# Appendix B

# Point Source Emissions Inventory Documentation

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## 1. INTRODUCTION

The attainment modeling for the Charlotte-Gastonia-Rock Hill, North Carolina-South Carolina 8-hour ozone nonattainment area (referred to as the Metrolina area) was performed in conjunction with the regional haze modeling being done by the Southeast Regional Planning Organization, Visibility Improvement State and Tribal Association of the Southeast (VISTAS) and the fine particulate matter ($PM_{2.5}$) and ozone modeling being done by the Association of Southeastern Integrated Planning (ASIP). VISTAS and ASIP are run by the ten Southeast states (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia). Since the regional haze and $PM_{2.5}$ modeling uses annual simulations and includes an intermediate year that is the original attainment year required for the Metrolina nonattainment area, the North Carolina Division of Air Quality (NCDAQ) decided to use the this modeling as the base modeling for its attainment demonstration.

The 2002 base year emissions inventory from the attainment demonstration was the starting point for the Reasonable Further Progress (RFP) demonstration. The 2008 emissions for the utility sector were provided by the utility company. The 2008 emissions for non-utility sources were developed by applying growth and control factors to the 2002 base year and these factors were applied through the Sparse Matrix Operator Kernel Emissions (SMOKE) preprocessor so that the 2002 and 2008 emissions estimates were comparable.

Although the VISTAS/ASIP developed emission estimates for all pollutants of concern for regional haze, fine particulate matter and ozone, only the emissions inventory discussions relevant to ozone formation, i.e., nitrogen oxides (NOx) and volatile organic compounds (VOCs), will be discussed in this document. The other pollutants are discussed in detail in the regional haze and fine particulate matter State Implementation Plans (SIPs).

## 2. 2002 POINT SOURCE INVENTORY DEVELOPMENT

This section details the development of the 2002 base year inventory for point sources. The starting point of the point source sector of the inventory was the incorporation of data submitted by State and Local (S/L) agencies to the United States Environmental Protection Agency (USEPA) as part of the Consolidated Emissions Reporting Rule (CERR) requirements. Work on incorporating the CERR data into the revised base year involved: 1) obtaining the data from the USEPA or the S/L agencies, 2) evaluating the emissions and pollutants reported in the CERR submittals, 3) augmenting CERR data with annual emission estimates for primary coarse particulate matter ($PM_{10}$-PRI) and $PM_{2.5}$-PRI; 4) evaluating the emissions from electric generating units, 5) completing quality assurance reviews for each component of the point source

inventory, and 6) updating the database with corrections or new information from S/L agencies based on their review of the 2002 inventory. This document will not address the augmenting of the particulate matter since these pollutants are not considered an ozone precursor. The remaining processes used to perform the emission inventory development are described in the first portion of this section.

## 2.1 Development of 2002 Actual Point Source Inventory

VISTAS/ASIP contracted with MACTEC to develop the 2002 emission inventory. The NCDAQ submitted the most updated statewide emission inventory to the contractor with the exception of the emissions from the three local programs. For the three local programs, Forsyth, Mecklenburg, and Buncombe Counties, the CERR submittal from the USEPA was used. Once all of the files were obtained, MACTEC ran the files through the USEPA's National Emissions Inventory (NEI) Input Format (NIF) Basic Format and Content checking tool to ensure that the files were submitted in standard NIF format and that there were no referential integrity issues with those files.

The primary task in preparing the 2002 base year inventory was the incorporation of corrections and new information as submitted by the S/L agencies based on their review of the previous draft versions of the inventory. The following subsections document the data sources for the inventory, the checks made on the CERR submittals, the evaluation of electric generating units (EGU) emissions, and other quality assurance/quality control (QA/QC) checks. The final subsection summarizes the 2002 NOx and VOC inventory by sector (EGU and non-EGU).

Throughout the development of the point source emissions inventory, the NCDAQ completed detailed reviews of the inventories prepared by the VISTAS/ASIP contractor and provided comments and data corrections when needed.

### 2.1.1 Consolidated Emissions Reporting Rule (Non-EGU point)

The CERR was published in the Federal Register on Monday, June 10, 2002 (67 FR 39602). This brief summary is provided as a quick introduction to the CERR and covers the major items in the rule.

The purpose of the CERR is to simplify reporting, offer options for data collection and exchange, and unify reporting dates for various categories of criteria pollutant emission inventories. The rule applies to S/L agencies. Previous reporting requirements have, at times, forced reporting agencies into inefficient collecting and reporting activities. This rule consolidates the emission inventory reporting requirements found in various parts of the Clean Air Act (CAA).

Consolidation of reporting requirements will enable S/L agencies to better explain to program managers and the public the necessity for a consistent inventory program, increases the efficiency of the emission inventory program, and provide more consistent and uniform data.

States are required to prepare a comprehensive statewide inventory every three years. The first inventory was for the year 2002 and was due June 1, 2004. This CERR inventory was used for the VISTAS/ASIP 2002 base year.

### 2.1.2 EGU Analysis

MACTEC made a comparison of the annual sulfur dioxide ($SO_2$) and NOx emissions for EGUs as reported in the S/L agencies CERR submittals and the data from the USEPA's Clean Air Markets Division (CAMD) continuous emission monitoring (CEM) database to identify any outstanding discrepancies. Facilities report hourly CEM data to the USEPA for units that are subject to CEM reporting requirements of the NOx SIP Call rule and Title IV of the CAA. The USEPA sums the hourly CEM emissions to the annual level, and MACTEC compared these annual CEM emissions to those in the S/L inventories. The 2002 CEM inventory containing NOx and $SO_2$ emissions and heat input data were downloaded from the USEPA CAMD web site (www.epa.gov/airmarkets). The data were provided by quarter and by emission unit.

The first step in the EGU analysis involved preparing a crosswalk file to match facilities and units in the CAMD inventory to facilities and units in the S/L inventories. In the CAMD inventory, the Office of Regulatory Information Systems (ORIS) identification (ID) code identifies unique facilities and the unit ID identifies unique boilers and internal combustion engines (i.e., turbines and reciprocating engines). In the North Carolina point source emissions inventories, the State and county code (FIP code) and State facility ID together identify unique facilities and the emission unit ID identifies unique boilers or internal combustion engines. In most cases, there is a one-to-one correspondence between the CAMD identifiers and the S/L identifiers. However, in some of the S/L inventories, the emissions for multiple emission units are summed and reported under one emission unit ID. MACTEC created an Excel spreadsheet that contained an initial crosswalk with the ORIS ID and unit ID in the CEM inventory matched to the State and county FIPS, State facility ID, and emission unit ID in the emissions inventories. The initial crosswalk contained both the annual emissions summed from the CAMD database, as well as, the S/L emission estimate. The matching at the facility level was nearly complete. In some cases, however, S/L agencies or stakeholders' assistance was needed to match some of the CEM units to emission units in the S/L inventories.

The second step in the EGU analysis was to prepare an Excel spreadsheet that compared the annual emissions from the hourly CAMD inventory to the annual emissions reported in the S/L inventory. The facility-level comparison of CEM to emission inventory NOx and $SO_2$ emissions found that for most facilities, the annual emissions from the S/L inventory equaled the CAMD CEM emissions. Minor differences could be explained because the facility in the S/L inventory contained additional small or emergency units that were not included in the CAMD database.

The minor inconsistencies found included small differences in emission estimates (<2 percent difference), exclusion/inclusion of small gas-fired units in the different databases, and grouping of emission units in S/L CERR submittals where CAMD listed each unit individually. MACTEC compared $SO_2$ and NOx emissions on a unit-by-unit basis and did not find any major inconsistencies. The VISTAS EGU Special Interest Work Group (SIWG) approved use CAMD data with additional small or emergency units provided by S/L that were not includes in the CAMD database.

### 2.1.3 Summary of the 2002 Actual Inventory

Table 2.1.3-1 summarizes the final 2002 actual base year inventory for North Carolina. All values are in tons per year. The EGU emissions include the emissions from all processes with a Source Classification Code (SCC) of either 1-01-xxx-xx (External Combustion Boilers – Electric Generation) or 2-01-xxx-xx (Internal Combustion Engines – Electric Generation). Emissions for all other SCCs are included in the non-EGU column.

**Table 2.1.3-1 2002 Actual Point Source Inventory for North Carolina**

| Pollutant | All Point Sources | EGUs | Non-EGUs |
|---|---|---|---|
| NOx | 196,782 | 151,854 | 44,928 |
| VOC | 62,170 | 988 | 61,182 |

## 3. 2008 POINT SOURCE EMISSIONS INVENTORY DEVELOPMENT

This section details the development of the 2008 emission inventory for point sources. There were two major sectors of the point source of the inventory. Different approaches were used for different sectors of the 2008 North Carolina point source inventory development. For Utility sector (EGU), the NCDAQ requested Duke Power to provide project 2008 emission estimates. For other point source sector (Non-EGU), the NCDAQ started with VISTAS/ASIP 2002 typical emissions, using Economic Growth and Analysis System growth factor model (EGAS) Version 5.0 growth factor to grow the 2002 inventory to 2008, then applying with control scenario

accounts for post-2002 emission reductions from recently promulgated federal, State, local, and site-specific control programs, and finally applying allowable emission allocation based on North Carolina 15A NCAC 02D .1417- Emission Allocations for Large Combustion Sources.

For both sectors, the NCDAQ generated 2008 inventory with control scenarios that account for post-2002 emission reductions from promulgated and proposed federal, State, local, and site-specific control programs as of July 1, 2004. Section 3.1 discusses the EGU projection inventory development, while Section 3.2 discusses the non-EGU projection inventory development.

## 3.1 North Carolina 2008 EGU Emission Projections

The NCDAQ requested Duke Power to provide hour specific projected emissions for their facilities. Typical summertime profile projections were requested from Duke Power. There were three Duke Power facilities in the Metrolina nonattainment area: Allen Steam, Buck Steam, and Riverbend.

It was noted that some projections seemed high compared to 2002 values considering the controls that were being put in place. There was concern expressed by the company that projections needed to be conservative in case the modeled emission rates were to end up in a permit with an enforceable short-term averaging time (such as 24-hour or less), they needed to make sure there was some margin of compliance to allow for process upsets. Process upsets would be rare (not typical) but they would need the assurance to avoid enforcement issues. This concern was addressed by stating that these projections were to be used for as our best estimate of "typical operating conditions in 2008".

Duke Power noted that all of their projections for 2007 and later are using the same generation profiles relative to a typical summer day. Differences between 2007, 2008, and other future years were associated with the timing of when they expect to have emissions controls in place. Estimates were based on April 1, 2005 Duke Power Compliance Plan for NC Clean Smokestacks Act compliance plan. All estimates should be considered “typical expected emissions”, not to be used for permit limits or regulatory compliance.

Some SCC codes and stack parameters were updated due to new equipment coming on-line. Kris Knudsen of Duke Power supplied these changes.

## 3.2 North Carolina 2008 Non-EGU Emission Projections

This section details the development of the North Carolina 2008 non-EGU emission inventory. The general approach for assembling future year data was to use recently updated growth and

control data consistent with the USEPA's Clean Air Interstate Proposed Rule (CAIR) analyses, supplement these data with available stakeholder input, and provide the results for stakeholder review to ensure credibility.

The NCDAQ started with VISTAS 2002 typical emission inventory. The 2002 VISTAS/ASIP point source emission inventory file contains both EGUs and non-EGUs. Duke Power and Progress Energy facilities, for which we have hourly projections, were removed from this file. The rest of the file contains all other point sources and constitutes the non-EGU emissions inventory. First the 2002 emission inventory was grown to 2008 by using projection factors developed from EGAS version 5.0. This growth processing creates emission data sets for years other than a year for which an emissions inventory is available. For growth processing, SMOKE creates a growth matrix that contains the growth factors for each source and pollutant in the inventory. It then combines the growth matrix with the emission inventory to create a grown emission inventory. Next, a control file supplied by VISTAS contractor, MACTEC was applied. Then allowable emission allocation, the NCDAQ developed based on North Carolina 15A NCAC 2D .1417, was applied. The allowable emission allocation control file contains county-specific, SIC-specific, SCC-specific controls.

The following sections discuss each of these steps to development 2008 non-EGU emissions inventory in detail.

### 3.2.1 Growth assumptions for non-EGU sources

The NCDAQ developed the growth factor data by using EGAS version 5.0. EGAS is an economic and activity forecast tool that provides credible growth factors for developing emission inventory projections. The economic activity data used by EGAS 5.0 must be provided in the same format as the default economic activity data sets contained within it. These data are from:

- Regional Economic Models Incorporated (REMI) Policy Insight Model, Version 5.5 - a 53 sector, 50 State + DC model;

- Department of Energy's Annual Energy Outlook (2004); The REMI socioeconomic data (output by industry sector, population, farm sector value added, and gasoline and oil expenditures) are available by 4-digit SIC code at the State level.

The NCDAQ considered recent projections for three key sectors in North Carolina where declining production was anticipated – SIC 22xx Textile Mill Products, 23xx Apparel and Other Fabrics, and 25xx Furniture and Fixtures. For the 2008 inventory, the NCDAQ decided to use a

growth factor of 1.0 for these SIC codes. Although the NCDAQ has data that shows a steady decline in these industries in North Carolina, the NCDAQ wanted to maintain the emission levels at 2002 levels so the future emission reduction credits were available in the event that they are needed for nonattainment areas.

For the 2008 inventory, the NCDAQ made one additional change to the growth factors. The AEO2004 data was replaced with the more recent AEO2006 forecasts (released in February 2006) to reflect changes in the energy market and to improve the emissions growth factors produced. The NCDAQ obtained the corresponding AEO2006 projection tables from DOE's web site. The NCDAQ with help of VISTAS developed tables comparing the growth factors based on AEO2004 and AEO2006 and decided to use the AEO2006 growth factors for fuel burning SCCs.

### 3.2.2 Control Programs applied to non-EGU sources

The methodologies used to account for the emission reductions associated with these emission control programs are discussed in the following sections.

#### 3.2.2.1 NOx Emission Allocations (NOx SIP Call) to non-EGU sources

The NCDAQ developed allowable emission allocation based on North Carolina rule 15A NCAC 02D .1417 - Emission Allocations for Large Combustion Sources.

Phase I of the NOx SIP call applies to certain large non-EGUs, including large industrial boilers and turbines, and cement kilns. The Phase II of the NOx SIP call rule was finalized on April 21, 2004. States had until April 21, 2005, to submit SIPs meeting the Phase II NOx budget requirements. The Phase II rule applies to large IC engines, which are primarily used in pipeline transmission service at compressor stations. The final rule reflects a control level of 82 percent for natural gas-fired IC engines and 90 percent for diesel or dual fuel categories.

The NCDAQ used more specific information on the anticipated controls at the compressor stations in the 2008 inventory instead of the default approach used by the USEPA in the proposed Phase II rule. The North Carolina rule 15A NCAC 02D .1417 applied to fossil fuel-fired stationary boilers, combustion turbines, or combined cycle systems serving a generator with nameplate capacity greater than 25 megawatts electrical and selling any amount of electricity. The North Carolina rule 15A NCAC 02D .1417 also applied to fossil fuel-fired stationary boilers, combustion turbines, or combined cycle systems having a maximum design heat input greater than 250 million Btu per hour.

The NCDAQ applied NOx Emission Allocations for 2006 and later from the North Carolina rule 15A NCAC 02D .1417 to the non-EGU sources that are subject to the rule to generate 2008 emission inventory.

#### 3.2.2.2 2, 4, 7, and 10-year MACT Standards

Maximum achievable control technology (MACT) requirements were also applied, as documented in the USEPA report entitled *Control Packet Development and Data Sources,* dated July 14, 2004 (see Appendix G). The point source MACTs and associated emission reductions were designed from Federal Register (FR) notices and discussions with the USEPA's Emission Standards Division (ESD) staff. VISTAS did not apply reductions for MACT standards with an initial compliance date of 2001 or earlier, assuming that the effects of these controls are already accounted for in the 2002 inventories supplied by the States. Emission reductions were applied only for MACT standards with an initial compliance date of 2002 or greater. Table 3.2.2-1 lists MACT control with control efficiency (CE) applied in the Metrolina area by SCC codes.

**Table 3.2.2-1 MACT controls in the Metrolina area by SCC codes**

| MACT Description | SCC | CE (%) |
|---|---|---|
| MACT: RICE | 20100102 | 40 |
| | 20200102 | 40 |
| | 20200202 | 40 |
| | 20300101 | 40 |
| MACT: Polymers and resins II | 30101881 | 67.4 |
| MACT: Polyesters | 30101891 | 67.4 |
| | 30101899 | 67.4 |
| MACT: Iron & Steel Foundries | 30400301 | 40 |
| | 30400315 | 40 |
| | 30400320 | 40 |
| | 30400331 | 40 |
| | 30400350 | 40 |
| | 30400360 | 40 |
| | 30400371 | 40 |
| | 30400398 | 40 |
| MACT: Petroleum refineries - other | 30601101 | 65.6 |
| MACT: Wood & Composite Wood Products | 30700701 | 41.2 |
| | 30700799 | 41.2 |
| MACT: Fabric Printing, Coating and Dyeing | 40201101 | 60.2 |
| | 40201103 | 60.2 |
| | 40201210 | 60.2 |

**Table 3.2.2-1 MACT controls in the Metrolina area by SCC codes**

| MACT Description | SCC | CE (%) |
|---|---|---|
| MACT: Rubber tire manufacture | 30800104 | 47.6 |
| | 30800107 | 47.6 |
| | 30800108 | 47.6 |
| | 30800120 | 47.6 |
| | 30800121 | 47.6 |
| | 30800197 | 47.6 |
| | 30800198 | 47.6 |
| | 30800199 | 47.6 |
| MACT: Paper and Other Web | 40201301 | 82 |
| | 40201303 | 82 |
| MACT: Auto and Light-Duty Truck Manufacturing | 40201606 | 66.7 |
| | 40201620 | 66.7 |
| MACT: Metal Can | 40201799 | 70.8 |
| | 40201806 | 53.1 |
| MACT: Metal Furniture | 40202031 | 73.1 |
| MACT: Wood Building Products | 40202103 | 74 |
| | 40202106 | 74 |
| MACT: Plastic Parts | 40202201 | 77 |
| | 40202208 | 77 |
| MACT: Misc. Metal Parts & Products | 40202501 | 47.9 |
| | 40202502 | 47.9 |
| | 40202533 | 47.9 |
| | 40202536 | 47.9 |
| | 40202537 | 47.9 |
| | 40202542 | 47.9 |
| | 40202599 | 47.9 |
| MACT: Metal surface coating | 40202601 | 66.2 |
| | 40202606 | 66.2 |
| | 40202607 | 66.2 |
| | 40202699 | 66.2 |
| MACT: Municipal Solid Waste Landfills | 50100410 | 75.2 |

### 3.2.2.3 Combustion Turbine MACT

The projection inventory does not include the NOx co-benefit effects of the MACT regulations for Gas Turbines or stationary Reciprocating Internal Combustion Engines, which the USEPA estimates to be small compared to the overall inventory.

### 3.2.3 Sources Shutdown After 2002

The NCDAQ identified and incorporated information regarding sources that have shut down after 2002 and set the emissions to zero in the projection inventories.

Kannapolis Energy Partners in Cabarrus County was shutdown on July 24, 2004. After discussion on emission reduction credit banking, the NCDAQ decided to keep Kannapolis Energy Partners in the 2008 emission inventory. They were kept in the modeling file and were included in the allowable emission allocation control packet with emissions froze at 2002 levels for NOx.

## 4. QUALITY ASSURANCE (QA)

Most SMOKE input files were prepared by VISTAS/ASIP that has been reviewed. The exception was the input files with data provided by Duke Power. These files were developed in-house by the NCDAQ. A "near" line-by-line comparison between data supplied by Duke Power and the input file developed was performed as a QA measure. The following paragraphs discuss the various post-processing QA measures performed.

Log files generated for each run for each day were reviewed for problems. These log files reflect that the subroutines completed normally with no errors.

SMOKE reports, generated during emissions processing, use the SMOKE intermediate files to create a large variety of emissions and activity data totals to be used for the QA of the emissions data. This QA is in addition to the QA performed by other SMOKE programs for checking file formats and input quality, and it focuses on analysis of the emissions values processed and output by SMOKE. For non-EGU runs performed on data sources inside North Carolina, county reports were generated for one day of each week for the entire modeling period. The day of week alternated weekly to make sure we captured several Mondays, several Tuesdays, etc. Bar charts were generated for each pollutant and compared with each other for consistency. Since these were annual and not hourly emissions, there should not be much variation between various days. This was noted to be the case. County total emissions were evaluated to ensure that the emission totals appeared reasonable for the type of sources located within the County (such as utilities). For Duke Power sources, where hourly profiles were obtained, county reports were generated for every day of the modeling period and reviewed. Weekend and holiday profiles were compared to weekday profiles and judged to be accurate.