

## ***Emissions inventory development for base year and future years for the Atlanta PM2.5 Nonattainment Area***

Direct PM2.5 emissions and PM2.5 precursor emissions (SO2 and NOx) as defined in the Clean Air Fine Particle Implementation Rule (72 FR 20586) were developed for base year 2008 and future years 2017 and 2024. Most of the 2008 base year emission inventory was obtained from the National Emissions Inventory 2008 version 1.5 (NEI2008, <http://www.epa.gov/ttnchie1/net/2008inventory.html>). The base year and future year emissions were prepared for seven source categories separately using different methods. These seven source categories include:

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

The Atlanta PM2.5 nonattainment area covers twenty-two counties, including twenty whole counties and two partial nonattainment counties. Portions of Heard County and Putnam County were included in the nonattainment area in order to include two large EGU sources (Plant Wansley and Plant Branch). All point sources located in the nonattainment area were included in the calculation. Emissions from area, fire, nonroad and onroad mobile sources were calculated first for the whole counties, as documented below. Then, the total emissions in the two partial counties were multiplied by the human population fraction in the nonattainment part of the two counties to calculate the emissions in the partial nonattainment area.

### ***EGU Point Sources***

Process-level emissions estimates for six EGU facilities in Atlanta PM2.5 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 projections for the Southeastern region in AEO2010 (Table 1).

Flue Gas Desulfurization (FGD) for control of SO2 was applied to individual units according to the schedule specified in Georgia's Rule 391-3-1-.02 (2) (sss) with adjustments for units that started operation ahead of the required schedule. The dates of initial FGD operation required by the rule for the EGUs inside the nonattainment area range from December 31, 2008, through June 1, 2015. Bowen Units 3 and 4 actually began FGD operation on May 1 and December 1, respectively, of 2008. Wansley 1 started FGD operation on December 1 of 2008. Yates 1 started FGD operation prior to 2008. 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) with adjustments for units that started operation ahead of the required schedule. 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 C-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

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20100201	Natural Gas	0.892	1.060
10100604	Natural Gas	0.892	1.060
10100212	Steam Coal	1.058	1.099

The control factors varied with pollutants. The SO<sub>2</sub> control factor associated with Flue Gas Desulfurization (FGD) was assumed to be 95% according to VISTAS 2012 Projection Emissions Inventory. The NO<sub>x</sub> control factor associated with Selective Catalytic Reduction (SCR) was assumed to be 82.5% according to VISTAS 2012 Projection Emissions Inventory. The PM<sub>2.5</sub> control factor associated with FGD was assumed to be 50% according to Table 5.4-1 on page 5.4-24 of the EPA document "Stationary Source Control Techniques Document for Fine Particulate Matter" (EC/R Incorporated, 1998). When FGD or SCR controls were already operated fully or partially at a unit during year 2008, the control factors were only applied to uncontrolled emissions in 2008. These periods were identified using CAMD hourly CEM data for NO<sub>x</sub> and SO<sub>2</sub> emissions and heat inputs. Days without control operation were identified as those days on which the ratio of NO<sub>x</sub> or SO<sub>2</sub> emissions to heat input exceeded 0.00004 lbs/mmBtu according to correlation analysis results. In addition, NO<sub>x</sub> 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 NO<sub>x</sub> control efficiency in this period was approximately 60% according to hourly CEM data analysis. Such NO<sub>x</sub> emissions were first adjusted to reflect before control emissions, and then apply the 82.5% NO<sub>x</sub> 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 840 MW. Two of the six combustion turbines are permitted to burn distillate oil (0.0015 % sulfur) up to 1000 hours/year each. NO<sub>x</sub> emissions from each unit will be controlled by a SCR and a low-NO<sub>x</sub> burner.

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

Forecasts of NO<sub>x</sub> 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 was assumed that the duration of operation for these gas-fired units will not push NO<sub>x</sub> emissions beyond 75 percent of their twelve-month permit caps. It was also assumed that the two affected combustion turbines would burn oil for 500 hours per year each. 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.

SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>2.5</sub> emissions during 2008, 2017 and 2024 were summarized by each EGU facility (Table 2).

**Table 2. Emissions by EGU facilities in 2008, 2017 and 2024**

FacilitySiteName	AIRSID	2008			2017			2024		
		SO <sub>2</sub>	NO <sub>x</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>x</sub>	PM <sub>2.5</sub>
Chattahoochee Energy Facility	14900006	5	97	89	4	86	79	5	103	94
Ga Power Company - Plant Bowen	01500011	149,015	25,360	2,003	8,781	7,763	1,219	9,123	8,066	1,267
Ga Power Company - Plant Branch	23700008	93,982	20,194	445	4,972	3,740	236	5,166	3,885	245
Ga Power Company - Plant McDonough/Atkinson	06700003	24,330	3,489	202	25	451	283	29	536	336
Ga Power Company - Plant Wansley	14900001	74,956	14,625	1,866	4,086	4,116	1,069	4,246	4,299	1,119
Ga Power Company - Plant Yates	07700001	68,208	12,413	333	30,648	6,557	285	31,844	6,813	297
Total		410,496	76,177	4,937	48,517	22,713	3,171	50,414	23,702	3,358

### ***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 C-2 contains a summary of the SCC-specific growth factors for Atlanta PM<sub>2.5</sub> nonattainment area. Appendix C-3 contains a list of non-EGU point sources in Atlanta PM<sub>2.5</sub> nonattainment area and facility-specific SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> emissions for 2008, 2017, and 2024. These emissions are not subject to additional controls in the future years 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 C-2 contains a summary of the SCC-specific growth factors for Atlanta PM<sub>2.5</sub> nonattainment area. These emissions are not subject to additional controls in the future years 2017 and 2024. Appendix C-3 contains SCC-specific SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> 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](http://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. Appendix C-3 contains SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> emissions summary by fire types and county in Atlanta PM<sub>2.5</sub> 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. Appendix C-3 contains SCC-specific SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> emissions for 2008, 2017, and 2024. For detailed run scripts and output databases, please refer to Appendix C-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 PM<sub>2.5</sub> 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 C-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 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  $1 + \frac{GF_{FY-2007} - 1}{N_{years}}$  assuming the linear growth.  $N_{years}$  refers to the number of years between base year 2007 to future years.

Appendix C-6 contains a list of specific aircraft and locomotives sources in Atlanta PM<sub>2.5</sub> nonattainment area and SCC-specific SO<sub>2</sub>, NO<sub>x</sub>, and PM<sub>2.5</sub> emissions for 2008, 2017, and 2024 and the associated growth or control factors.

## ***Onroad Mobile***

SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>2.5</sub> emissions from onroad mobile sources in 2008 and 2024 were developed by Atlanta Regional Commission using MOVES2010a. MOVES was run separately for two groups of twenty nonattainment counties in Atlanta in inventory mode. The two groups of counties has different I/M program and they are the Atlanta 13 county area and the Atlanta 7 county area. Average 2008 annual daily meteorological inputs were used. Best available local data were used for MOVES inputs such as vehicle population, vehicle miles traveled (VMT) by source types, road type distribution, speed distributions, ramp fractions, hourly VMT fractions and age distribution. Since there is no public road in the nonattainment part of Heard County, MOVES was not run Heard County. MOVES was run for whole Putnam County, and the emissions in the partial nonattainment area were calculated using human population fraction. Local vehicle population and VMT were used Putnam County. Please refer to the document “MOVES-Based Mobile Source Emissions Modeling for the Atlanta Nonattainment Area” provided by the Atlanta Regional Commission in Appendix C-7 for more detailed information.

## ***Partial County Fractions for Calculation of Partial County Emissions***

The partial county fractions were calculated as the ratio of human populations in the nonattainment part to the total populations of Heard County or Putnam County. The human population in the nonattainment part of a county was estimated as the total of human population in census blocks whose geographical centroids fall inside the nonattainment area boundary. According to 2010 Census data, the human population in the nonattainment part of Heard County was 0 and the total population in Heard County was 11,834. Therefore, the partial county fraction for Heard County is  $0/11,834 = 0$ . For Putnam County, the human population in the nonattainment part is 3484 and the total population is 21,218. The corresponding partial county fraction for Putnam County is therefore  $3484/21,218 = 16.42\%$ .

## ***QA/QC***

Detailed QA/QC efforts for nonpoint sources were documented in Georgia Air Protection Branch 2011 Quality Assurance Project Plan (Georgia Air Protection Branch, 2011). Point sources emissions have gone through QA check in EPA EIS system. Onroad mobile source emissions were provided by Atlanta Regional Commission, and were reviewed by running MOVES independently at Georgia Air Protection Branch. All MOVES input files have been carefully checked.

## ***Reference***

EC/R Incorporated, 1998, Stationary Source Control Techniques Document for Fine Particulate Matter, obtained from <http://www.epa.gov/ttnecat1/dir1/finepmtech.pdf> , accessed on 1/19/2011.

E.H. Pechan & Associates, Inc. 2011. Growth and Control Factor Development for Aircraft, Commercial Marine Vessels, and Locomotives

EPA, 2010. U.S. Environmental Protection Agency, EGAS Version 5.0, available for download from <http://www.epa.gov/ttnecas1/egas5.htm>, accessed March 2010.

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