Attachment A:

1-Hour SO_2 Data Requirement Rule
Air Quality Modeling Protocol for the
Oklaunion Power Station
Vernon, TX

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Air Quality Modeling Protocol
for the
Oklaunion Power Station
Vernon, TX

Prepared for
Public Service Company of Oklahoma

For Submittal
to
The Texas Commission on Environmental Quality

Prepared by
Ashley Ullstrom and David J. Long, PE
Air Quality Services Section
American Electric Power Service Corporation

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INTRODUCTION

American Electric Power Service Corporation (AEPSC) on behalf of the American Electric Power subsidiary Public Service Company of Oklahoma, has been requested to perform modeling under the USEPA 1-Hour SO_2 Data Requirements Rule (40 CFR 51.1200) for the Oklaunion Power Station (Oklaunion Plant) located in Vernon, Texas. The modeling conducted under this protocol will be submitted to the Texas Commission on Environmental Quality to demonstrate compliance with the 1-Hour SO_2 Standard by the Oklaunion Power Station under the USEPA 1-Hour SO_2 Data Requirements Rule and will allow Oklaunion Plant to follow the provisions of 40 CFR 51.1205(b).

DESCRIPTION OF FACILITY AND AREA

The Oklaunion Power Station consists of one electric generating unit rated at 720 MW gross. The unit is equipped with an electrostatic precipitator, wet flue gas desulfurization (FGD), and activated carbon injection (ACI). The plant is located near the Oklahoma border, approximately 12 kilometers southeast of Vernon, Texas. The elevation of the plant site averages 372 m MSL. There are no significant terrain or elevation changes surround the Oklaunion Power Station. The area around the plant is classified as rural for purposes of air quality modeling as there are no towns with a significant population area immediately surrounding the plant.

Figure 1. Oklaunion Power Station and surrounding area showing property holdings

Since actual operating conditions are being modeled for this demonstration, the Data Requirements Rule allows the use of the actual stack height for purposes of demonstrating compliance with the new NAAQS[1] regardless of the GEP stack height for the facility.

Figure 2. Detail of the Oklaunion Power Station site.

SOURCES TO BE MODELED

Based on previous discussions with TCEQ, there are no other significant sources of SO_2 in the area surrounding Oklaunion Plant that will need to be included in the DRR modeling demonstration. Oklaunion Plant itself contains the main coal fired boiler, an emergency generator, and a diesel fire pump. The emergency generator is used in the event of a loss of power event and is classified as an emergency engine under the RICE MACT. The fire pump is only operated for testing purposes and in the event of an emergency. It is also classified as an emergency engine under the RICE MACT and is not reported on the Annual Emissions Inventory due to its small size and low annual operating levels. Table 1 summarizes these additional sources and shows the emissions reported in the Annual Emissions Inventory filed with the TCEQ for the years 2012 to 2015.

Table 1. Minor sources at Oklaunion Plant and their reported 2012 to 2015 annual emissions in tons

Equipment	2012	2013	2014	2015
Emergency Generator	0.0003	0.0002	0.0004	0.0003
Diesel Fire Pump	Not Reported	Not Reported	Not Reported	Not Reported

Due to the limited emissions and operation of all minor SO_2 emitting sources at Oklaunion Plant, the main boiler will be the only source included in the modeling and analysis.

MODEL PLATFORM SELECTION

The current Gaussian model listed in Appendix A to 40 CFR 51 Appendix W, AERMOD will be used for this study. As of the date of this protocol Version 15181 of AERMOD and AERMET are approved for use in regulatory activities such as this study. No Beta Options present in AERMOD or AERMET will be used. Should an updated version of AERMOD or AERMET become available during the time this study is being conducted that removes the Beta designation for a model option, we reserve the right to move to the updated version of AERMOD or AERMET to take advantage of the model improvement. If this alternative is selected, it will be described in detail in the final modeling report.

The receptor grid has been developed using Version 11103 of AERMAP, the current version of the receptor processor software. In addition, the BPIP analysis of Oklaunion Plant has already been completed using Version 04274 of BPIPPRM, the current version listed on the USEPA TTN Web Site as applicable for studies of this nature.

RECEPTOR GRID

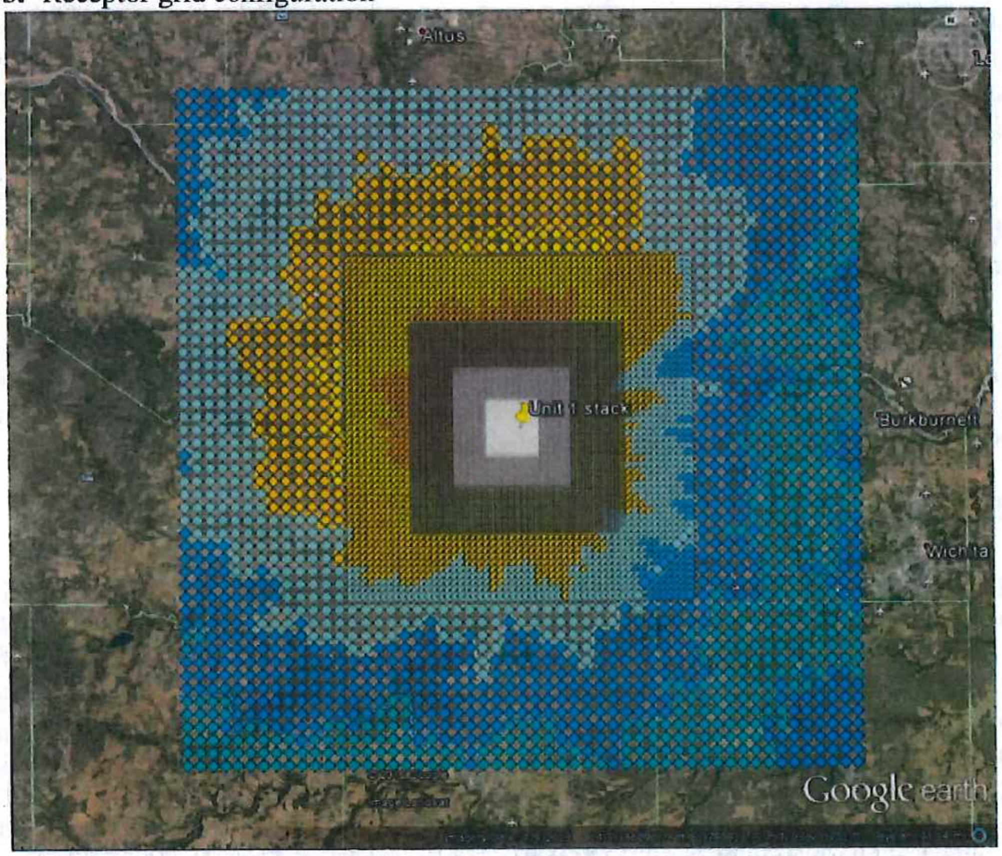
The receptor grid for the study uses DEM data sourced from the MRLC System at a 1/3 arc second resolution in geo tiff format and processed through AERMAP Version 11103. The receptor grid consists of a series of nested receptor grids starting at the Unit 1 stack (483787 E, 3771325 N, Zone 14, NAD 83) and extending out roughly 50 kilometers from that starting point. The inner nest around the plant has a resolution of 100 meters and extends out 4 kilometers in all directions. The next nest has a resolution of 250 meters covering the next 5 kilometers out from the stack. The third nest has a resolution of 500 meters covering the next 7 kilometers. The fourth nest has a resolution of 1000 meters and extends out an additional 10 kilometers. The final receptor field has a resolution of 2000 meters and extends out from 26 kilometers to 52 kilometers from the stack. Figure 3 shows the receptor grid configuration in Google Earth.

Based on standard modeling practice, it is permissible to remove receptors from the simulation that fall on property with restricted public access controlled by the facility based on the definition of ambient air. In addition, based on recent USEPA guidance[2], this practice has been extended to cover highways and significant bodies of water where an ambient monitor could not be placed and the likelihood of a lengthy exposure is low.

At this time it is not planned to remove any receptors from the above described grid. Should receptors be removed from the Oklaunion Plant site, a 50 meter resolution fence line grid will be established around the areas of plant property where the receptors are removed. Receptors may also be removed from any significant bodies of water or major highways in accordance with applicable USEPA Guidance. Receptors removed for any reason will be identified in the final modeling report along with the reason for the removal of the receptor(s) identified.

Should a modeled value of regulatory interest occur outside of the 100 meter grid, a set of 100 meter receptors will be developed around the receptor(s) of interest to further examine the modeled impacts in that area.

Figure 3. Receptor grid configuration



METEOROLOGICAL DATA

The meteorological data set to be used for this study will be the 2013 – 2015 Wichita Falls Municipal Airport surface data, paired with Fort Worth Upper Air Data. One minute and five minute surface data from Wichita Falls Municipal Airport for 2013 to 2015 has been processed through AERMINUTE Version 15272 to augment the hourly surface data in an effort to reduce the number of missing and calm hours in the final meteorological data files for use in AERMOD Version 15181. No Beta Options were used in the processing of the data.

Surface conditions based on the Oklaunion Plant site were developed by AERSURFACE in accordance with USEPA guidance using a 1 km distance from the grid center point. Monthly precipitation data for use in determining the surface moisture levels for the 2013 to 2015 period based on the 30 year historic average for the Wichita Falls Municipal Airport was sourced from the National Climatic Data Center[3]. Table 2 shows the monthly precipitation data and classification for the Wichita Falls Municipal Airport for the period from 2013 to 2015. The classifications were based on average being classified as precipitation being between +/- 20% of the 30 year average precipitation value and the dry and wet classifications being outside of the +/- 20% of the 30 year average range.

Table 2. Precipitation Data for Wichita Falls Regional Airport for 2013 to 2015

		Precipitation				Classification		
Month	**30 Year AVG**	**2013**	**2014**	**2015**		**2013**	**2014**	**2015**
January	1.14	0.6	0.0	2.2		DRY	DRY	WET
February	1.75	2.0	0.4	0.4		AVG	DRY	DRY
March	2.20	0.5	2.2	1.8		DRY	AVG	AVG
April	2.60	2.4	1.5	3.7		AVG	DRY	WET
May	3.79	1.6	1.1	17.0		DRY	DRY	WET
June	4.15	2.9	3.1	4.2		DRY	DRY	AVG
July	1.59	3.9	5.5	2.8		WET	WET	WET
August	2.50	1.5	2.0	1.5		DRY	AVG	DRY
September	2.81	2.0	1.5	4.6		DRY	DRY	WET
October	3.11	2.0	1.3	4.4		DRY	DRY	WET
November	1.65	0.7	4.2	5.2		DRY	WET	WET
December	1.62	1.3	1.0	2.6		DRY	DRY	WET

Following processing, the 2013 – 2015 meteorological data set was tested in AERMOD Version 15181. From this test, it was determined that there were 51 calm hours (0.19%) in the final data set and 108 hours of missing data (0.41%) over the 26280 hours of data. Based on the low level of missing and calm hours, the 2013 to 2015 Wichita Falls – Fort Worth data set is deemed suitable for use in AERMOD and is the recommended data set and time period for use in this study.

BACKGROUND VALUE

The nearest SO_2 monitors to the Oklaunion Power Station are located southeast of the plant in Dallas (48-113-0069) and Midlothian (48-139-0016), northwest of the plant Amarillo (48-375-1025), and northeast in Oklahoma City (40-107-1037). Tables 3 and 4 contain various high level metrics for the potential background ambient monitors that may be useful in screening various monitors from consideration as a source of background data. Table 3 shows the percentage of data captured, by year for the period 2013 to 2015 at each monitor. Based on this metric, the monitor in Amarillo can be dropped from further consideration as data capture at this monitor was very limited in 2013.

Table 3. Annual Hourly Data Capture Rate for the Monitors Examined

Monitor	2013		2014		2015		Acceptable Capture
	Hrs	Capture	Hrs	Capture	Hrs	Capture	
48-113-0069	8281	95%	8413	96%	8560	98%	YES
48-139-0016	8239	94%	8556	98%	8474	97%	YES
48-375-1025	1808	21%	8467	97%	7052	81%	NO
40-109-1037	8681	99%	8692	99%	8381	96%	YES

Table 4 then considers the high level 1-hour and annual data from the Dallas, Midlothian, and Oklahoma City monitors shown in the USEPA Air Data system to give an indication of the nature of the monitor values in the data set.

Table 4. Air Data 1-Hour and annual SO_2 metrics by year for potential background monitors in ppb

	2013				2014				2015			
Monitor	1 hr Max	1 hr 2nd Max	99th pctle	Annual Avg	1 hr Max	1 hr 2nd Max	99th pctle	Annual Avg	1 hr Max	1 hr 2nd Max	99th Pctle	Annual Avg
48-113-0069	7.4	7.3	5	0.17	6.3	5.3	5	0.27	5.6	4.8	4	0.25
48-139-0016	23.8	18.4	16	0.54	19.8	11.1	8	0.17	12.7	8.6	5	0.17
40-109-1037	5	3	3	0.22	7	4	3	0.08	4	4	3	0.5

In examining the data in Table 4, the Midlothian monitor (48-139-0016), Oklahoma City monitor (40-109-1037), and Dallas monitor (48-113-0069) all show relative stability in the high level values and do not exhibit a sharp gradient as these values are worked through, indicating that they do not appear to be impacted by local sources. Based on the monitored values and the apparent lack of SO_2 sources in both the area around Oklaunion Plant and the Oklahoma City SO_2 monitor located on the campus of Oklahoma Christian University, the recommended background value can be developed from the data at that monitor. Since the data at this monitor is stable, we are recommending that the three year average of the 99th percentile values be used for all hours in this study resulting in a background value of 3.0 ppb (7.9 ug/m^3).

PLANT OPERATING DATA

Under the Data Requirements Rule, actual hourly emissions and operating data is preferred for use in an SO_2 modeling analysis. The exhaust flue at Oklaunion Power Station has Continuous Emissions Monitor Systems (CEMS) installed and operated under 40 CFR 75 that measure SO_2, Flow, Temperature, and other parameters specified in 40 CFR 75. This data is then processed and reported to USEPA Clean Air Markets Division (CAMD) in units of ppm SO_2, lb/hr SO_2, and wscfh for flow. Temperature is used in the derivation of the reported flow, but is not reported to CAMD as the CAMD reporting protocols do not allow for the explicit reporting of the temperature data. Certain hours may also be impacted by data substitution requirements and other data management requirements found in 40 CFR 75. These hours may require manual editing prior to the data being truly representative of the actual operating conditions present. Table 5 shows the input data for the modeling study, with the hourly data elements being used shown as "Variable" to denote the use of actual hourly conditions based on CEMS and other operating data sources. The data selected covers the period 2013 to 2015 to match the meteorological data being used.

Table 5. Proposed modeling inputs for the Oklaunion Power Station simulations

Unit	Flue Easting (m)	Flue Northing (m)	Stack Base (m)	Emission Rate (g/sec)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/sec)	Exit Diameter (m)
Unit 1	483787	3771326	370.3	Variable	137.9	Variable	Variable	7.01

The emissions, temperature, and exit velocity data for the period 2013 to 2015 have been prepared into an HOUREMIS file as described in the AERMOD User's Guide. This preparation included the inspection of each data element and the replacement of missing, substituted, and otherwise erroneous data that meets Part 75 requirements, but is unsuitable for any purpose other than demonstrating compliance with the requirements of 40 CFR 75. The replacement of the data deemed unacceptable for modeling purposes will use various techniques as appropriate for the parameter and amount of data needing replaced. These methods include hour before hour after substitution for those cases where the data gap is short and the method can appropriately bridge the gap based on an evaluation of other operating parameters; a constrained ending hour unconstrained beginning hour for cases where a single operational ramp describes the data to be replaced; tabular substitution based on binned load or heat input; average hour for similar conditions (typically used in start-up conditions to replace missing or diluent capped data); data developed from other available operating data; and professional judgment. The spreadsheet used for this review and the development of the modeling inventory will be supplied in the documentation supplied with the model simulations.

REFERENCES

1. US EPA, Office of Air Quality Planning and Standards, *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard* (NAAQS), Federal Register, Vol 80 No 162, August 21, 2015, page 51078.

2. US EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, *SO_2 NAAQS Modeling Technical Assistance Document*, February 2016 Draft, pages 8 – 9.

3. National Climatic Data Center, http://www.ncdc.noaa.gov, last checked May 17, 2016.