GA EPD Dispersion Modeling for the 2010 1-Hour SO_2 NAAQS: Georgia Power - Plant Bowen December 28, 2016

Georgia Power's Plant Bowen is an affected source under EPA's Data Requirements Rule (DRR) because Plant Bowen emitted greater than 2,000 tons of SO_2 in 2014. To satisfy the requirements of the DRR, Georgia Power notified Georgia EPD that they will characterize air quality through the modeling option and submitted a dispersion modeling report and related modeling files on November 18, 2016. Dispersion modeling was conducted by Georgia Power. Georgia EPD reviewed the modeling report and files to ensure that the dispersion modeling was conducted in accordance with the final DRR and Modeling Technical Assistance Document (TAD).

This report discusses the procedures used to review the supporting dispersion modeling and the modeling results.

INPUT DATA

Meteorological Data – Since no on-site meteorological data was available, the hourly meteorological data of surface and upper air observations from the Cartersville Airport, GA (surface) and Peachtree City Airport, GA (upper) NWS stations for the period of 2012-2014 was used in this modeling. One-minute data (TD-6405 format) for June-December, 2013 for the Cartersville Airport station (KVPC) are missing. GA EPD developed two versions of the 2013 meteorological data, "version 1" used one-minute data for KCHA (Lovell Field Airport) station to fill in the missing1-minute data and "version 2" used 5-minute data (TD-6401 format) for KVPC to fill in the missing data. The 2013 version 1 meteorological data was used in dispersion modeling conducted by Georgia Power. The 2013 version 2 meteorological data was used in dispersion modeling conducted by Georgia EPD. Therefore, different modeling results between Georgia Power and GA EPD is expected. This report uses the results from the GA EPD modeling (version 2).

The meteorological data was compiled and provided by GA EPD. The AERMET processor (15181) was used to convert the NWS data into AERMOD model-ready meteorological data files using the AERSURFACE surface characteristics evaluation utility (13016). Values of the surface characteristics (albedo, Bowen ratio, and surface roughness) surrounding the Cartersville Airport, GA NWS surface station and the project site were derived for each of twelve 30-degree sectors over four seasons in accordance with the AERMOD Implementation Guide (09078). GA EPD compared the above AERSURFACE generated surface characteristics and found no significant differences in the albedo, Bowen ratio, and surface roughness for the two sites.

Therefore, a meteorological dataset with the Cartersville airport NWS surface characteristics was used in the modeling. According to the 3-year wind rose for the Cartersville Airport (Figure 1), the winds are predominantly from the east.

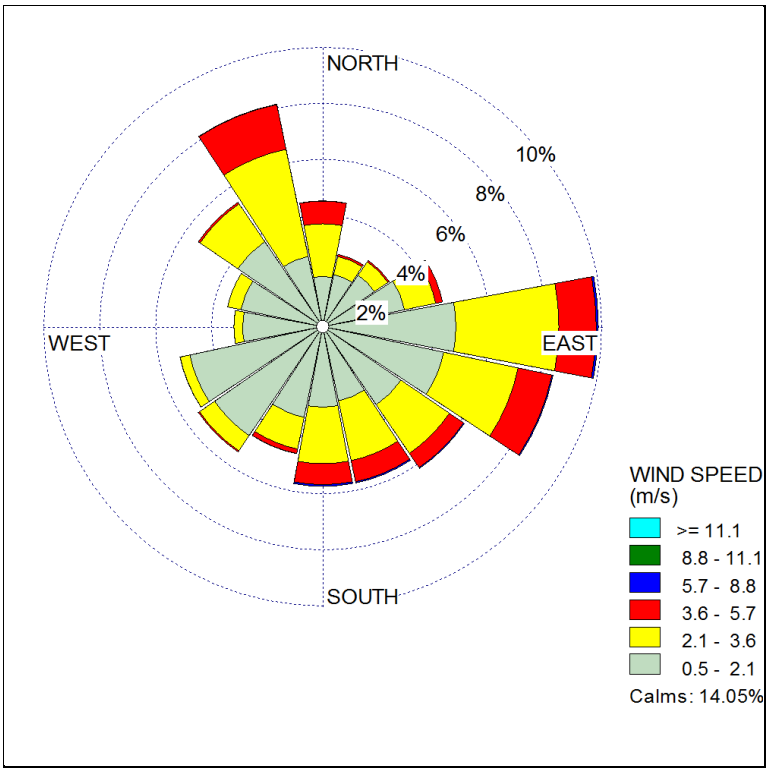

Figure 1. Three-year wind rose (2012-2014) for the Cartersville Airport.

Source Data – Plant Bowen is an electric power generation plant with four supercritical pulverized coal-fired boilers (Units 1, 2, 3, and 4). Each unit is equipped with a wet flue gas desulfurization (FGD) system for SO_2 emissions control. During normal operations, the units will exhaust through the two 675-foot scrubber stacks: one stack (BOW12FGD) serves Units 1 and 2 (each with its own flue) and the other stack (BOW34FGD) serves Units 3 and 4 (each with its own flue). However, there may be some periods of time during which a scrubber is not in operation. In these cases, the units will exhaust through one of two 1000-foot bypass stacks that were in existence prior to installation of the scrubbers: one stack (BOW12BYP) serves Units 1 and 2 (each with its own flue) and the other stack (BOW34BYP) serves Units 3 and 4 (each with its own flue).

Actual hourly emissions, temperatures, and flow rates for the most recent three calendar years (2012-2014) were used in the modeling. This information was reported to EPA's Clean Air Markets Division (CAMD) under the Acid Rain Program using continuous emission monitoring systems (CEMS) certified according to 40 CFR Part 75. Figures 2-4 show the hourly SO_2 emission rates (g/s) that were modeled through each stack for BOW12BYP, BOW12FGD, BOW34BYP, and BOW34FGD in 2012, 2013, and 2014.

Receptor Locations – A comprehensive Cartesian receptor grid extending to approximately 20 km from the Plant Bowen in all directions was used in the AERMOD modeling analysis to assess ground-level SO_2 concentrations. The Cartesian receptors were placed according to the following configuration based on the center of the Plant Bowen:

- 0 km – 2km ➔ 100 meters apart
- 2 km – 5 km ➔ 250 meters apart
- 5 km – 10 km ➔ 500 meters apart
- 10 km – 20 km ➔ 1,000 meters apart

This domain is sufficient to capture the maximum impact. Receptors were also placed at 100-m intervals within Plant Bowen's ambient air boundary. Although the SO_2 Modeling TAD specifies that receptors need not be placed at locations where it is not feasible to place a monitor (e.g., water bodies and within facility property lines), the receptor grid conservatively simulates all areas including within the facility's ambient air boundary that is not generally accessible to the public. This receptor grid represents a very conservative approach to the modeling analysis. All receptor locations are represented in the Universal Transverse Mercator projections, Zone 16, North American Datum 1983.

Terrain Elevation – Terrain data from USGS 1-sec National Elevation Dataset (NED) CONUS were extracted to obtain the elevations of receptors by AERMAP terrain processor (version 11103). The resulting elevation data were verified by comparing contoured receptor elevations with USGS 7.5-minute topographic map contours.

Building Downwash – The effects of building downwash were incorporated into the AERMOD analysis. Direction-specific building parameters required by AERMOD were developed using the BPIP PRIME utility (version 04274).

Offsite Emission Inventory and Background – No offsite sources are included in the modeling analysis and the 2013-2015 design value for the Rome Monitor (13-115-003) of 35 ppb (91.6 $\mu g/m^3$) is used as a background SO_2 concentration. Detailed information can be found in the previously submitted June 17, 2016 modeling protocol addendum and the September 27, 2016 modeling protocol update.

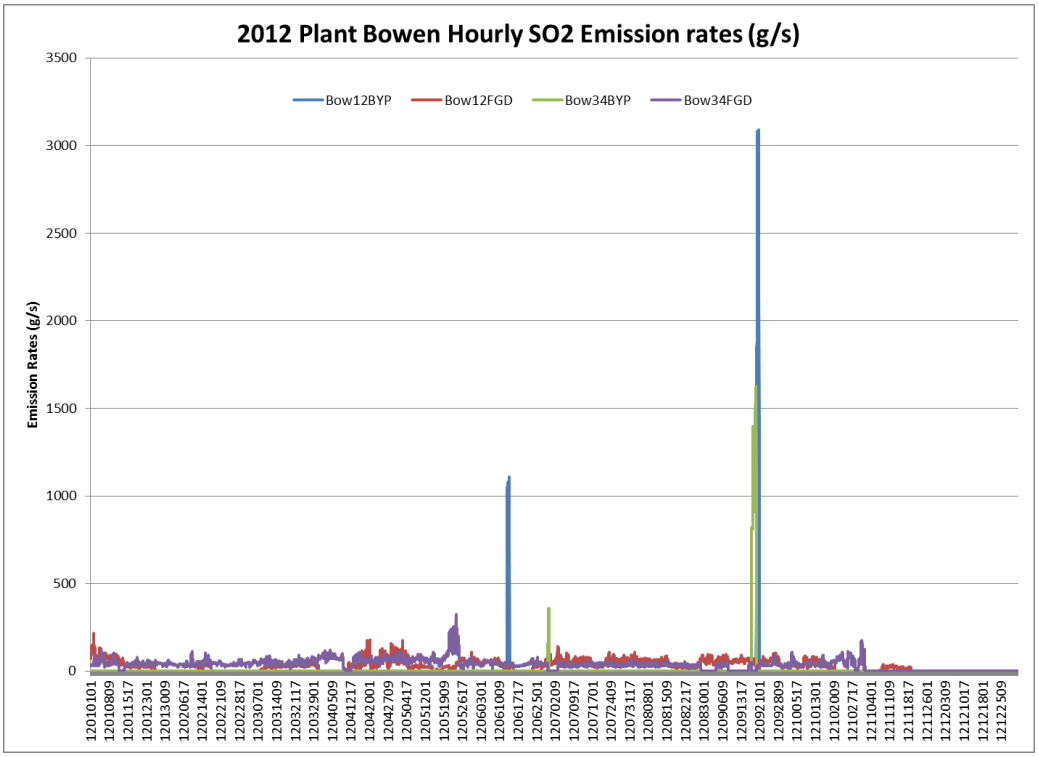

Figure 2. Hourly (2012) SO_2 emission rates (g/s) modeled through each stack for Georgia Power Plant Bowen.

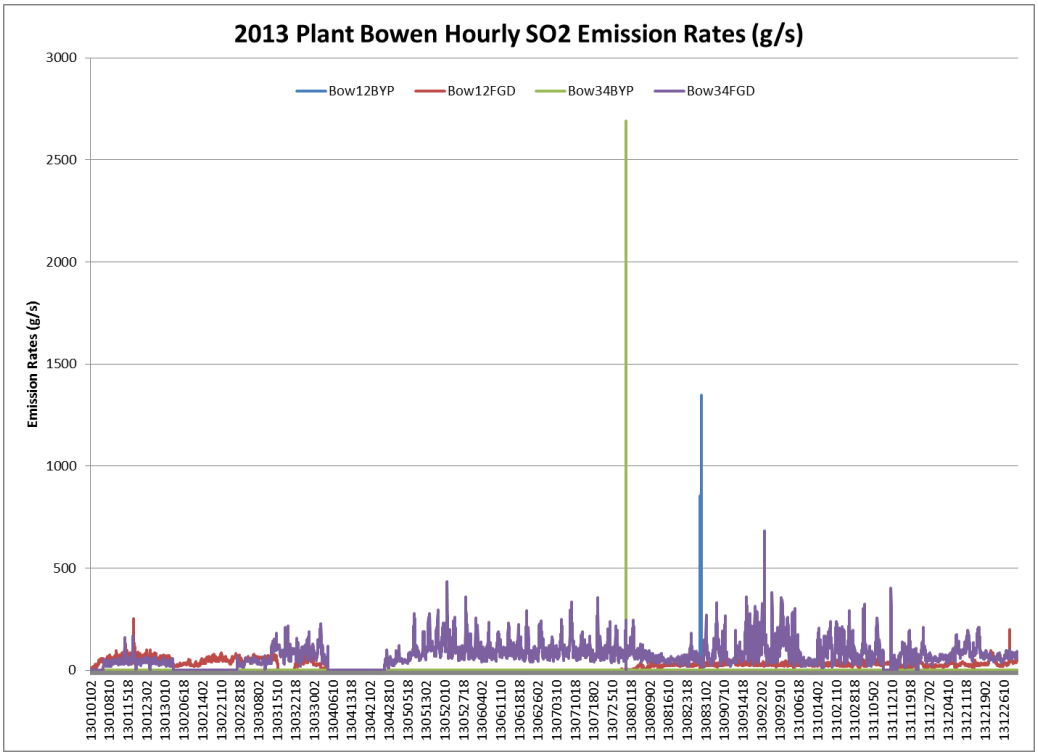

Figure 3. Hourly (2013) SO_2 emission rates (g/s) modeled through each stack for Georgia Power Plant Bowen.

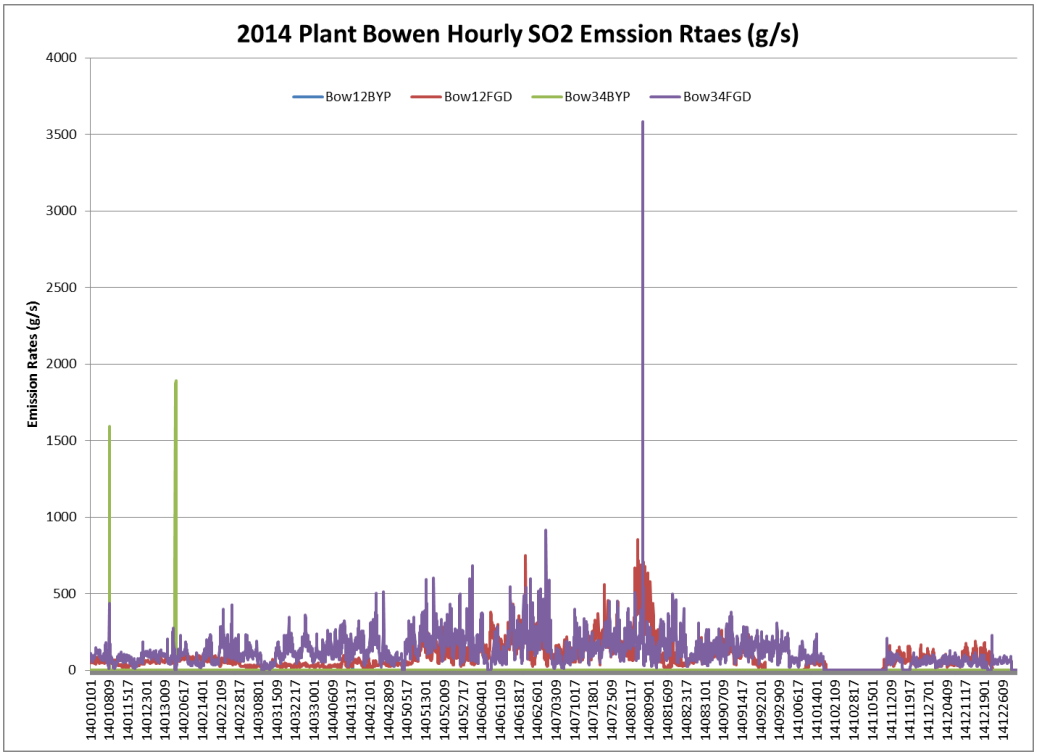

Figure 4. Hourly (2014) SO_2 emission rates (g/s) modeled through each stack for Georgia Power Plant Bowen.

1-HOUR SO_2 NAAQS ASSESSMENT

The total SO_2 concentrations were calculated as the sum of the modeled concentrations due to SO_2 emissions from Plant Bowen and the background SO_2 concentration of 35 ppb (91.6 µg/m^3). AERMOD (version 15181) was used to model the 1st, 2nd, 3rd, and 4th highest three-year average of 1-hour SO_2 concentrations (Table 1). Figure 5 shows a Google Earth map for Plant Bowen. As seen in Figure 6, the 4th high daily maximum 1-hour SO_2 concentration averaged over 3-years for SO_2 was located at approximately 2.34 kilometers south of Plant Bowen.

The highest 4th high 1-hour SO_2 concentration averaged over three years including the modeled SO_2 impacts from Plant Bowen (21 ppb = 54.3 µg/m^3) and the background SO_2 concentration from the Rome monitor (35 ppb = 91.6 µg/m^3) is 56 ppb (145.9 µg/m^3). As shown in Table 2, this value is well below the NAAQS level of 75 ppb (196 µg/m^3).

Table 1. Summary of 1st, 2nd, 3rd, and 4th highest 1-hour SO_2 modeled impacts averaged over 3 years (2012-2014).

Rank	**3-year Average (ppb)**	2012 (ppb)	2013 (ppb)	2014 (ppb)	Receptor (lat, log)	Distance from Plant Bowen (km)
1st High	87	100	48	113	34.1100, -84.9266	1.81
2nd High	69	68	49	90	34.1071, -84.9143	2.17
3rd High	61	63	46	75	34.1009, -84.9134	2.85
4th High	**56**	46	45	76	34.1071, -84.9100	2.34

Table 2. Summary of 1-hour SO_2 NAAQS analysis.

Pollutant	Averaged Period	Model Design Concentration excluding background	Monitored Background Concentration	Total Concentration	NAAQS	Below NAAQS (Y/N)
SO_2	1-hour	21 ppb	35 ppb	**56 ppb**	75 ppb	Yes
SO_2	1-hour	54.3 $\mu g/m^3$	91.6 $\mu g/m^3$	145.9 $\mu g/m^3$	196 $\mu g/m^3$	Yes

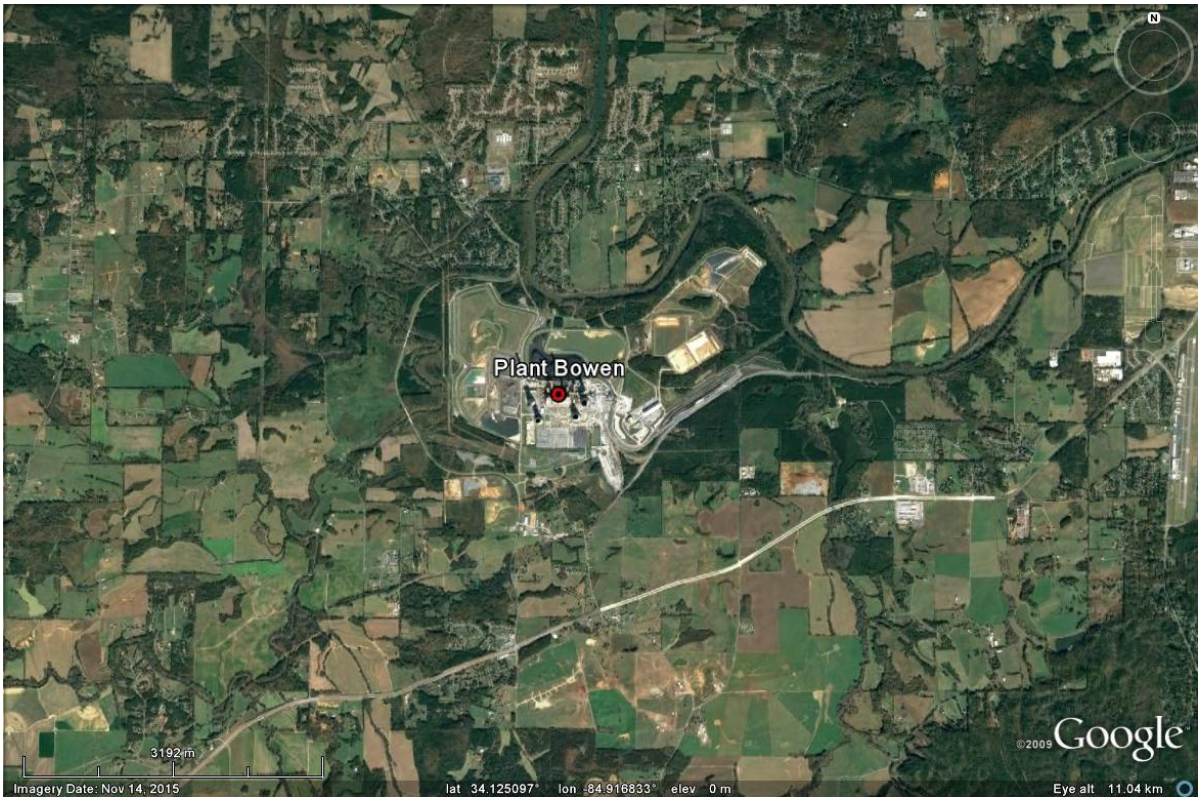

Figure 5. Google Earth map for Plant Bowen.

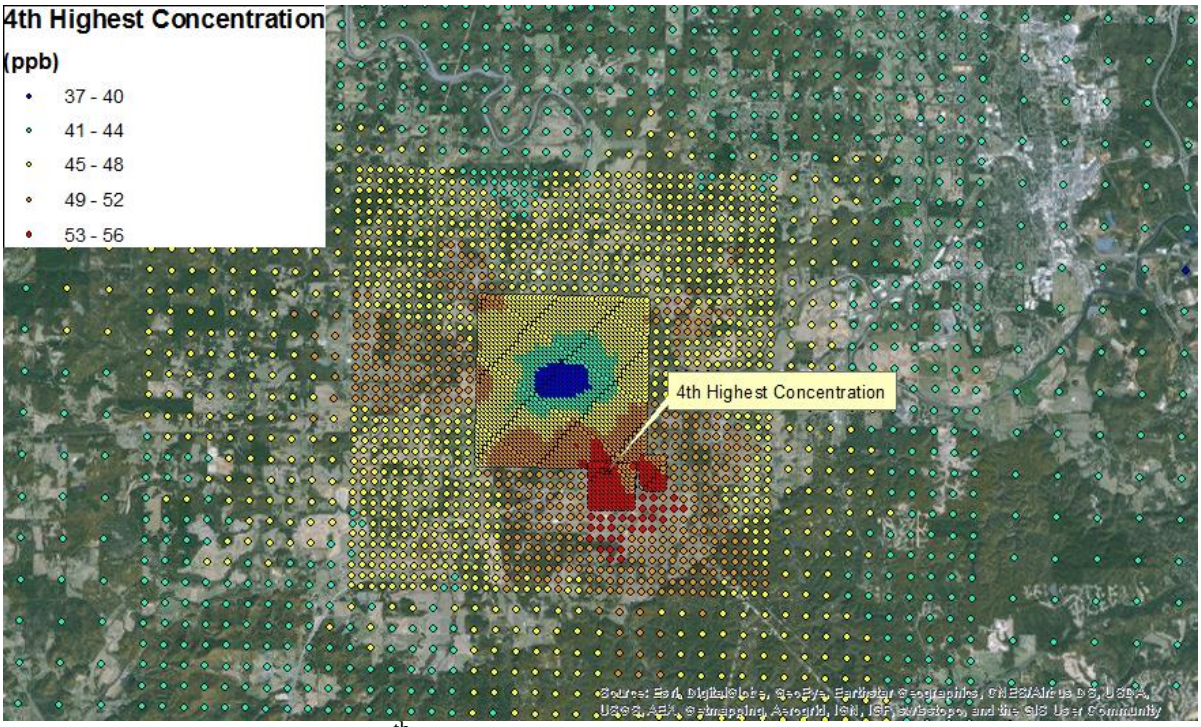

Figure 6. Spatial plot of the 4th highest daily maximum 1-hour SO_2 concentration averaged over 3 years.

CONCLUSIONS

The Georgia Power Plant Bowen dispersion modeling for the 1-hour SO_2 NAAQS designations was conducted in accordance with the final Data Requirements Rule (DRR) and Modeling Technical Assistance Document (TAD) using the most recently available information. As seen in Table 2, SO_2 emissions from Plant Bowen do not cause or contribute to any violations of the 1-hour SO_2 NAAQS. This result demonstrates attainment of the 1-hour SO_2 NAAQS in the area surrounding the Plant Bowen.