPP is the operational program for SSES Units 1 and 2. ~~This~~ The SSES program was designed in accordance with the guidance provided in Regulatory Guide 1.23 (Safety Guide 23) (NRC, 1972) and complies with the requirements of the second proposed Revision 1 of Regulatory Guide 1.23 (NRC, 1986). ~~Delta temperature accuracy criteria is provided in Safety Guide 23, Onsite Meteorological Programs (NRC, 1972).~~ There are currently three monitoring locations at SSES: a primary meteorological tower, a backup tower and a supplemental (downriver) ~~tower (described below in greater detail).~~ tower. The ~~pre-applicatoin~~pre-application and pre-operational meteorological monitoring program for BBNPP only includes data from the primary SSES meteorological tower.

#### 6.4.1.1 Tower Location

The site is about 5 mi (8 km) ~~N~~NE of Berwick, Pennsylvania. The primary meteorological tower for the SSES is located on-site (650 ft (198 m) msl) approximately 1115 ft (340 m) to the southeast of the cooling towers. The area is generally level, increasing slightly in elevation to the north and west. South and east of the tower the topography slopes down towards the Susquehanna River. Vegetation in the immediate vicinity consists of low weeds with some deciduous trees in a gully to the south. The deciduous trees are approximately 40 ft (12 m) in height and are approximately 100 ft (30 m) from the tower. An ash facility exists approximately 185 ft (56 m) north of the tower. The maximum height of this structure is approximately 30 ft (9 m).

Figure 6.4-1, Site Map with Meteorological Tower Location, presents the location of the SSES and BBNPP meteorological towers as well as the topography within a 1 mi (1.6 km) radius of the BBNPP site. Figure 6.4-2, Detailed Topography Within 5 mi (8 km), also presents the general topographic features of the region.

~~Although grade at the existing SSES meteorological tower is 24 feet (7 meters) lower than grade at the BBNPP reactor building, consideration of prevailing wind direction, the impact of topographny and manmade and vegetation obstructions leads to the conclusion that the meteorological measurements at the tower are acceptable.~~

#### 6.4.1.2 Tower Design

The SSES meteorological tower is a 200 ft (61 m) open-lattice steel framed tower.

The primary data recording system used for the SSES meteorological tower is a digital data acquisition system. All telemetry transmitters, translators and a data logger are housed in a

weatherproof cinderblock building. This building has thermostatically controlled heating and air conditioning. The secondary recording system is the SSES Control Room recorders.

### 6.4.1.3 Instrumentation

Instruments at the SSES meteorological tower monitor temperature, delta temperatures, wind speed and direction, ~~sigma theta,~~ dew point and precipitation. SSES meteorological tower instrument types, specifications, and accuracies are presented in Table 6.4-1.

The temperature measuring system consists of multiple thermistor composite sensors. Two sensors are mounted in motor aspirated shields at each of the 33 ft (10 m) and 197 ft (60 m) levels (above ground level). Vertical dispersion coefficients are computed from the vertical temperature differences.

Wind speed and direction are monitored at the 33 ft (10 m) and 197 ft (60 m) levels using a 3-cup anemometer and a counterbalanced lightweight vane. The standard deviation of the wind direction (sigma theta) is measured at 33 ft (10 m) and 197 ft (60 m) and is used to compute horizontal dispersion coefficients. Sigma theta calculations based on wind direction measurements are used as a backup to temperature difference readings to monitor atmospheric stability.

The dew point temperature is measured at the 33 ft (10 m) level using a sensor consisting of bifilar gold electrodes wound on a lithium chloride impregnated wick.

Precipitation is measured at the base of the tower using a heated tipping bucket rain gauge. This is a remote reading rain gauge which produces a signal proportional to total rainfall.

~~Table 6.4-1 provides~~ The wind sensors are mounted on a boom that is at least twice the ~~current meteorological instrument accuracies and ranges and compares them with the guidance provided in Regulatory Guide~~ length of the tower side. The boom is not mounted on the tower such that the instruments are approximately perpendicular to the primary two wind directions. However, this tower was installed before RG 1.23, Revision ~~1 (NRC, 2007).~~ 1, was published and will only be used for the pre-operational phase of BBNPP.

### 6.4.1.4 Instrument Maintenance and Surveillance Schedules

Calibration schedules are specified to comply with Regulatory Guide 1.23 recommendations (SSES, 2005). Equipment checks are performed at least weekly. Charts are changed as required. Component checks and adjustments are performed when required. All meters and other equipment used in calibration are, in turn, calibrated at scheduled intervals.

~~All calibration~~ Inspection and maintenance ~~is performed at least semi-annually~~ of all equipment is accomplished in accordance with procedures. Inspection is implemented by qualified technicians that are capable of performing the ~~frequencies and procedures prescribed in~~ maintenance, if required. The results of the ~~manufacturer's operating~~ inspections and maintenance ~~manual.~~ performed are recorded.

### 6.4.1.5 Data Reduction and Compilation

The primary data recording system is a digital data acquisition system. ~~The~~ Both 15-minute and hourly average data values are produced. An analog recording system provides a backup in case of digital system failure, so that a high data recovery rate can be maintained. Data recovery rates for the SSES meteorological monitoring program have consistently been greater than 95%. ~~Recovery rates for each year from 1999 through 2003 were above 95% for~~

~~all instruments, except the recovery rate for dew point in 2000 which was 87.2%. The five year average recovery rates for all instruments was greater than 95% for this period.~~

Section 2.3.3.6 of the SSES FSAR, Rev. 60 (SSES, 2005) describes the analytical data reduction procedures used to produce hourly averages and other specified meteorological compilations. In summary, Section 2.3.3.6 of the SSES Units 1 and 2 FSAR provides procedures for the following:

- For temperature and dew point, computing hourly averages from ~~one-minute observations~~five second sample data
- Treatment of calm wind conditions
- Computing hourly averages for wind speed and wind direction
- Replacement of invalid or missing digital data with analog data
- Substituting data from the secondary (197 ft (60 m)) tower level for unavailable data from the primary (33 ft (10 m)) tower level
- Reducing the 197 ft (60 m) wind speed to the equivalent 10-meter value utilizing the wind power law.

The hourly values of the meteorological parameters are then processed to obtain the following compilations:

- Joint frequency distributions of wind speed and stability for lower and upper levels
- Wind direction persistence summaries by stability class
- Maximum, minimum and diurnal variation of temperature and humidity
- Annual average values of relative concentration with direction and distance
- Frequency distribution of concentrations for the 0-2 hour, 0-8 hour, 8-24 hour, 1-4 day and 4-30 day time periods.

The 15-minute averaged data are available for use in the determination of magnitude and continuous assessment of the impact of releases of radioactive materials to the environment during a radiological emergency (as required in 10 CFR Part 50, Paragraphs 50.47(b)(4), 50.47(b)(8), and 50.47(b)(9) as well as Section IV.E.2 of Appendix E). The hourly averaged data are available for use to:

- Determine radiological effluent release limits associated with normal operations can be met for any individual located off site (as required in 10 CFR 100.20(c)(2)).
- Determine radiological dose consequences of postulated accidents meet prescribed dose limits at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) (as required in 10 CFR 100.20(c)(2)).
- Evaluate personnel exposures in the control room during radiological and airborne hazardous material accident conditions (as required in 10 CFR Part 50, Appendix A).
- Determine compliance with numerical guides for design objectives and limiting conditions for operation to meet the requirement that radioactive material in effluents

released to unrestricted areas be kept as low as is reasonably achievable (as required in 10 CFR Part 50, Appendix I).

- Determine compliance with dose limits for individual members of the public (as required in 10 CFR Part 20, Subpart D).

Annual summaries of meteorological data in the form of joint frequency distributions of wind speed and wind direction by atmospheric stability class are kept onsite and are available to the Nuclear Regulatory Commission upon request. The annual summaries used for licensing are presented in FSAR Section 2.3.2.

ER Section 2.7 indicates that the SSES meteorological data represent long-term conditions at the site by comparing site meteorological statistics with similar statistics from surrounding National Weather Service (NWS) stations (Wilkes-Barre/Scranton, Allentown, and Williamsport, PA). The comparison noted:

- Wilkes-Barre/Scranton is located in the same climatic division as the BBNPP and the SSES site. (A climate division represents a region within a state that is as climatically homogeneous as possible, as determined by the U.S. National Climatic Data Center.)
- The monthly mean temperatures at the SSES site are within 0.6 degree Fahrenheit (0.3 degree Celsius) of the three NWS sites on the average. The annual mean temperature at the BBNPP site is within 0.1 degree Fahrenheit (0.06 degree Celsius) of the Allentown value.
- The annual average precipitation at the SSES site is within 1.5 inches (38.1 mm) of the Wilkes- Barre/Scranton value.

Winds are from the SW approximately 11% of the time at the SSES site and are from the SW approximately 13% of the time at Wilkes-Barre/Scranton.

### 6.4.1.6 Nearby Obstructions to Air Flow

Downwind distances from the SSES meteorological tower to nearby (within 0.5 mi (0.8 km)) obstructions to air flow were determined using U.S. Geological Survey topographical maps. Highest terrain is to the west and north. Lowest ~~terrain~~terrain is to the northeast through southeast (river valley). ~~Table 6.4-2 presents the distances to nearby obstructions to air flow in each downwind sector.~~

Table 6.4-8 presents information on potential man-made obstructions to air flow for the SSES meteorological tower.

A study performed to determine the effect of the SSES Unit 1 and 2 cooling towers on meteorological measurements at SSES concluded that the impact of the cooling towers on wind speed measurements is minimal and the effect on wind direction measurements is nearly non-existent.

### 6.4.1.7 Deviations to Guidance from Regulatory Guide 1.23

The pre-operational meteorological monitoring program for BBNPP deviates from the guidance provided in Regulatory Guide 1.23, Revision 1 (NRC, 2007) The SSES meteorological tower is not at a distance at least 10 times the height of any nearby obstruction that exceeds one-half the height of the wind measurement. Further discussion is provided in Section 6.4.1.1. The SSES meteorological tower is not at the same elevation as the finished BBNPP

grade. The SSES tower location was selected to assure the meteorological tower was located on level, open terrain at a suitable distance from any nearby obstructions and complies with the guidance of the second proposed revision to Reguatory Guide 1.23, Revision 1 (NRC, 1986). ~~Also, the resolution of the existing sensors does not meet the measurement resolution recommended in Regulatory Guide 1.23, Revision 1.~~

The tower, guyed wire, and anchor inspections are performed once every 5 years instead of an annual inspection for tower and guyed wire and an anchor inspection of once every 3 years as provided in Regulatory Guide 1.23, Revision 1.

The wind instruments are not mounted on the tower such that the instruments are approximately perpendicular to the primary two wind directions. Further discussion is provided in Section 6.4.1.3.

## 6.4.2 Operational Meteorological Measurement program

The operational meteorological monitoring program for BBNPP utilizes the BBNPP meteorological tower and its instrumentation, telemetry and data recording system. This program is designed according to the guidance provided in Regulatory Guide 1.23, Revision 1 (NRC, 2007).

Information relating to the BBNPP meteorological tower location and support facilities for the operational meteorological monitoring program is contained in Section 6.4.2.1 and Section 6.4.2.2. Likewise, Section 6.4.2.3 contains general instrument information.

Table 6.4-3 presents detailed information on the BBNPP meteorological tower instrument types and specifications and compares them with regulatory requirements from Regulatory Guide 1.23, Revision 1 (NRC, 2007). Information relating to operational instrument maintenance and ~~service schedules~~ surveillance scheduling is contained in Section 6.4.2.4. Data reduction and compilation is contained in Section 6.4.2.5.

Pertinent meteorological data are submitted to the NRC's ERDS as required in Section VI of Appendix E to 10 CFR Part 50.

### 6.4.2.1 Tower Location

The BBNPP meteorological tower ~~is~~ and support facilities for the operational meteorological monitoring program are located approximately ~~3577~~4,368 ft ~~(1090~~ (1,331 m) ESE of the BBNPP Reactor Building. Grade at the tower is approximately 670 ft (204 m) msl. While tower grade is not the same as plant grade, it is nonetheless acceptable, as discussed in Section 6.4.2.7. Figure 6.4-1, ~~Site Map with Meteorological Tower Location,~~ Topography within a 1-Mile (1.6 km) Radius of the Site, presents the location of the BBNPP meteorological ~~towers~~tower as well as the topography within a 1 mi (1.6 km) radius of the BBNPP site. Figure 6.4-2, ~~Detailed~~ Topography ~~Within 5 mi~~within a 5-Mile (8 ~~km),~~ km) Radius of the Site, presents the general topographic features of the region.

### 6.4.2.2 Tower Design

The BBNPP meteorological tower is ~~a 200 ft (61 m)~~ an open-lattice steel ~~framed tower.~~ tower approximately 197 ft (60 m) in height.

~~The primary data recording system used for the BBNPP meteorological tower is a digital data acquisition system. All telemetry transmitters, translators and a data logger are housed in a weatherproof cinderblock building. This building has thermostatically controlled heating and~~

~~air conditioning. The secondary recording system is the Process Information and Control System (PICS) described in Section 7.1.1.3.2 of the U.S. EPR FSAR.~~

### 6.4.2.3 Instrumentation

Equipment includes sensors to measure wind speed, wind direction, ambient temperature, delta temperature, dew point or wet bulb temperature, and precipitation.

Sensor accuracies and resolutions will meet those presented in Table 2 of Regulatory Guide 1.23, Revision 1 (NRC, 2007). The ~~instrumentation for~~ wind sensors are mounted at a distance equal to at least twice the horizontal dimension of the tower (e.g., the side of a triangular tower). The wind sensors are mounted in a direction perpendicular to the primary two primary wind directions (up- and down-valley). Wind measurements are made at 33 ft (10 m) and 197 ft (60 m). Ambient temperature and dew point or wet bulb temperature are measured at 33-ft (10- m). The temperature sensors will be mounted in downward-pointing fan-aspirated shields. The fan-aspirated shields will be at least one and one half times the tower horizontal width away from the nearest point on the tower. Delta temperature is measured between the 197 ft (60 m) and 33 ft (10 m) levels of the tower. Precipitation is measured at or near the base of the tower and will be equipped with a wind shield.BBNPP meteorological tower ~~is outlined~~ instrument types, specifications and accuracies are presented in Table 6.4-3.

### 6.4.2.4 Instrument Maintenance and Surveillance Schedules

~~The BBNPP~~ Information relating to the operational meteorological tower instrument maintenance and surveillance ~~includes channel checks performed daily, and channel calibrations performed semiannually. System calibrations encompass entire data channels, including all recorders and displays (e.g., those local at the meteorological tower and~~ schedules is provided in ~~the~~ER Section 6.4.1.4~~emergency response facilities, as well as those used to compile the historical data.~~.

### 6.4.2.5 Data Reduction and Compilation

The BBNPP meteorological tower data collection uses electronic digital data ~~acquistion~~acquisition systems as the primary data recording system and conforms to the guidance in Regulatory Guide 1.23, Revision 1 (NRC, 2007).

The 15-minute averaged data are available for use in the determination of magnitude and continuous assessment of the impact of releases of radioactive materials to the environment during a radiological emergency (as required in 10 CFR Part 50, Paragraphs 50.47 (b)(4), 50.47(b)(8), and 50.47 (b)(9) as well as Section IV.E.2 of 10 CFR 50 Appendix E). The hourly averaged data are available for use to:

1. Determine radiological effluent release limits associated with normal operations can be met for any individual located off site (as required in 10 CFR 100.21 (c)(1).

2. Determine radiological dose consequences of postulated accidents meet prescribed dose limits at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) (as required in 10 CFR 52.79 (a)(1)(vi)).

3. Evaluate personnel exposures in the control room during radiological and airborne hazardous material accident conditions (as required in 10 CFR Part 50, Appendix A).

4. Determine compliance with numerical guides for design objectives and limiting conditions for operation to meet the requirement that radioactive material in effluents

released to unrestricted areas be kept as low as is reasonably achievable (as required in 10 CFR Part 50, Appendix I).

5. Determine compliance with dose limits for individual members of the public (as required in 10 CFR Part 20, Subpart D).

#### 6.4.2.6 Nearby Obstructions to Air Flow

Downwind distances from the BBNPP meteorological tower to nearby (within 0.5 mile or 0.8 km) obstructions to air flow were determined using U.S. Geological Survey topographical maps. Highest terrain is to the west and north. Lowest terrain is to the northeast through southeast (river valley). Table 6.4-6 presents the distances to nearby obstructions to air flow in each downwind sector.

Table 6.4-5 presents building heights and distances from various structures to the BBNPP meteorological tower. The BBNPP cooling towers are 475 ft (145 m) tall and the SSES cooling towers are 540 ft (165 m) tall (SSES, 2006). The two tallest EPR buildings are the Reactor Building 204 ft (62 m) and the Turbine Building ~~180~~160 ft ~~(55~~(49 m). The Turbine Building is also the closest major building to the BBNPP meteorological tower. Both buildings will ~~be~~have a ~~finished~~ finish floor grade of approximately ~~674~~720 ft ~~(205~~(219 m) msl. Grade at the BBNPP meteorological tower is approximately 670 ft (204 m) msl (USGS, 1978). This ~~small~~ difference ~~in grade~~ between finished site grade and the meteorological tower grade is acceptable ~~per Regulatory Guide 1.23, Revision 1.~~ for the following reasons:

- It is assumed in atmospheric dispersion modeling that the plume follows the terrain, therefore, the meteorological measurements would be applicable for their primary purpose, atmospheric dispersion modeling to protect the health and safety of members of the public.
- The selected location is suitably far from man-made obstructions to air flow.
- Any potential locations closer to plant grade have significant obstructions to air flow.

All EPR buildings are greater than a factor of ten times their respective heights away from the meteorological tower, and as such are not expected to impact the meteorological measurements. The BBNPP and SSES cooling towers are closer than a factor of ten times their respective heights away from the BBNPP meteorological tower. This deviation from Regulatory Guide 1.23, Revision 1 has a minimal influence on the BBNPP meteorological tower instruments as discussed in the study described below.

A study performed to determine the effect of the SSES Unit 1 and 2 cooling towers on meteorological measurements at SSES (refer to Section 6.4.1.6) concluded that the impact of the cooling towers on wind speed measurements is minimal and the effect on wind direction measurements is nearly non-existent. Since the BBNPP meteorological tower is further away from the SSES cooling towers than the SSES meteorological tower, it is concluded that there will be little to no impact on wind measurements made at the BBNPP meteorological tower due to the SSES cooling towers. Similarly, since the BBNPP meteorological tower is further away from the BBNPP cooling towers than the SSES meteorological tower is to the SSES cooling towers, it is concluded that there will be little to no impact on wind measurements made at the BBNPP meteorological tower due to the BBNPP cooling towers. In addition, the predominant wind direction for the site has been from the east-northeast at the 10 m level and from the north-northeast at the 60 m level with secondary peaks at both levels from the southwest. Due to the orientation of the BBNPP meteorological tower with respect to the

BBNPP and SSES cooling towers, the influence of the local meteorology will act also to minimize the impact of the cooling towers on meteorological measurements.

### 6.4.2.7 Deviations to Guidance from Regulatory Guide 1.23

The ~~only deviation to the guidance from Regulatory Guide 1.23, Revision 1 (NRC, 2007) is the~~ BBNPP and SSES cooling towers do not meet the distance criterion ~~that the distance~~ of any nearby obstructions ~~are~~ to airflow being at least 10 times the height of the structure that exceeds one-half of the height of the wind measurement away from the meteorological tower. ~~The BBNPP and SSES cooling towers do not meet this distance criterion for~~ This deviation from Regulatory Guide 1.23, Revision 1 (NRC, 2007) has minimal influence on the BBNPP meteorological ~~tower.~~tower instruments as discussed in the study described in Section 6.4.2.6.

The BBNPP meteorological tower is not at the same elevation as the finished BBNPP grade. The difference between finished site grade and meteorological tower grade is acceptable for the following reasons: 1) it is assumed in atmospheric dispersion modeling that the plume follows the terrain; therefore, the meteorological measurements would be applicable for their primary purpose, atmospheric dispersion modeling to protect the health and safety of members of the public, 2) the selected location is suitably far from man-made obstructions to air flow, and 3) any potential locations closer to plant grade have significant obstructions to air flow.

## 6.4.3 References

**NRC, 1972.** Onsite Meteorological Programs, Safety Guide 23 (Regulatory Guide 1.23 Revision 0), U.S. Nuclear Regulatory Commission, February 1972.

**NRC, 1986.** Meteorological Measurement Program For Nuclear Power Plants, Regulatory Guide 1.23, Second Proposed Revision 1, U.S. Nuclear Regulatory Commission, April 1986.

**NRC, 2007.** Meteorological Monitoring Programs for Nuclear Power Plants, Regulatory Guide 1.23, Revision 1, U.S. Nuclear Regulatory Commission, March 2007.

**SSES, 2005.** Susquehanna Steam Electric Station, Final Safety Analysis Report, Rev. 60, pp. 2.3-12 through 2.3-18, June 2005.

**SSES, 2006.** Susquehanna Steam Electric Station Units 1 and 3 License Renewal Application, Appendix E, Environmental Report, p 3.1-4, September 2006.

**USGS, 1978.** U.S. Geological Survey Berwick Triangle Topographical Map

## Table 6.4-1— SSES Meteorological Tower Instrument Types, Specifications and Accuracies for Pre-Application and Pre-Operational Programs

| Characteristics | Requirements* | Specifications |
|---|---|---|
| Wind Speed Sensor | | |
| Make | | Climatronics |
| Model | | 100075 |
| Starting Threshold | < 1 mph (0.45 m/s) | 0.5 mph |
| Range | | 0-145 mph |
| Accuracy | +/- 0.2 m/s (+/- 0.45 mph) or 5% of observed wind speed | +/- 1.0% or +/- 0.15 mph, whichever is greater |
| Resolution | 0.1 m/s (0.1 mph) | 0.1 m/s (0.1 mph) |
| Wind Direction Sensor | | |
| Make | | Climatronics |
| Model | | 100076 |
| Starting Threshold | < 1 mph (0.45 m/s) | 0.5 mph |
| Range | | 0-360 degrees |
| Accuracy | +/- 5 degrees | +/- 2 degrees |
| Resolution | 1.0 degree | 1.0 degree |
| Temperature Sensors | | |
| Make | | Climatronics |
| Model | | 100093 |
| Range (ambient) | | -20°F to +100°F |
| Range (vertical temperature diference) | | -5°F to +5°F |
| Accuracy (ambient) | +/- 0.5°C (+/- 0.9°F) | +/- 0.15°C |
| Resolution (ambient) | 0.1°C (0.1°F) | 0.1°C (0.1°F) |
| Accuracy (vertical temperature difference) | +/- 0.1°C (+/- 0.18°F) | +/- 0.1°C |
| Resolution (vertical temperature difference) | 0.01°C (0.01°F) | 0.01°C (0.01°F) |
| Dew Point Sensor | | |
| Make | | Climatronics |
| Model | | 101197 |
| Range | | -40°F to +100°F |
| Accuracy | +/- 1.5°C (+/- 2.7°F) | +/- 0.5°C |
| Resolution | 0.1°C (0.1°F) | 0.1°C (0.1°F) |
| Precipitation Sensor | | |
| Make | | Climatronics |
| Model | | 100097-1 |
| Accuracy | +/- 10% for a volume equivalent to 2.54 mm (0.1 in.) of precipitation at a rate of 50 mm/h (< 2 in./h) | +/- 1.0% at 3 inches per hour |
| Resolution | 0.25 m (0.01 in) | 0.25 m (0.01 in) |

* Accuracy requirements from Regulatory Guide 1.23, Revision 1, March 2007

**Table 6.4-2 — Distances from the SSES Meteorological Tower to Nearby Obstructions to Air Flow**

| Downwind Sector* | Approximate Distance miles (meters) |
|---|---|
| N | 0.5 (805) |
| NNE | N/A** |
| NE | N/A** |
| ENE | N/A** |
| E | N/A** |
| ESE | N/A** |
| SE | N/A** |
| SSE | N/A** |
| S | N/A** |
| SSW | 0.5 (805) |
| SW | 0.5 (805) |
| WSW | N/A** |
| W | 0.35 (563) |
| WNW | 0.36 (579) |
| NW | 0.5 (805) |
| NNW | 0.5 (805) |

* With respect to True North
** Lower than base elevation and therefore no possible obstructions

**Table 6.4-3— BBNPP Meteorological Tower Instrument Types, Specifications and Accuracies for Operation Program**

| Measurement | System Accuracy* | Measurement Resolution* |
|---|---|---|
| Wind Speed | +/- 0.2 m/s (+/-0.45 mph) or 5% of observed wind speed starting threshold <0.45 m/s (1 mph) | 0.1 m/s or 0.1 mph |
| Wind Direction | +/- 5 degree starting threshold <0.45 m/s (1 mph) | 1.0 degree |
| Ambient Temperature | +/-0.5°C (+/-0.9°F) | 0.1°C or 0.1°F |
| Vertical Temperature Difference | +/-0.1°C (+/-0.18°F) | 0.01°C or 0.01°F |
| Dew Point Temperature | +/-°1.5°C (+/-2.7°F) | 0.1°C or 0.1°F |
| ~~Wet-Bulb~~Wet-Bulb Temperature | +/-0.5°C (+/-0.9°F) | 0.1°C or 0.1°F |
| Relative ~~Hum~~Humidity | +/-4% | 0.1% |
| Precipitation (water ~~equivalent~~equivalent) | +/-10% for a volume equivalent to 2.54 mm (0.1 in) of precipitation at a rate <50 mm/h (<2 in/h) | 0.25 mm or 0.01 in |
| Time | +/- 5 min | 1 min |
| *Resolution and Accuracy requirements consistent with Regulatory Guide 1.23, Revision 1 March 2007 | | |

~~**Table 6.4-4—Distances from the U.S. EPR Major Buildings to the BBNPP Meteorological Tower**~~

| ~~Building~~ | ~~Height~~ | ~~Distance to Meteorological Tower~~ |
|---|---|---|
| ~~BBNPP Reactor Building~~ | ~~62 m (203 ft) above grade~~ | ~~1090 m (3577 ft) (estimated)~~ |
| ~~BBNPP Turbine Building~~ | ~~55 m (180 ft) (estimated)~~ | ~~950 m (3115 ft) (estimated)~~ |
| ~~BBNPP Cooling Tower (closest)~~ | ~~145 m (475 ft)~~ | ~~1048 m (3438 ft)~~ |
| ~~SSES Cooling Tower (closest)~~ | ~~165 m (540 ft)~~ | ~~844 m (2769 ft)~~ |

## Table 6.4-5— Potential Man-Made Obstructions to Air Flow for the BBNPP Meteorological Tower

(Page 1 of 2)

| Obstruction | Wind Direction and Sector | Distance (ft)/(m) | Grade (ft)/(m) | Height (ft)/(m) | Largest Bottom Dimension (ft)/(m) | Largest Top Dimension (ft)/(m) |
|---|---|---|---|---|---|---|
| SSES Met. Tower | 45 NE | 4171/1271 | 650/198 | N/A | N/A | N/A |
| SSES CWS Cooling South Unit 2 (centerline) | 19 NNE | 3139/957 | 690/210 | 540/165 | 419/128 | 301/92 |
| SSES CWS Cooling North Unit 1 (centerline) | 15 NNE | 3823/1165 | 710/216 | 540/165 | 419/128 | 301/92 |
| BBNPP CWS Cooling East (centerline) | 316 NW | 4520/1378 | 700/213 | 475/145 | 360/110 | 202/62 |
| BBNPP CWS Cooling West (centerline) | 310 NW | 4985/1519 | 700/213 | 475/145 | 360/110 | 202/62 |
| Treeline (to North) | 357 N | 260/79 | 668/204 | 79/24 | N/A | N/A |
| Treeline (to South) | 177 S | 300/91 | 668/204 | 94/29 | N/A | N/A |
| BBNPP Reactor Building (centerline) | 300 WNW | 4368/1331 | 720/219 | 204.4/62.3 | 182.87/56 | N/A |
| BBNPP Turbine Building (centerline) | 303 WNW | 4043/1232 | 720/219 | 160/49 | 384.5/117 | N/A |
| SSES Reactor Building Unit 2 (centerline) | 28 NNE | 3669/1118 | 670/204 | 203.125/ 61.913 | 323/98 | N/A |
| SSES Turbine Building Unit 2 (centerline) | 26 NNE | 3585/1093 | 676/206 | 112.21/34.20 | 630/192 | N/A |
| BBNPP Emergency Diesel Generator South | 298 WNW | 4141/1262 | 720/219 | 68/21 | 178/54 | N/A |
| BBNPP Emergency Diesel Generator North | 304 NW | 4464/1361 | 720/219 | 68/21 | 178/54 | N/A |
| BBNPP Service and Administration Building (Access Building) | 299 WNW | 4214/1284 | 720/219 | 62.67/19.10 | 119.94/37 | N/A |

**Table 6.4-5— Potential Man-Made Obstructions to Air Flow for the BBNPP Meteorological Tower**

(Page 2 of 2)

| Obstruction | Wind Direction and Sector | Distance (ft)/(m) | Grade (ft)/(m) | Height (ft)/(m) | Largest Bottom Dimension (ft)/(m) | Largest Top Dimension (ft)/(m) |
|---|---|---|---|---|---|---|
| SSES Emergency Diesel Generator (E) | 30 NNE | 4092/1247 | 656/200 | 85.5/26.1 | 80/24 | N/A |
| SSES Emergency Diesel Generator (AN/ AD) | 27 NNE | 3952/1205 | 660/201 | 75.5/23.0 | 120/37 | N/A |
| SSES Service and Administration Building | 26 NNE | 4123/1257 | 676/206 | 66/20 | 150.5/46 | N/A |
| SSES Salt Dome Storage | 43 NE | 4045/1233 | 655/200 | 60/18 | 60/18 | N/A |
| SSES Domestic Water Storage Tank | 40 NE | 4234/1291 | 660/201 | 46/14 | 46/14 | N/A |
| N/A stands for not applicable | | | | | | |

**Table 6.4-6— Distances from BBNPP Met Tower to Nearby Obstructions to Air Flow**

| Downwind Sector* | Approximate Distance miles (meters) |
|---|---|
| N | 0.45 (724) |
| NNE | 0.45 (724) |
| NE | N/A** |
| ENE | N/A** |
| E | N/A** |
| ESE | N/A** |
| SE | N/A** |
| SSE | N/A** |
| S | N/A** |
| SSW | N/A** |
| SW | 0.25 (402) |
| WSW | 0.40 (644) |
| W | 0.30 (483) |
| WNW | 0.45 (724) |
| NW | 0.5 (805) |
| NNW | 0.5 (805) |

* With respect to True North
** Lower than base elevation and therefore no possible obstructions

**Table 6.4-7— {Existing Man-Made Potential Obstructions to Air Flow for the SSES Meteorological Tower}**

| Obstruction | Wind Direction and Sector | Distance ft (m) | Grade ft (m) | Height ft (m) | Largest Bottom Dimension ft (m) | Largest Top Dimension ft (m) |
|---|---|---|---|---|---|---|
| SSES CWS Cooling Tower South Unit 2 (centerline) | 271 W | 1958 (597) | 690 (210) | 540 (165) | 419 (128) | 301 (92) |
| SSES CWS Cooling Tower North Unit 1 (centerline) | 291 WNW | 2108 (643) | 710 (216) | 540 (165) | 419 (128) | 301 (92) |
| SSES Reactor Building Unit 2 (centerline) (note 1) | 284 WNW | 1219 (372) | 670 (204) | 203.125 (62) | 323 (98) | N/A |
| SSES Turbine Building Unit 2 (centerline) (note 1) | 280 W | 1409 (429) | 676 (206) | 112.21 (34) | 630 (192) | N/A |
| SSES Emergency Diesel Generator (E) | 301 WNW | 1100 (335) | 656 (200) | 85.5 (26) | 80 (24) | N/A |
| SSES Emergency Diesel Generator (A-D) | 297 WNW | 1336 (407) | 660 (201) | 75.5 (23) | 120 (37) | N/A |
| SSES Service and Administration Building | 302 WNW | 1430 (436) | 676 (206) | 66 (20) | 150.5 (46) | N/A |
| SSES Salt Dome Storage | 277 W | 209 (64) | 655 (200) | 60 (18) | 60 (18) | N/A |
| SSES Domestic Water Storage Tank | 321 NW | 432/132 | 660 (201) | 46 (14) | 46 (14) | N/A |
| -Note 1: SSES Unit 2 reactor Building and Turbine Building are closer to the SSES Meterological Tower than the Unit 1 structures. | | | | | | |

**Table 6.4-8— Potential Man-Made Obstructions to Air Flow for the SSES Meteorological Tower**

(Page 1 of 2)

| Obstruction | Wind Direction and Sector | Distance ft (m) | Grade ft (m) | Height ft (m) | Largest Bottom Dimension ft (m) | Largest Top Dimension ft (m) |
|---|---|---|---|---|---|---|
| BBNPP Met. Tower | 225 SW | 4171/1271 | 675/206 | N/A | N/A | N/A |
| SSES CWS Cooling Tower South Unit 2 (centerline) | 271 W | 1958/597 | 690/210 | 540/165 | 419/128 | 301/92 |
| SSES CWS Cooling Tower North Unit 1 (centerline) | 291 WNW | 2108/643 | 710/216 | 540/165 | 419/128 | 301/92 |
| BBNPP CWS Cooling East (centerline) | 273 W | 6100/1859 | 700/213 | 475/145 | 360/110 | 202/62 |
| BBNPP CWS Cooling West (centerline) | 272 W | 6794/2071 | 700/213 | 475/145 | 360/110 | 202/62 |
| BBNPP Reactor Building (centerline) | 264 W | 6789/2069 | 720/219 | 204.4/62.3 | 182.87/56 | N/A |
| BBNPP Turbine Building (centerline) | 264 W | 6385/1946 | 720/219 | 160/49 | 384.5/117 | N/A |
| SSES Reactor Building Unit 2 (centerline) | 284 WNW | 1219/372 | 670/204 | 203.125/ 61.913 | 323/98 | N/A |
| SSES Turbine Building Unit 2 (centerline) | 280 W | 1409/429 | 676/206 | 112.21/34.20 | 630/192 | N/A |
| BBNPP Emergency Diesel Generator South | 261 W | 6712/2046 | 720/219 | 68/21 | 178/54 | N/A |
| BBNPP Emergency Diesel Generator North | 266 W | 6703/2043 | 720/219 | 68/21 | 178/54 | N/A |
| BBNPP Service and Administration Building (Access Building) | 263 W | 6697/2041 | 720/219 | 62.67/19.10 | 119.94/37 | N/A |
| SSES Emergency Diesel Generator (E) | 301 WNW | 1100/335 | 656/200 | 85.5/26.1 | 80/24 | N/A |

**Table 6.4-8— Potential Man-Made Obstructions to Air Flow for the SSES Meteorological Tower**

(Page 2 of 2)

| Obstruction | Wind Direction and Sector | Distance ft (m) | Grade ft (m) | Height ft (m) | Largest Bottom Dimension ft (m) | Largest Top Dimension ft (m) |
|---|---|---|---|---|---|---|
| SSES Emergency Diesel Generator (AN/AD) | 297 WNW | 1336/407 | 660/201 | 75.5/23 | 120/37 | N/A |
| SSES Service and Administration Building | 302 WNW | 1430/436 | 676/206 | 66/20 | 150.5/46 | N/A |
| SSES Salt Dome Storage | 277 W | 209/64 | 655/200 | 60/18 | 60/18 | N/A |
| SSES Domestic Water Storage Tank | 321 NW | 432/132 | 660/201 | 46/14 | 46/14 | N/A |
| N/A stands for not applicable | | | | | | |

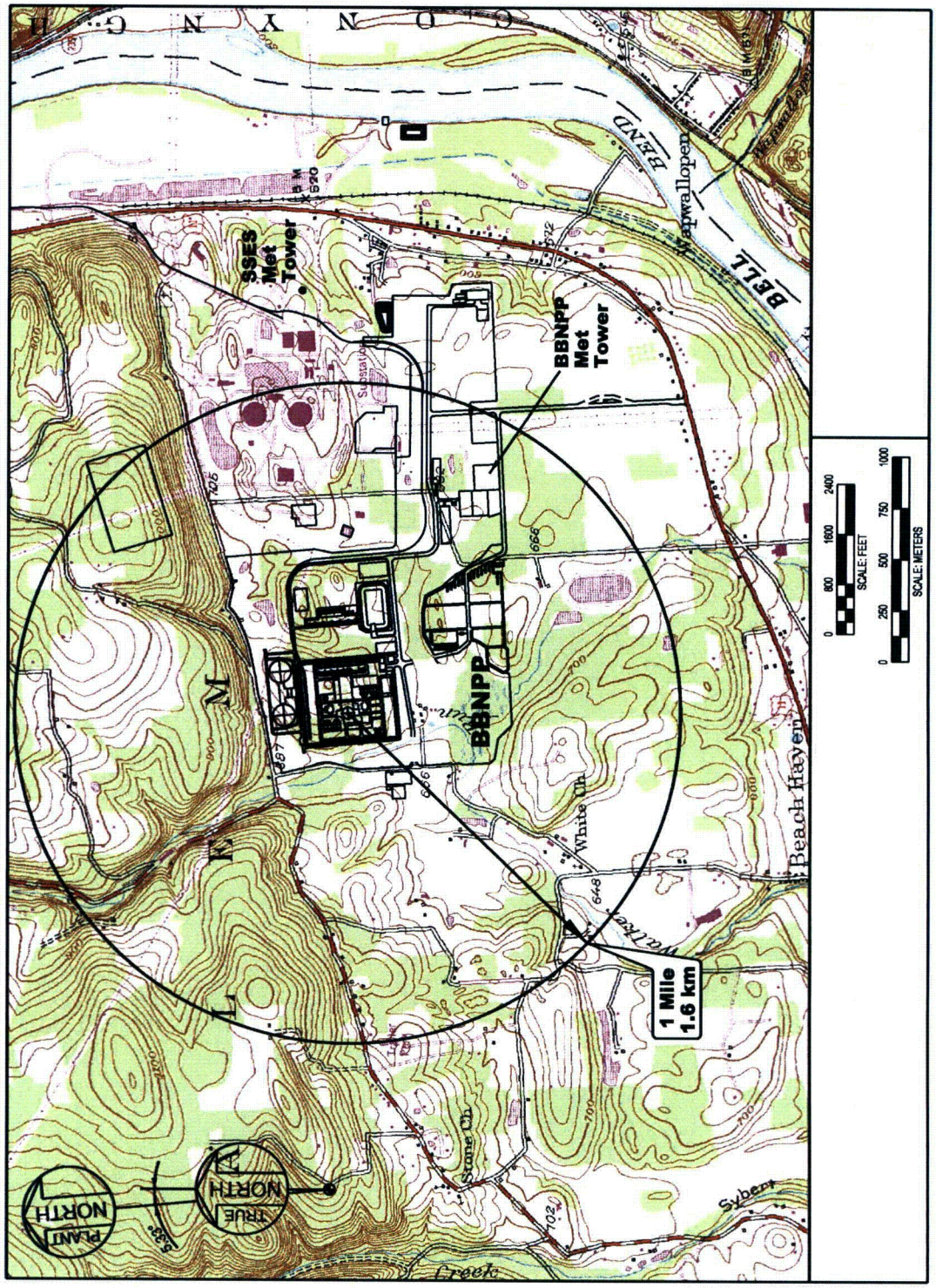


**Figure 6.4-1— Topography within a 1-Mile (1.6 km) Radius of the Site**

**Figure 6.4-2— Topography within a 5-Mile (8 km) Radius of the Site**