Emissions inventory development for base year and future years

Ozone season daily emissions for ozone precursors (VOC and NOX) in the Atlanta ozone nonattainment area were developed for base year 2008 and future years 2017 and 2024. Most of the 2008 base year annual emissions were obtained from the National Emissions Inventory 2008 version 1.5 (NEI2008, http://www.epa.gov/ttnchie1/net/2008inventory.html). The base year emissions were projected to future years separately using different methods by seven source categories, including:

- EGU point sources
- Non-EGU point sources
- Area sources
- Fires
- Nonroad mobile sources
- Nonroad mobile sources - Marine, aircraft and railroad
- Onroad mobile sources

Ozone season daily emissions were calculated as the average daily emissions during the period of June, July and August. The Atlanta ozone nonattainment area covers 20 counties.

EGU Point Sources

Process-level emissions estimates for three EGU facilities in Atlanta ozone nonattainment area during 2008 were obtained from NEI2008 version 1.5. Such emissions were projected to year 2017 and 2024 using corresponding growth and control factors. Different growth factors were calculated for different SCC based on fuel consumption for Southeastern region in AEO2010 (Table 1). Selective Catalytic Reduction (SCR) for control of NOx was applied to individual units according to the schedule specified in Georgia's Rule 391-3-1-.02 (2) (sss). The dates of initial SCR operation required by the rule for the EGUs inside the nonattainment area range from December 31, 2008, through June 1, 2015. Units at Bowen actually began ozone-season SCR operation prior to 2008. Please refer to Appendix B-1 for detailed EGU control schedules.

Table 1. Growth factors by SCCs for EGU sources

SCC	Fuel Type	2017	2024
20100101	Distillate Fuel Oil	1.352	1.447
10100501	Distillate Fuel Oil	1.352	1.447
20100201	Natural Gas	0.892	1.060
10100604	Natural Gas	0.892	1.060
10100212	Steam Coal	1.058	1.099

The NOx control factor associated with SCR control was assumed to be 82.5% according to the VISTAS 2012 Projection Emissions Inventory. When SCR control was already operated fully or partially at a unit during year 2008, the control factor was applied only to uncontrolled NOx emissions that occurred in 2008. These periods were identified using CAMD hourly CEM data for NOx emissions and heat inputs. Days without SCR operation were identified as those days on which the ratio of NOx emissions to heat input exceeded 0.00004 lbs/mmBtu, according to correlation analysis results. In addition, NOx emissions during the period from October 1st, 2008, to December 31st, 2008 from Plant Bowen Unit 3 were projected to future years using a different method, since the actual NOx control efficiency in this period was approximately 60% according to hourly CEM data analysis. Such NOx emissions were first adjusted to reflect before control emissions, and then apply the 82.5% NOx emissions control factor for future year emissions projection.

Future year emissions for Plant McDonough-Atkinson located in Cobb County were calculated separately since this plant will undergo significant changes in generating equipment and operation during the attainment demonstration period. In 2008, Plant McDonough operated two coal-fired EGU's (Units 1 and 2) with a combined generating capacity of 530 MW. Due to the requirements specified in Georgia's Rule 391-3-1-.02 (2) (sss) for EGU controls, Georgia Power plans to shut down Unit 2 by the 4th quarter of 2011 and Unit 1 by the 2nd quarter of 2012. Unit 2 will be replaced with two gas-fired combined cycle blocks (Blocks 4 and 5) and Unit 1 will be replaced by one gas-fired combined cycle block (Block 6). Each block consists of two generating units, with each unit consisting of a combustion turbine and a duct burner. The combined generation capacity of the three blocks (six units) is 2520 MW. NOx emissions from each unit will be controlled by a SCR and a low-NOx burner.

The facility's Title V permit (Permit No. 4911-067-0003-V-03-0) stipulates rolling 12-month limits on NOx and VOC emissions from each of the three gas-fired generating blocks. In addition, short-term average NOx and VOC emissions rates (in ppmvd) are stipulated for both the ozone and non-ozone seasons. The 12-month per block limits for Blocks 4 and 5 are 135 tons VOC and 217 tons NOx. The limits for Block 6 are 132 tons VOC and 200 tons NOx. The permitted NOx emission rates are 6.0 ppmvd for May through September and 15.0 ppmvd for the rest of the year.

Forecasts of NOx and VOC emissions from McDonough's Blocks 4, 5, and 6 were calculated by assuming that actual rolling 12-month emissions will be 75 percent of the permitted limits. Since natural gas has historically been more expensive than coal, it is assumed that the duration of operation for these gas-fired units will not push NOx and VOC emissions beyond 75 percent of their twelve-month permit caps. Growth factors were calculated for McDonough-Atkinson using the same fuel consumption approach that is described above, subject to the constraint that annual emissions cannot rise above the permitted 12-month limits.

Ozone season daily emissions for EGU point sources were calculated by multiplying the annual total emissions with daily emissions fractions during June, July and August. The fractions for NOx and VOC emissions during June, July and August were estimated respectively using hourly 2008 CAMD CEM NOx emissions and heat input data, and then were divided by the number of days in these three months (92) to get ozone season daily emissions fractions. The same daily fractions have been used for both base year and future years. For future year emissions from Plant McDonough-Atkinson, the fraction of NOx emissions during the months of June through August was calculated as the product of the NOx ozone-season limit and 3 months, divided by the sum of the ozone-season limit times 5 months and the non-ozone season limit times 7 months.

Ozone season daily emissions during 2008, 2017 and 2024 were summarized by each EGU facility (Table 2).

Table 2. Ozone Season Daily Emissions by EGU facilities in 2008, 2017 and 2024, tons/day

Facility Name	AIRSID	2008		2017		2024	
		VOC	NOX	VOC	NOX	VOC	NOX
Ga Power Company - Plant Bowen	01500011	1.06	18.99	1.12	19.46	1.17	20.22
Ga Power Company - Plant McDonough/Atkinson	06700003	0.14	10.04	0.78	1.19	0.93	1.41
Ga Power Company - Plant Yates	07700001	0.37	34.59	0.38	18.57	0.4	19.29
Total		1.57	63.62	2.29	39.22	2.5	40.92

Non-EGU Point Sources

Emissions estimates for non-EGU point sources in 2008 were obtained from NEI2008 version 1.5. Emissions in future years 2017 and 2024 were estimated using SCC- and county-specific growth factors generated with the USEPA's Economic Growth Analysis System version 5.0 (EGAS 5.0) with "Default

REMI 6.0 SCC Configuration". Appendix B-2 contains a summary of the SCC-specific growth factors for Atlanta ozone nonattainment area. These emissions are not subject to additional controls in the future years 2017 and 2024.

Ozone season daily emissions for non-EGU point sources were estimated by multiplying the annual total emissions with ozone season daily emissions fractions, which were calculated using the same temporal allocation method used in Sparse Matrix Operator Kennel Emissions (SMOKE, http://www.smoke-model.org/index.cfm). The SMOKE temporal profiles and reference files were obtained from EPA's 2005 Modeling Platform website (ftp://ftp.epa.gov/EmisInventory/2005v4_2/ancillary_smoke). The SMOKE temporal profiles gave monthly emissions fractions, and were linked to each emission record by SCC according to the SMOKE temporal reference file. The total of the monthly fractions of June, July and August were divided by the number of days in these three months (92) to get ozone season daily emissions fractions.

Appendix B-3 contains a list of non-EGU point sources in Atlanta ozone nonattainment area and facility-specific VOC and NOx ozone season daily emissions for 2008, 2017, and 2024.

Area Sources

Emissions from area sources in 2008 were obtained from NEI2008 version 1.5. Emissions in future years 2017 and 2024 were estimated using SCC- and county-specific growth factors generated with the USEPA's Economic Growth Analysis System version 5.0 (EGAS 5.0) with "Default REMI 6.0 SCC Configuration". Appendix B-2 contains a summary of the SCC-specific growth factors for Atlanta PM2.5 nonattainment area. These emissions are not subject to additional controls in the future years 2017 and 2024. Ozone season daily emissions for area sources were calculated using the SMOKE temporal profiles as described for non-EGU point sources.

Appendix B-3 contains SCC-specific VOC and NOx ozone season daily emissions for 2008, 2017, and 2024.

Fires

Emissions from fires in 2008 were obtained from NEI2008 version 1.5. These estimates were provided by Georgia Environmental Protection Division as part of AERR2008 submission (Georgia Air Protection Branch, 2011). This inventory was developed using 2008 burned area data and burning permit data provided by Georgia Forestry Commission and the same method as used for the VISTAS2002 fire inventory (www.epa.gov/ttnchie1/conference/ei13/rpo/barnard_pres.pdf). Emissions in future years 2017 and 2024 were assumed to be the same as base year 2008.

Ozone season daily emissions for fires were calculated by dividing the total emissions during June, July and August by the number of days in these three months (92). The emissions during these three months were estimated using monthly emissions for nonpoint fires and event emissions records for wildfires occurred during this period in NEI2008.

Appendix B-3 contains VOC and NOx ozone season daily emissions summary by fire types and county in Atlanta ozone nonattainment area for 2008, 2017, and 2024.

Nonroad Mobile Sources – NONROAD Model Category

Emissions from NONROAD model source categories in 2008, 2017 and 2024 were calculated using NMIM2008, which incorporates EPA's latest NONROAD model (NONROAD2008) released in April 2009, and reflects all of EPA's final nonroad standards to date. The runs for 2017 and 2024 have used the

same 2008 meteorological inputs. Defaults in NMIM 2008 were used for all runs. The total emissions in June, July and August were divided by the number of days in these three months (92) to calculate ozone season daily emissions. Appendix B-3 contains SCC-specific VOC and NOx ozone season daily emissions for 2008, 2017, and 2024. For detailed run scripts and output databases, please refer to Appendix B-4.

Nonroad Mobile Sources – Marine, Aircraft, and Locomotives

Emissions from aircrafts and locomotives in 2008 were obtained from NEI2008 version 1.5 (http://www.epa.gov/ttnchie1/net/2008inventory.html). Emissions from yard locomotives were not included in the NEI2008, and were obtained from Eastern Regional Technical Advisory Committee (ERTAC) separately. There were no emissions from commercial marine vessels in the Atlanta PM2.5 nonattainment area.

Growth and control factors that were used to develop future year emissions were provided by Pechan. For more information regarding the SEMAP marine, aircraft, and locomotives growth and control factors, please refer to Appendix B-5 (Pechan, 2011).

Growth factors for all aircraft engine and airport-related SCCs were based on landing and take-off operation (LTO) projections available from the Federal Aviation Administration's Terminal Area Forecasts (TAF) (FAA, 2010). Growth rates for military aircraft were held constant at 2008 levels. No control factors have been applied to aircraft for criteria pollutant forecasts.

Growth factors for Class I and Class II/III line haul and diesel switchyard operations were calculated based on freight rail sector fuel consumption forecasts. Growth factors for passenger and commuter rail were developed from national forecasts of intercity rail diesel consumption, and commuter rail diesel consumption. Control factors were based on US EPA's locomotive engine Regulatory Impact Analyses (RIA) and associated emission factor guidance.

The SEMAP growth factors were for base year 2007 (referred as $GF_{FY-2007}$ hereafter). The growth factors for base year 2008 ($GF_{FY-2008}$) were calculated as $\frac{GF_{FY-2007}}{1+\frac{GF_{FY-2007}-1}{N_{years}}}$ assuming linear growth. N_{years} refers to the number of years between base year 2007 and future years. N_{years} is 10 years for future year 2017 and is 17 years for future year 2024.

Ozone season daily emissions for aircrafts and locomotives were calculated using the SMOKE temporal profiles as described for non-EGU point sources.

Appendix B-6 contains a list of specific aircraft and locomotives sources in Atlanta ozone nonattainment area and SCC-specific VOC and NOx emissions for 2008, 2017, and 2024 and the associated growth or control factors.

Reference

EC/R Incorporated, 1998, Stationary Source Control Techniques Document for Fine Particulate Matter, obtained from http://www.epa.gov/ttncatc1/dir1/finepmtech.pdf , accessed on 1/19/2011.

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Georgia Air protection Branch, 2011, Quality assurance project plan for 2008 emission inventories for sources other than large industrial stationary point sources