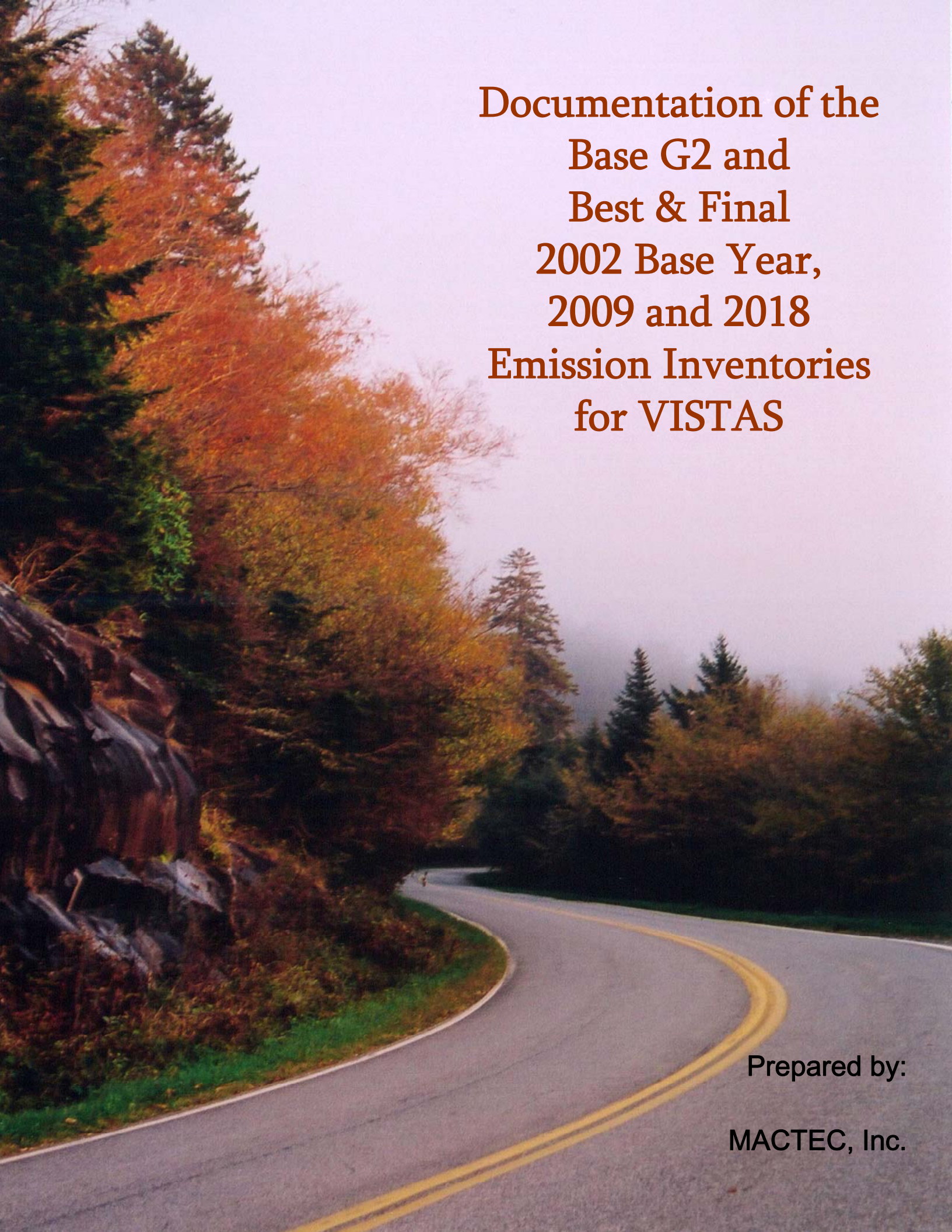

Documentation of the Base G2 and Best & Final 2002 Base Year, 2009 and 2018 Emission Inventories for VISTAS

Prepared by:

MACTEC, Inc.

Documentation of the

Base G2 and Best & Final

2002 Base Year, 2009 and 2018

Emission Inventories for VISTAS

Prepared for:

Visibility Improvement State and Tribal Association of the Southeast (VISTAS)

March 14, 2008

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Acronyms and Abbreviations

AEO	Annual Energy Outlook
AF&PA	American Forest and Paper Association
APCD	Air Pollution Control District
ATP	Anti-Tampering Program
BLRID	Boiler Identification (Boiler ID)
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CEM	Continuous Emissions Monitoring
CAMD	Clean Air Markets Division
CERR	Consolidated Emissions Reporting Rule
CMU	Carnegie Mellon University
CMV	commercial marine vessels
CE	Control Efficiency
CO	carbon monoxide
DENR	North Carolina Department of Environment and Natural Resources
DHEC	South Carolina Department of Health and Environmental Control
EDMS	Emissions Data Management Systems
ESD	Emissions Standards Division
EPA	Environmental Protection Agency
EGU	Electric Generating Unit
ICF	ICF International, Inc.
FIP	Federal Implementation Plan
FLM	Federal Land Manager
FTP	File transfer protocol
FR	Federal Register
FS	Forest Service
HDD	Heavy Duty Diesel
HDD RULE	Heavy Duty Diesel Rule
ICF	ICF International, Inc.
ID	Identification
I/M	Inspection and Maintenance
IPM®	Integrated Planning Model®
IAQTR	Interstate Air Quality Transport Rule
LTO	Landing and take off
MACT	Maximum achievable control technology

Acronyms and Abbreviations (continued)

MACTEC	MACTEC Engineering and Consulting, Inc.
MOBILE 6	MOBILE emissions estimation model version 6
MRPO	Midwest Regional Planning Organization
NH_3	Ammonia
NEI	National Emission Inventory
NIF	National Emission Inventory Format
NLEV	National Low Emission Vehicle regulation
NMIM	National Mobile Inventory Model
NONROAD	no acronym (model name)
NO_x	Oxides of nitrogen
NWR	National Wildlife Refuge
OTB	On the books
OTW	On the way
ORIS	Office of Regulatory Information Systems
OTAQ	Office of Transportation and Air Quality
OTC	Ozone Transport Commission
PFC	Portable fuel containers
PM	Particulate matter
PM_{10}-FIL	Particulate matter less than or equal to 10 microns in diameter that can be captured on a filter
PM_{10}-PRI	Particulate matter less than or equal to 10 microns in diameter that includes both the filterable and condensable components of particulate matter
$PM_{2.5}$-FIL	Particulate matter less than or equal to 2.5 microns in diameter that can be captured on a filter
$PM_{2.5}$-PRI	Particulate matter less than or equal to 2.5 microns in diameter that includes both the filterable and condensable components of particulate matter
PM-CON	Particulate matter created by the condensation of hot materials to form particulates, usually less than 2.5 microns in diameter
ppmW	parts per million by weight
PRI	Primary
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
REMI	Regional Economic Models, Inc.
RFG	Reformulated gasoline
RVP	Reid Vapor Pressure

Acronyms and Abbreviations (continued)

SCC	Source Classification Code
SIP	State Implementation Plan
SIWG	Special Interest Workgroup
S/L/T	State/Local/Tribal
SMOKE	Sparse Matrix Operator Kernel Emissions Modeling System
S/L	State and Local
SO_2	Oxides of Sulfur
T4	Tier 4
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle Miles Traveled
VOC	Volatile organic compounds
WRAP	Western Regional Air Partnership

Documentation of the Base G2 and Best & Final 2002 Base Year, 2009 and 2018, Emission Inventories for VISTAS

Introduction

Base G2 document was delivered final in Aug (?) 2007. In fall 2007 states updated specific point source EGU and non-EGU facility record in Best and Final (B&F) inventories for 2009 and 2018 to account for BART controls, consent decrees, corrections to Base G2, and source specific controls. Only EGU and non-EGU point source records were changed. Area, non-road, on-road remained the same as Base G2. In this report all records for area, non-road, and on-road were used in B&F modeling the same as Base G2. This report has been updated from the Base G2 report submitted in July 2007 just for B&F changes to EGU and non-EGU sources. A history of the development of the VISTAS inventory follows. Specific sections of the document detail the modifications made as the inventory progressed from Base F through B&F.

The Base G2 inventory included changes in 2018 controls on specific electric generating units in GA, FL, NC, and WV. There were no changes in 2009 controls for EGU and no changes between the Base G and Base G2 inventories for non-EGU point, on-road, non-road, or area sources in 2009 or 2018. The Base G2 modeling run included changes for 2018 EGU controls plus corrections in 2002 typical, 2009, and 2018 for errors in emissions processing in Base G. These corrections in emissions processing are not seen when comparing the Base G and G2 inventory files.

Base G and Base G2 inventories represent two separate model runs, as does the B&F. Since Base G2 supersedes Base G, VISTAS will maintain only the Base G2 and B&F model files since both were used in State Implementation Plan submittals.

History of VISTAS Base and Projection Year Emission Inventory Development

This section is provided to supply the history behind the development of the base and projection year inventories provided to the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) and the Association for Southeast Integrated Planning (ASIP). Through the various iterations, the inventories that have been developed have typically had version numbers provided by the contractors who developed the inventories and to a certain extent these were also based on their purpose. Different components of the 2002 base year inventories have been supplied by E.H. Pechan and Associates, Inc. (Pechan), MACTEC Engineering and Consulting, Inc.

(MACTEC), and by Alpine Geophysics, Inc. (AG). The projection year inventories were developed by MACTEC and AG.

The initial 2002 base year inventory was jointly developed by Pechan and MACTEC. Pechan developed the on-road and non-road mobile source components of the inventory while MACTEC developed the point and area source component of the inventory. This version of the inventory included updates to on-road mobile that incorporated information from the 1999 NEI Version 2 final along with updated information on VMT, fuel programs, and other inputs to the MOBILE6 model to produce a draft version of the 2002 inventory. For non-road sources, a similar approach was used. Updated State information on temperatures and fuel characteristics were obtained from VISTAS States and used with the NONROAD 2002 model to calculate 2002 emissions for NONROAD model sources. These estimates were coupled with data for commercial marine vessels, locomotives and airplanes projected to 2002 using appropriate growth surrogates. A draft version of these inventories was prepared in late 2003, with a final version in early 2004. An overview of the development of the on-road component can be found at: http://www.vistas-sesarm.org/documents/Pechan_drafton-roadinventory_082803.ppt while an overview of the non-road component can be found at: http://www.vistas-sesarm.org/documents/Pechan_Non-roadInventory_082803.ppt.

Similarly, draft versions of the 2002 point and area source base year inventories were prepared by MACTEC in the same timeframe (late 2003 for the draft, final in early 2004). The point source component was based on data submitted by the VISTAS States or on the 1999 NEI. The data submitted by the States ranged from 1999 to 2001 and was all projected to 2002 using appropriate growth surrogates from Economic Growth Analysis System (EGAS) version 4. Toxic Release Inventory (TRI) data were used to augment the inventory for NH_3. Continuous Emissions Monitor (CEM) data from the U.S. EPA's Clean Air Markets Division was used to supply emissions for electric generating utilities (EGUs). Particulate matter emissions were augmented (when missing) by using emission factor ratios. Details on all these calculations are discussed in Section 1.1.1.3 of this document.

The area source component of the 2002 draft base year emissions was prepared similarly to the point sources, using State submittals and the 1999 NEI Version 2 final as the basis for projecting emissions to 2002 using EGAS growth factors. For ammonia area sources the Carnegie Mellon University (CMU) ammonia model was used to calculate emissions. Finally, data on acreage burned on a fire by fire basis was solicited from State forestry agencies in order to calculate fire emissions on a fire by fire basis. Virtually all VISTAS State forestry agencies provided data for these calculations at least for wild and

prescribed fires. An overview of the point and area source development methods can be found at:
http://www.vistas-sesarm.org/documents/MACTEC_draftpointareainventory_82803.ppt.

Three interim versions of the 2002 base year inventory were developed. The first was delivered in August of 2003, the second in April of 2004 and the final one in October of 2004. The August 2003 and April 2004 inventories were prepared by MACTEC and Pechan. A draft version of the revised 2002 base year inventory was released in June of 2004, with a final version released in October 2004. That 2002 base year inventory was solely prepared by MACTEC. The October 2004 inventory incorporated 2002 Consolidated Emissions Reporting Rule (CERR) data into the inventory along with some updated data from the VISTAS States. This inventory is typically referred to as version 3.1 of the VISTAS inventory.

Closely following the version 3.1 2002 base year inventory, a "preliminary" 2018 projection inventory was developed. This "preliminary" 2018 inventory was developed in late 2004 (Oct/Nov) and was designed solely for use in modeling sensitivity runs to provide a quick and dirty assessment of what "on the books" and "on the way" controls could be expected to provide in terms of improvements to visibility and regional haze impairment. A brief overview of the history of the three versions of the 2002 base year and the 2018 preliminary inventory use can be found at: http://www.vistas-sesarm.org/documents/STAD1204/2002and2018Emissions14Dec2004.ppt.

Following preparation of the final 3.1 version of the 2002 base year inventory, States were asked to review and provide comments on that inventory to MACTEC for update and revision. At the same time MACTEC prepared a revised draft version of the 2018 projection inventory (January 2005) and a draft version of a 2009 projection inventory (April 2005). All of these were known as version 3.1 and were provided to the VISTAS States for review and comment. Comments were received and updates to the inventories based on these comments were prepared. The revised inventories were provided to the VISTAS States. At that time to be consistent with the modeling nomenclature being used by AG in performing their modeling runs, the inventory became the Base F VISTAS inventory. The Base F inventory was delivered for review and comment in August of 2005. In addition, MACTEC delivered a report entitled *Documentation of the Revised 2002 Base Year, Revised 2018, and Initial 2009 Emission Inventories for VISTAS* on August 2, 2005 that described the methods used to develop the Base F inventories. For the Electric Generating Utilities (EGU) different versions of the Integrated Planning Model were used between Base D and Base F, resulting in different projections of future EGU emissions.

Over the period from August 2005 until June/July 2006 MACTEC received comments and updates to some categories from VISTAS States, particularly EGU. In addition, a new NONROAD model (NONROAD05) was released. Thus additional updates to the inventory were prepared based on the comments received along with revised NONROAD emission estimates from NONROAD05. The resultant inventory became the Base G inventory.

Following release of the Base G inventory in early 2007, four States specified additional changes to reflect their best estimates of EGU emission levels and controls in 2018. The resulting 2018 EGU emission inventory is referred to as Base G2, which was released in July 2007.

The current version of the VISTAS inventory is referred to as the "Best and Final (B&F)" inventory. States specified additional changes to the point source inventory to reflect improved knowledge of EGU emission levels and controls in 2009 and 2018. States also specified changes to nonEGU sources reflecting new information on anticipated controls and shutdowns. No changes to any other source sector (e.g., area, fire, nonroad, onroad) were made for the B&F inventory. The 2018 B&F inventory was released in October 2007, and the 2009 B&F inventory was released in December 2007.

This document details the development of the Base G/G2/B&F inventories for 2002, 2009 and 2018. The information that follows describes the development of the VISTAS inventory by sector from Base F forward. Unless specific updates were made to an inventory sector, the methods used for Base F were retained. Table I-1 through Table I-3 indicate roughly which version of the inventory is in use for each sector of the inventory as of the B&F inventory.

Under a separate contract, AG was asked to obtain and convert emission inventory data for the five states that make up the Midwest Regional Planning Organization (MRPO) for use by VISTAS/ASIP modelers. Details of this effort are documented in an Appendix to this report.

Table I-1 Inventory Version in Use by Year and Source Sector Through B&F - 2002

Source	AL	FL	GA	KY	MS	NC	SC	TN	VA	WV
EGU	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G
Non-EGU Point	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G	Base F with some source specific revisions in Base G
Area[1]	Base F for ammonia sources (CMU Model) and for some area sources, Base G for selected sources updated by the State with State supplied data	Base F except for some emissions zeroed out (and records removed) for some southern FL counties for Base G.	Base F	Base F	Base F	Base F for ammonia sources (CMU Model) and for some area sources, Base G for selected sources updated by the State with State supplied data. Some corrections applied by MACTEC to correct PM values	Base F	Base F	Base F for ammonia Sources (CMU Model) and for some area sources, Base G for selected sources updated by the State with State supplied data.	Base F
On-road	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G
Non-road	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources, except aircraft and locomotives updated for Base G.	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources except for aircraft in Cincinnati/N. KY Int. Airport, which are Base G.	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. NC moved from Southern to Mid-Atlantic State in seasonal adjustment file. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources, except for aircraft emissions which are Base G.	Base G for all sources included in the NONROAD model. Base F for non-NONROAD model sources
Fires	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical	Base F Typical

Notes:

Base G global Area Source changes that apply to ALL States: A) removal of Stage II refueling from area source file to non-road and on-road; B) modification of PM2.5 ratio for several fugitive dust sources per WRAP methodology; C) addition of portable fuel container (PFC) emissions to all States based on OTAQ report.

Table I-2 Inventory Version in Use by Year and Source Sector Through B&F - 2009

Source	AL	FL	GA	KY	MS	NC	SC	TN	VA	WV
EGU[1]	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final
Non-EGU Point[2]	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F
Area	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model. Some specific source categories updated using State supplied file to override projected values.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.
On-road	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G
Non-road	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources.	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources except for aircraft in Cincinnati/N. KY Int. Airport, which are Base G using State supplied growth factors.	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources
Fires	Base F typical except for Rx fires	Base F typical	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires

Notes:

1. All EGU emissions updated with new IPM runs in Base G; additional EGU-specific changes specified by States for Best & Final.
2. Revised growth factors from DOE AEO2006 fuel use projections

Table I-3 Inventory Version in Use by Year and Source Sector Through B&F - 2018

Source	AL	FL	GA	KY	MS	NC	SC	TN	VA	WV
EGU[1]	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final	Best & Final
Non-EGU Point[2]	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in Base G2 and B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in Base G2 and B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in Base G2 and B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in B&F	Base F methodology but with revised growth factors for fuel fired sources in Base G and source-specific changes in Base G2 and B&F
Area	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model. Some specific source categories updated using State supplied file to override projected values.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.	Base F with updated AEO growth factors for fuel fired sources. Agricultural ammonia sources from CMU model.
On-road	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G	Base G
Non-road	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources.	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources except for aircraft in Cincinnati/N. KY Int. Airport, which are Base G using State supplied growth factors.	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources	Base G for all sources included in the NONROAD model. Base F projection methodology used for non-NONROAD model sources
Fires	Base F typical except for Rx fires	Base F typical	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires	Base F typical except for Rx fires

Notes:

1. All EGU emissions updated with new IPM runs in Base G; additional EGU-specific changes specified by States for Base G2 and B&F.
2. Revised growth factors from DOE AEO2006 fuel use projections

1.0 2002 Base Year Inventory Development

1.1 Point Sources

This section details the development of the 2002 base year inventory for point sources. There were two major components to the development of the point source sector of the inventory. The first component was the incorporation of data submitted by the Visibility Improvement State and Tribal Association of he Southeast (VISTAS) States and local (S/L) agencies to the United States Environmental Protection Agency (EPA) 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 EPA or the S/L agency, 2) evaluating the emissions and pollutants reported in the CERR submittals, 3) augmenting CERR data with annual emission estimates for 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. The processes used to perform those operations are described in the first portion of this section.

The second component was the development of a "typical" year inventory for electric generating units (EGUs). VISTAS determined that a typical year electric generating units (EGU) inventory was necessary to smooth out any anomalies in emissions from the EGU sector due to meteorology, economic, and outage factors in 2002. The typical year EGU inventory is intended to represent the five year (2000-2004) period that will be used to determine the regional haze reasonable progress goals. The second part of this section discusses the development of the typical year EGU inventory.

1.1.1 Development of 2002 Point Source Inventory

MACTEC developed a draft 2002 emission inventory in June 2004 (*Development of the Draft 2002 VISTAS Emission Inventory for Regional Haze Modeling – Point Sources*, MACTEC, June 18, 2004). The starting point for the draft 2002 emission inventory was EPA's 1999 National Emission Inventory (NEI), Version 2 Final (NEI99V2). For several states, we replaced the NEI99V2 data with more recent inventories for either calendar year 1999, 2000, or 2001 as submitted by the S/L agencies. We also performed several other updates, including updating emission estimates for selected large source of ammonia, incorporating 2002 Continuous Emissions Monitoring-(CEM)-based SO_2 and NO_x emissions for electric utilities, adding PM_{10} and $PM_{2.5}$ emissions when they were missing from an S/L submittal, and performing a variety of additional Quality assurance/Quality control (QA/QC) checks.

The next version of the 2002 inventory (referred to as Base F) was released in August 2005 (*Documentation of the Revised 2002 Base Year, Revised 2018, and Initial 2009 Emission Inventories for VISTAS*, MACTEC, August 2, 2005). The primary task in preparing the Base F 2002 base year inventory was the replacement of NEI99V2 data with data submitted by the VISTAS S/L agencies as part of the CERR submittal and included in EPA's 2002 NEI.

The next version of the 2002 inventory (referred to as Base G) was released in August 2006 and is documented in this report. The primary task in preparing the Base G 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 Base F inventory. Note that no changes to the Base G 2002 point source inventory were made during the Base G2 and B&F update cycles (in other words, for the 2002 actual and typical inventories, Base G = Base G2 = B&F).

The following subsections document the data sources for the Base G/B&F inventory, the checks made on the CERR submittals, the process for augmenting the inventory with PM_{10} and $PM_{2.5}$ emissions, the evaluation of EGU emissions, other QA/QC checks, and other Base G updates. The final subsection summarizes the Base G/B&F 2002 inventory by state, pollutant, and sector (EGU and non-EGU).

1.1.1.1 Data Sources

Several data sources were used to compile the Base F point source inventory: 1) the inventories that the S/L submitted to EPA from May through July 2004 as required by the CERR; 2) supplemental data supplied by the S/L agencies that may have been revised or finalized after the CERR submittal to EPA, and 3) the draft VISTAS 2002 inventory in cases where S/L CERR data were not available. For the Base G inventory, we replaced data from Hamilton County, Tennessee, using data from Hamilton County's CERR submittal as contained in EPA's 2002 NEI inventory (in Base F, the inventory for Hamilton County was based on the draft VISTAS 2002 inventory, which in turn was based on the 1999 NEI).

Table 1.1-1 summarizes the data used as the starting point for the Base F 2002 inventory. Once all of the files were obtained, MACTEC ran the files through the EPA National Emission Inventory 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. In a couple of cases small errors were found. For example, in one case non-standard pollutant designations were used for particulate matter (PM) and ammonia emissions. MACTEC contacted each VISTAS State point source contact person to resolve the issues with the files and corrections were made. Once all corrections to the native files were made, MACTEC continued with the incorporation of the data into the VISTAS point source files. S/L agencies completed a detailed review of the Base F inventory. Additional updates and corrections to the Base F

inventory were requested by S/L agencies and incorporated into the Base G inventory. The Base G changes are documented in more detail in Section 1.1.1.6. No additional changes to the Base G inventory were made as part of the Base G2/B&F round of updates.

Table 1.1-1 State Data Submittals Used for the Base F 2002 Point Source Inventory.

State / Local Program	Point Source Emissions Data Source
AL	C
FL	B
GA	B
KY	C
MS	B
NC	C
SC	C
TN	C
VA	B
WV	B
Davidson County, TN	B
Hamilton County, TN	D
Memphis/Shelby County, TN	B
Knox County, TN	B
Jefferson County, AL	B
Jefferson County, KY	B
Buncombe County, NC	B
Forsyth County, NC	B
Mecklenburg County, NC	B

Key
A = Draft VISTAS 2002
B = CERR Submittal from EPA's file transfer protocol (FTP) site
C = Other (CERR or other submittal sent directly from S/L agency to MACTEC)
D = CERR Submittal from EPA's NEI 2002 Final Inventory

1.1.1.2 Initial Data Evaluation

For the Base F inventory, we conducted an initial review of the 2002 point source CERR data in accordance with the QA procedures specified in the Quality Assurance Project Plan (QAPP) for this project. The following evaluations were completed to identify potential data quality issues associated with the CERR data:

- Compared the number of sites in the CERR submittal to the number of sites in the VISTAS draft 2002 inventory; for all States, the number of sites in the CERR submittal was less than in the VISTAS draft 2002 inventory, since the CERR data was limited to major sources, while the VISTAS draft 2002 inventory contained data for both major and minor sources; verified with S/L contacts that minor sources not included in the CERR point source inventory were included in the CERR area source inventory.

- Checked for correct pollutant codes and corrected to make them NIF-compliant; for example, some S/L agencies reported ammonia emissions using the CAS Number or as "ammonia", rather than the NIF-compliant "NH_3" code.
- Checked for types of particulate matter codes reported (i.e., PM-FIL, PM-CON, PM-PRI, PM_{10}-PRI, PM10-FIL, $PM_{2.5}$-PRI, $PM_{2.5}$-FIL); corrected codes with obvious errors (i.e., changed PMPRI to PM-PRI). (The PM augmentation process for filling in missing PM pollutants is discussed later in Section 1.1.1.3)
- Converted all emission values that weren't in tons to tons to allow for preparation of emission summaries using consistent units.
- Checked start and end dates in the PE and EM tables to confirm consistency with the 2002 base year.
- Compared annual and daily emissions when daily emissions were reported; in some cases, the daily value was non-zero (but very small) but the annual value was zero. This was generally the result of rounding in an S/L agency's submittal.
- Compared ammonia emissions as reported in the CERR submittals and the 2002 Toxics Release Inventory; worked with S/L agencies to resolve any outstanding discrepancies.
- Compared SO_2 and NO_x emissions for EGUs to EPA's Clean Air Markets Division CEM database to identify any outstanding discrepancies. (A full discussion of the EGU emissions analysis is discussed later in Section 1.1.1.4)
- Prepared State-level emission summaries by pollutant for both the EGU and non-EGU sectors to allow S/L agencies to compare emissions as reported in the 1999 NEI Version 2, the VISTAS draft 2002 inventory, and the CERR submittals.
- Prepared facility-level emission summaries by pollutant to allow S/L agencies to review facility level emissions for reasonableness and accuracy.

We communicated the results of these analyses through email/telephone exchanges with the S/L point source contacts as well as through Excel summary spreadsheets. S/L agencies submitted corrections and updates as necessary to resolve any QA/QC issues from these checks.

1.1.1.3 PM Augmentation

Particulate matter emissions can be reported in many different forms, as follows:

PM Category	Description
PM-PRI	Primary PM (includes filterable and condensable)

PM-CON	Primary PM, condensable portion only (all less than 1 micron)
PM-FIL	Primary PM, filterable portion only
PM_{10}-PRI	Primary PM_{10} (includes filterable and condensable)
PM_{10}-FIL	Primary PM_{10} filterable portion only
$PM_{2.5}$ -PRI	Primary $PM_{2.5}$ (includes filterable and condensable)
$PM_{2.5}$ -FIL	Primary $PM_{2.5}$ filterable portion only

S/L agencies did not report PM emissions in a consistent manner. The State/local inventories submitted for VISTAS included emissions data for either PM-FIL, PM-PRI, PM_{10}-FIL, PM_{10}-PRI, $PM_{2.5}$ -FIL, $PM_{2.5}$ -PRI, and/or PM-CON. From any one of these pollutants, EPA has developed augmentation procedures to estimate PM_{10}-PRI, PM_{10}-FIL, $PM_{2.5}$ -PRI, $PM_{2.5}$ -FIL, and PM-CON. If not included in a State/local inventory, PM_{10}-PRI and $PM_{2.5}$ -PRI were calculated by adding PM_{10}-FIL and PM-CON or $PM_{2.5}$ -FIL and PM-CON, respectively.

The procedures for augmenting point source PM emissions are documented in detail in Appendix C of *Documentation for the Final 1999 National Emissions Inventory {Version 3} for Criteria Air Pollutants and Ammonia – Point Sources*, January 31, 2004). Briefly, the PM data augmentation procedure includes the following five steps:

- Step 1: Prepare S/L/T PM and PM_{10} Emissions for Input to the PM Calculator
- Step 2: Develop and Apply Source-Specific Conversion Factors
- Step 3: Prepare Factors from PM Calculator
- Step 4: Develop and Apply Algorithms to Estimate Emissions from S/L/T Inventory Data
- Step 5: Review Results and Update the NEI with Emission Estimates and Control Information.

Please refer to the EPA documentation for a complete description of the PM augmentation procedures.

Table 1.1-2 compares the original PM emission estimates from the S/L CERR submittals and the revised 2002 VISTAS emissions estimates calculated using the above methodology. This table is intended to show that we took whatever States provided in the way of PM and filled in gaps to add in PM-CON where emissions were missing in order to calculate PM_{10}-PRI and $PM_{2.5}$ -PRI for all processes to get a complete set of particulate data. We did not compare any other pollutants besides PM, since for other pollutants CERR emissions equal VISTAS emissions. As noted in Table 1.1-2, we made significant revisions to the PM emissions for Kentucky in the Base F inventory and for South Carolina in the Base G inventory.

Table 1.1-2 Comparison of Particulate Matter Emissions from the S/L Data Submittals and the Base G 2002 VISTAS Point Source Inventory

State	Database	PM-PRI	PM-FIL	PM-CON	PM_{10}-PRI	PM_{10}-FIL	$PM_{2.5}$ -PRI	$PM_{2.5}$ -FIL
AL	CERR	28,803	9,174	0	16,522	6,548	8,895	4,765
	VISTAS	43,368	33,336	10,129	32,791	22,661	23,290	13,328
FL	CERR	0	33,732	0	0	32,254	0	0
	VISTAS	61,728	37,325	24,403	57,243	32,840	46,147	21,744
GA	CERR	42,846	0	0	27,489	0	15,750	0
	VISTAS	44,835	37,088	7,799	33,202	25,403	22,777	15,085
KY	CERR	0	3,809	0	19,748	1,360	0	0
	VISTAS	27,719	22,349	5,329	21,326	15,963	14,173	8,749
MS	CERR	23,925	0	0	20,968	0	10,937	0
	VISTAS	23,928	17,632	6,296	21,089	14,793	11,044	5,739
NC	CERR	48,110	0	0	36,222	0	24,159	0
	VISTAS	48,114	41,407	6,708	36,992	30,284	27,512	21,113
SC	CERR	0	43,837	0	0	32,656	0	21,852
	VISTAS	43,844	38,633	5,210	34,799	29,588	26,418	21,207
TN	CERR	1,660	25,500	21,482	43,413	22,164	34,167	12,140
	VISTAS	56,797	32,085	24,715	50,937	26,269	41,442	16,774
VA	CERR	0	0	0	17,065	0	12,000	0
	VISTAS	40,856	36,414	4,442	17,065	12,623	12,771	8,607
WV	CERR	0	29,277	0	0	14,778	0	8445
	VISTAS	36,188	29,392	6,795	22,053	15,258	15,523	8,733

Note 1: CERR refers to data as submitted by S/L agencies; VISTAS refers to data calculated by MACTEC using the PM augmentation methodologies described in this document.

Note 2: KY DEP's initial CERR submittal reported particulate matter emissions using only PM-PRI pollutant code. MACTEC used this pollutant code during the initial PM augmentation routine. In February 2005, KY DEP indicated that data reported using the PM-PRI code should actually have been reported using the PM_{10}-PRI code. MACTEC performed a subsequent PM augmentation in April 2005 using the PM_{10}-PRI code. These changes were reflected in the Base F emission inventory.

Note 3: South Carolina Department of Health and Environmental Control (SC DHEC) initial CERR submittal reported particulate matter emissions using the PM-FIL, PM_{10}-FIL, and $PM_{2.5}$ -FIL pollutant codes. MACTEC used these pollutant codes during the initial PM augmentation routine. In August 2005, SC DHEC indicated that data reported using the PM-FIL, PM_{10}-FIL, and $PM_{2.5}$ -FIL pollutant codes should actually have been reported using the PM-PRI, PM_{10}-PRI, and $PM_{2.5}$ _PRI codes. MACTEC performed a subsequent PM augmentation in April 2006 using the revised pollutant codes. These changes were reflected in the Base G emission inventory.

Note 4: The emission values in the VISTAS emission rows above differ slightly from the final values in the Base G inventory. This is due to several corrections and updates to the 2002 inventory submitted by S/L agencies after the PM augmentation was performed as discussed in Section 1.1.1.6.

After the PM augmentation process was performed, we executed a series of checks to identify potential inconsistencies in the PM inventory. These checks included:

- PM-PRI less than PM_{10}-PRI, $PM_{2.5}$ -PRI, PM_{10}-FIL, $PM_{2.5}$ -FIL, or PM-CON;
- PM-FIL less than PM_{10}-FIL, $PM_{2.5}$ -FIL;
- PM_{10}-PRI less than $PM_{2.5}$ -PRI, PM_{10}-FIL, $PM_{2.5}$ -FIL or PM-CON;
- PM_{10}-FIL less than $PM_{2.5}$ -FIL;
- PM25-PRI less than $PM_{2.5}$ -FIL or PM-CON;
- The sum of PM_{10}-FIL and PM-CON not equal to PM_{10}-PRI; and
- The sum of $PM_{2.5}$ -FIL and PM-CON not equal to $PM_{2.5}$ -PRI.

S/L agencies were asked to review this information and provide corrections where the inconsistencies were significant. In general, corrections (or general directions) were provided in the case of the potential inconsistency issues. In other cases, the agency provided specific process level pollutant corrections.

Note that for the Base G inventory, only the PM_{10}-PRI and $PM_{2.5}$ -PRI emission estimates were retained since they are the only two PM species that are included in the air quality modeling. Other PM species were removed from the Base G inventory to facilitate emissions modeling.

1.1.1.4 EGU Analysis

We made a comparison of the annual SO_2 and NO_x emissions for EGUs as reported in the S/L agencies CERR submittals and EPA's Clean Air Markets Division (CAMD) CEM database to identify any outstanding discrepancies. Facilities report hourly CEM data to EPA for units that are subject to CEM reporting requirements of the NO_x State Implementation Plan (SIP) Call rule and Title IV of the Clean Air Act (CAA). EPA sums the hourly CEM emissions to the annual level, and we compared these annual CEM emissions to those in the S/L inventories. The 2002 CEM inventory containing NO_x and SO_2 emissions and heat input data were downloaded from the EPA CAMD web site (www.epa.gov/airmarkets).

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 S/L inventories, the State and county FIPS 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. We 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 Federal

Implementation Plan (FIPS), State facility ID, and emission unit ID in the S/L inventory. The initial crosswalk contained both the annual emissions summed from the CAMD database as well as the S/L emission estimate. It should be noted that the initial matching of the IDs in both inventories was based on previous crosswalks that had been developed for the preliminary VISTAS 2002 inventory and in-house information compiled by MACTEC and Alpine Geophysics. The matching at the facility level was nearly complete. In some cases, however, S/L agency or stakeholder 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 NO_x 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 final step was to compare the SO_2 and NO_x emissions for select Southern Company units in the VISTAS region. Southern Company is a super-regional company that owns EGUs in four VISTAS States – Alabama, Florida, Georgia, and Mississippi – and participates in VISTAS as an industry stakeholder. Southern Company independently provided emission estimates for 2002 as part of the development of the preliminary VISTAS 2002 inventory. In most cases, these estimates were reviewed by the States and incorporated into the States CERR submittal. The exception to this was a decision made by Georgia's Department of Environmental Protection (GDEP) to utilize CEM-based emissions for the actual 2002 emissions inventory for sources within the State when Southern Company also provided data. There were no major inconsistencies between the Southern Company data, the CAMD data, and the S/L CERR data.

The minor inconsistencies included small differences (<2 percent) in emission estimates, 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. We compared SO_2 and NO_x emissions on a unit by unit basis and did not find any major inconsistencies.

1.1.1.5 QA Review of Base F Inventory

QA checks were run on the Base F point source inventory data set to ensure that all corrections provided by the S/L agencies and stakeholders were correctly incorporated into the S/L inventories and that there were no remaining QA issues. After exporting the inventory to ASCII text files in NIF 3.0, the EPA QA program was run on the ASCII files and the QA output was reviewed to verify that all QA issues that could be addressed were resolved.

Throughout the inventory development process, QA steps were performed to ensure that no double counting of emissions occurred, and to ensure that a full and complete inventory was developed for VISTAS. QA was an important component to the inventory development process and MACTEC performed the following QA steps on the point source component of the VISTAS revised 2002 base year inventory:

1. Facility level emission summaries were prepared and evaluated to ensure that emissions were consistent and that there were no missing sources.
2. State-level EGU and non-EGU comparisons (by pollutant) were developed between the Base F 2002 base year inventory, the draft VISTAS 2002 inventory, and the 1999 NEI Version 2 inventory.
3. Data product summaries and raw NIF 3.0 data files were provided to the VISTAS Emission Inventory Technical Advisor and to the Point Source, EGU, and non-EGU Special Interest Work Group representatives for review and comment. Changes based on these comments were reviewed and approved by the S/L point source contact prior to implementing the changes in the files.
4. Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from Base F1 to Base F2.

1.1.1.6 Additional Base G Updates and Corrections

S/L agencies completed a detailed review of the Base F inventory. Table 1.1-3 summarizes the updates and corrections to the Base F inventory that were requested by S/L agencies and incorporated into the Base G inventory.

There was a discrepancy between the base year 2002 and 2009/2018 emissions for PM_{10}-PRI, $PM_{2.5}$-PRI, and NH_3. The 2002 emissions were provided directly by the S/L agencies and were estimated using a variety of techniques (i.e., EPA emission factors, S/L emission factors, site-specific emission factors, and source test data). The 2009/2018 emissions, on the other hand, were estimated by Pechan (see Section 2.1.1.3) using an emission factor file based solely on AP-42 emission factors. An adjustment was made for 2002 EGU PM and NH_3 emissions to reconcile these differences. The post-processed Integrated Planning Model® (IPM®) 2009/2018 output uses a set of PM and NH_3 emission factors that are "the most recent EPA approved uncontrolled emission factors" – these are most likely not the same emission factors used by States and emission inventory preparation contractors for estimating these emissions in 2002 for EGUs in the VISTAS domain. VISTAS performed a set of modifications to replace 2002 base year PM and NH_3 emission estimates with estimates derived from the most recent EPA-approved emission factors. For further details of the methodology used to make this adjustment, see *EGU Emission Factors and Emission Factor Assignment*, memorandum from Greg Stella to VISTAS State Point Source Contacts and VISTAS EGU Special Interest Workgroup, June 13, 2005.

Table 1.1-3 Summary of Updates and Corrections to the Base F 2002 Inventory Incorporated into the 2002 Base G Inventory.

Affected State(s)	Nature of Update/Correction
TN, WV	The latitude and longitude values for TN (except the four local programs) and WV were truncated to two decimal places in the Base F inventory. MACTEC re-exported the NIF ER tables in a manner that so that the latitude and longitude were not truncated in the Base G inventory.
AL	Corrected the latitude and longitude for two facilities: Ergon Terminalling (Site ID: 01-073-010730167) and Southern Power Franklin (Site ID: 01-081-0036).
	Corrections to stack parameters at 10 facilities for stacks with parameters that do not appear to fall into the ranges typically termed "acceptable" for AQ modeling.
FL	Corrected emission values for the Miami Dade RRF facility (Site ID: 12-086-0250348).
GA	Hercules Incorporated (12-051-05100005) had an erroneous process id (#3) within emission unit id SB9 and was deleted. This removes about 6,000 tons of SO_2 from the 2002 inventory.
	Provided a revised file of location coordinates at the stack level that was used to replace the location coordinated in the ER file.
NC	Made several changes to Base F inventory to correct the following errors: 1. Corrected emissions at Hooker Furniture (Site ID: 37-081-08100910), release point G-29, 9211.38 tons volatile organic compounds (VOC's) should be 212.2 tons, 529.58 tons PM_{10} should be 17.02 tons, 529.58 tons PM2.5 should be 15.79 tons in 2002 inventory. 2. Identified many stack parameters in the ER file that were unrealistic. Several have zero for height, diameter, gas velocity, and flow rate. NC used the procedures outlined in Section 8 of the document ""National Emission Inventory QA and Augmentation Report" to correct unrealistic stack parameters. 3. Identified truncated latitude and longitude values in Base F inventory. NC updated all Title V facility latitude and longitude that was submitted to EPA for those facilities in 2004. Smaller facilities with only two decimal places were not corrected. 4. Corrected emissions for International Paper (3709700045) Emission Unit ID, G-12, should be 1.8844 tons VOCs instead of 2819.19 tons in 2002
SC	Corrected PM species emission values. SC DHEC's initial CERR submittal reported particulate matter emissions using the PM-FIL, PM_{10}-FIL, and PM25-FIL pollutant codes. In August 2005, SC DHEC indicated that data reported using the PM-FIL, PM_{10}-FIL, and PM25-FIL pollutant codes should actually have been reported using the PM-PRI, PM_{10}-PRI, and PM25_PRI codes. MACTEC performed a subsequent PM augmentation in April 2006 using the revised pollutant codes. These changes were reflected in the Base G emission inventory.
TN	Identified six facilities that closed in 2000/2001 but had non-zero emissions in the 2002 Base F inventory. MACTEC changed emissions to zero for all pollutants in the Base G 2002 inventory.
	Supplied updated emission inventory for the Bowater facility (47-107-0012) based on the facility's updated 2002 emission inventory update.
	Replaced data from Hamilton County, Tennessee, using data from Hamilton County's CERR submittal as contained in EPA's 2002 NEI (in Base F, the inventory for Hamilton County was based on the draft VISTAS 2002 inventory, which in turn was based on the 1999 NEI).
	Updated emissions for PCS Nitrogen Fertilizer LP (Site ID: 47-157-00146)
WV	Updated emissions for Steel of West Virginia (Site ID: 54-011-0009)
	Made changes to several Site ID names due to changes in ownership
	Made corrections to latitude/longitude and stack parameters at a few facilities for stacks with parameters that do not appear to fall into the ranges typically termed "acceptable" for AQ modeling.

1.1.1.7 Summary of B&F 2002 Inventory

Tables 1.1-4 through 1.1-10 summarize the B&F 2002 base year inventory. All values are in tons. Note that no changes to the Base G 2002 point source inventory were made during the Base G2 and B&F update cycles (in other words, Base G = Base G2 = B&F)

For the purposes of Tables 1.1-4 through 1.1-10, 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. Note that aggregating emissions into EGU and non-EGU sectors based on the above SCCs causes a minor inconsistency with the EGU emissions reported in EPA's CAMD database. The EGU emissions summarized in these tables may include emissions from some smaller electric generating units in the VISTAS inventory that are not in CAMD's 2002 CEM database or the IPM forecasted emissions. The minor inconsistencies result in a less than 2 percent difference between the summary tables below and the data from CAMD's CEM database.

Table 1.1-4 Base G / B&F 2002 VISTAS Point Source Inventory for SO_2 (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	544,309	447,828	96,481
FL	518,721	453,631	65,090
GA	568,731	514,952	53,778
KY	518,086	484,057	34,029
MS	103,388	67,429	35,960
NC	522,113	477,990	44,123
SC	259,916	206,399	53,518
TN	413,755	334,151	79,604
VA	305,106	241,204	63,903
WV	570,153	516,084	54,070
Total	**4,324,278**	**3,743,725**	**580,556**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-5 Base G / B&F 2002 VISTAS Point Source Inventory for NO_x (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	244,348	161,038	83,310
FL	302,834	257,677	45,156
GA	196,767	147,517	49,251
KY	237,209	198,817	38,392
MS	104,661	43,135	61,526
NC	196,782	151,854	44,928
SC	130,394	88,241	42,153
TN	221,652	157,307	64,344
VA	147,300	86,886	60,415
WV	277,589	230,977	46,612
Total	**2,059,536**	**1,523,449**	**536,087**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-6 Base G / B&F 2002 VISTAS Point Source Inventory for VOC (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	49,332	2,295	47,037
FL	40,995	2,524	38,471
GA	34,952	1,244	33,709
KY	46,321	1,487	44,834
MS	43,852	648	43,204
NC	62,170	988	61,182
SC	38,927	470	38,458
TN	85,254	926	84,328
VA	43,906	754	43,152
WV	15,775	1,180	14,595
Total	**461,484**	**12,516**	**448,970**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-7 Base G / B&F 2002 VISTAS Point Source Inventory for CO (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	185,550	11,279	174,271
FL	139,045	57,113	81,933
GA	140,561	9,712	130,850
KY	122,555	12,619	109,936
MS	59,871	5,303	54,568
NC	64,461	13,885	50,576
SC	63,305	6,990	56,315
TN	122,348	7,084	115,264
VA	70,688	6,892	63,796
WV	100,220	10,341	89,879
Total	**1,068,604**	**141,218**	**927,388**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-8 Base G / B&F 2002 VISTAS Point Source Inventory for PM_{10}-PRI (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	32,886	7,646	25,240
FL	57,243	21,387	35,857
GA	32,834	11,224	21,610
KY	21,326	4,701	16,626
MS	21,106	1,633	19,472
NC	36,592	22,754	13,838
SC	35,542	21,400	14,142
TN	49,814	14,640	35,174
VA	17,211	3,960	13,252
WV	22,076	4,573	17,503
Total	**326,630**	**113,918**	**212,714**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-9 Base G / B&F 2002 VISTAS Point Source Inventory for $PM_{2.5}$ -PRI (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	23,291	4,113	19,178
FL	46,148	15,643	30,504
GA	22,401	4,939	17,462
KY	14,173	2,802	11,372
MS	11,044	1,138	9,906
NC	26,998	16,498	10,500
SC	27,399	17,154	10,245
TN	39,973	12,166	27,807
VA	12,771	2,606	10,165
WV	15,523	2,210	13,313
Total	**239,721**	**79,269**	**160,452**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

Table 1.1-10 Base G / B&F 2002 VISTAS Point Source Inventory for NH_3 (tons/year).

State	All Point Sources	EGUs	Non-EGUs
AL	2,200	317	1,883
FL	1,657	234	1,423
GA	3,697	83	3,613
KY	1,000	326	674
MS	1,359	190	1,169
NC	1,234	54	1,180
SC	1,553	142	1,411
TN	1,817	204	1,613
VA	3,230	127	3,104
WV	453	121	332
Total	**18,200**	**1,798**	**16,402**

Note: EGU emissions include SCCs 1-01-xxx-xx and 2-01-xxx-xx; non-EGU has all other SCCs.

1.1.2 Development of Typical Year EGU inventory

VISTAS developed a typical year 2002 emission inventory for EGUs to avoid anomalies in emissions due to variability in meteorology, economic, and outage factors in 2002. The typical year inventory represents the five year (2000-2004) period and was used to determine the regional haze reasonable progress goals. Actual 2002 emissions were used when comparing the CMAQ modeling results to the 2002 measurements in the model performance evaluation. A detailed discussion of how the actual and typical year EGU inventories were used for modeling is contained in the *Technical Support Document for VISTAS Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans* located on the VISTAS web site (http://www.vistas-sesarm.org)

Data from EPA's CAMD were used to develop normalization factors for producing a 2002 typical year inventory for EGUs. We used the ratio of the 2000-2004 average heat input and the 2002 actual heat input to normalize the 2002 actual emissions. MACTEC obtained data from EPA's CAMD for utilities regulated by the Acid Rain program. Annual data for the period 2000 to 2004 were obtained from the CAMD web site (www.epa.gov/airmarkets). The parameters available were the SO_2 and NO_x emission rates, heat input, and operating hours. We used the actual 2002 heat input and the average heat input for the 5-year period from 2000-2004 as the normalization factor, as follows:

$$\text{Normalization Factor:} \quad \frac{\text{2000-2004 average heat input}}{\text{2002 actual heat input}}$$

If the unit did not operate for all five years, then the 2000-2004 average heat input was calculated for the one or two years in which the unit did operate. For example, if the unit operated only during 2002, then the normalization factor would be 1.0. The annual actual emissions were multiplied by the normalization factor to determine the typical emissions for 2002, as follows:

$$\text{Typical Emissions} = \text{2002 actual emissions} \times \text{Normalization Factor}$$

After applying the normalization factor, some adjustments were needed for special circumstances. For example, a unit may not have operated in 2002 and thus have zero emissions. If the unit had been permanently retired prior to 2002, then we used zero emissions for the typical year. If the unit had not been permanently retired and would normally operate in a typical year, then we used the 2001 (or 2000) heat input and emission rate to calculate the typical year emissions.

The Southern Company provided typical year data for their sources. Hourly emissions data for criteria pollutants were provided. MACTEC aggregated the hourly emissions into annual values. Further documentation of how Southern Company created the typical year inventory for their

units can be found in *Developing Southern Company Emissions and Flue Gas Characteristics for VISTAS Regional Haze Modeling (April 2005, presented at 14th International Emission Inventory Conference* http://www.epa.gov/ttn/chief/conference/ei14/session9/kandasamy.pdf). Since Southern Company only supplied filterable particulate emissions, we ran the $PM_{10}/PM_{2.5}$ augmentation routine to calculate annual emission estimates for PM_{10}-PRI and $PM_{2.5}$-PRI. The Southern Company typical year data were used for Southern Company sources in Alabama, Florida, and Mississippi. Georgia EPD elected to use the typical year normalization factor derived from the CAMD data instead of the Southern Company typical year data (as was used in the Base F inventory).

The final step was to replace the 2002 actual emissions with the 2002 typical year data described above. MACTEC provided the raw data and results of the typical year calculations in a spreadsheet for S/L agency review and comment. Any comments made were incorporated into the Base G inventory.

Table 1.1-11 summarizes emissions by State and pollutant for the actual 2002 EGU inventory and the typical year EGU inventory. For the entire VISTAS region, actual 2002 SO_2 emissions were about 1.6 percent higher than the typical year emissions. The differences on a state-be-state basis ranged from actual emissions being 2.3 percent lower in Kentucky to 10.9 percent higher in Mississippi. For the entire VISTAS region, actual 2002 NO_x emissions were about 1.7 percent lower than the typical year emissions. The differences on a state-be-state basis ranged from actual emissions being 1.6 percent lower in Kentucky to 6.3 percent higher in Mississippi.

Table 1.1-11 Comparison of SO_2 and NO_x Emissions (tons/year) for EGUs.

	SO_2 Emissions (tons/year)			NO_x Emissions (tons/year)		
State	**Actual 2002**	**Typical 2002**	**Percentage Difference**	**Actual 2002**	**Typical 2002**	**Percentage Difference**
AL	447,828	423,736	5.4	161,038	154,704	3.9
FL	453,631	444,383	2.0	257,677	255,678	0.8
GA	514,952	517,633	-0.5	147,517	148,126	-0.4
KY	484,057	495,153	-2.3	198,817	201,928	-1.6
MS	67,429	60,086	10.9	43,135	40,433	6.3
NC	477,990	478,489	-0.1	151,854	148,812	2.0
SC	206,399	210,272	-1.9	88,241	88,528	-0.3
TN	334,151	320,146	4.2	157,307	152,137	3.3
VA	241,204	233,691	3.1	86,886	85,081	2.1
WV	516,084	500,381	3.0	230,977	222,437	3.7
Total	**3,743,725**	**3,683,968**	**1.6**	**1,523,449**	**1,497,864**	**1.7**

Note: a negative percentage difference indicates actual emissions are less than the typical year emissions.

1.2 Area Sources

This section details the development of the Base G 2002 base year inventory for area sources. There are three major components of the area source sector of the inventory. The first component is the "typical" year fire inventory. Version 3.1 of the VISTAS base year fire inventory provided actual 2002 emissions estimates. Since fire emissions are not easily grown or projected, in order to effectively represent fires in both the base and future year inventories, VISTAS determined that a typical year fire inventory was necessary. Development of the "typical" year fire inventory covered wildfire, prescribed burning, agricultural fires and land clearing fires. The first part of this section of the report discusses the development of the typical year fire inventory. The methodology provided in that section is identical to the documentation provided for Base F since the "typical" year inventory was developed as part of the Base F development effort. The major change in Base G for the fire component of the inventory was the development of projection year inventories that represent alternatives to the "typical" year inventory. These alternative projections incorporated projected changes in the acreage burned for prescribed fires on Federal lands. These projections are an augmentation of the "typical" year inventory.

The second component of the area source inventory was the incorporation of data submitted by the VISTAS States to the United States Environmental Protection Agency (EPA) as part of the CERR. Work on incorporating the CERR data into the revised base year involved: 1) obtaining the data from EPA, 2) evaluating the emissions and pollutants reported in order to avoid double counting and 3) backfilling from the existing VISTAS 2002 base year inventory for missing sources/pollutants. The processes used to perform those operations are described in the second portion of this section. That work was performed as part of the Base F inventory effort. In general no changes to that method were made as part of the Base G inventory updates. The methods used for the Base F inventory development effort using the CERR submittals have been maintained in this document. Where necessary, additional documentation has been added to 1) reflect changes that resulted from VISTAS States review of the Base F inventory and the incorporation of those changes into Base G, 2) changes made to how certain sources were estimated or 3) addition of new sources not found in Base F.

The final component of the area source inventory was related to the development of NH_3 emission estimates for livestock and fertilizers and paved road PM emissions. For the NH_3 emission estimates for livestock and fertilizers we used version 3.6 of the Carnegie Mellon University (CMU) NH_3 model. For the paved road PM emissions, we used the most recent estimates developed by EPA as part of the National Emission Inventory (NEI) development effort. EPA had developed an improved methodology for estimating paved road emissions so those values were substituted directly into the inventory after receiving consensus from all of the VISTAS States to perform the replacement. Details on these methods are provided in the third

portion of this section of the document. That section is virtually identical to that from the Base F inventory document as there were only a couple of changes to the ammonia portion of the inventory and some updates to all fugitive dust categories including paved roads on a global basis between Base F and Base G.

Finally, quality assurance steps for each component of the area source inventory are discussed.

1.2.1 Development of a "typical" year fire inventory

Typical year fire emissions were developed starting from the actual fire acreage data and emission calculated for each VISTAS State. The table below shows the data submitted by each State in the VISTAS region indicating what data was received from each State for the purposes of calculating actual fire emissions.

Fire Type	AL	FL	GA	KY	MS	NC	SC	TN	VA	WV
Land Clearing	✓	✓	✓				✓			
Ag Burning	✓	✓	✓				✓			
Wildfires	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Prescribed	✓	✓	✓	✓	✓	✓	✓	✓		✓

In order to effectively characterize fire emissions in the VISTAS region, a typical (as opposed to strictly 2002 year based inventory) was required. Development of a typical year fire inventory provided the capability of using a comparable data set for both the base year and future years. Thus fire emissions would remain the same for air quality and visibility modeling in both the base and any future years. MACTEC originally proposed five different methods for developing the typical fire year to the VISTAS Fire Special Interest Work Group (SIWG) and requested their feedback and preference for developing the final typical year inventory. The method that was selected by SIWG members was to use a method similar to that used to develop an early version of a 2018 projection inventory. For that early 2018 inventory, State level ratios of acres over a longer term record (three or more years) developed for each fire type relative to 2002. The 2002 acreage was then scaled up or down based on these ratios to develop a typical year inventory. For Base F and G, the decision of the VISTAS Fire SIWG was to base the ratio on county level data for States that supplied long term fire-by-fire acreage data rather than State-level ratios. Where States did not supply long term fire-by-fire acreage data, MACTEC reverted to using State-level ratios. With one broad exception (wildfires) this method was implemented for all fires. MACTEC solicited long term fire-by-fire acreage data by fire type from each VISTAS State. A minimum of three or more years of data were used to develop the ratios. Those

data were then used to develop a ratio for each county based on the number of acres burned in each county for each fire type relative to 2002.

Thus if we had long term county prescribed fire data from a State, we developed a county acreage ratio of:

$$Ratio = \frac{\text{Long term average county level Rx acres}}{\text{2002 actual county level Rx acreage}}$$

This ratio was then multiplied times the actual 2002 acreage to get a typical value (basically the long term average county level acres). Wherever possible this calculation was performed on a fire by fire basis. The acreage calculated using the ratio was then used with the fuel loading and emission factor values that we already had (and had been reviewed by the SIWG) to calculate emissions using the same method used for the 2002 actual values (which were previously documented). The following lists indicate which counties used the State ratios by fire type.

Land Clearing		Agricultural Fires		Prescribed Burning	
FIPS	**COUNTY**	**FIPS**	**COUNTY**	**FIPS**	**COUNTY**
12086	Miami-Dade County	13063	Clayton County	13059	Clarke County
12037	Franklin County	13083	Dade County	13083	Dade County
12043	Glades County	13089	Dekalb County	13089	Dekalb County
12045	Gulf County	13097	Douglas County	13097	Douglas County
12049	Hardee County	13121	Fulton County	13121	Fulton County
12057	Hillsborough County	13135	Gwinnett County	13123	Gilmer County
12073	Leon County	13137	Habersham County	13135	Gwinnett County
12077	Liberty County	13215	Muscogee County	13139	Hall County
12081	Manatee County	13227	Pickens County	13215	Muscogee County
12095	Orange County	13241	Rabun County	13241	Rabun County
12097	Osceola County	13247	Rockdale County	13247	Rockdale County
12103	Pinellas County	13311	White County		
12115	Sarasota County				
13015	Bartow County				
13021	Bibb County				
13045	Carroll County				
13047	Catoosa County				
13057	Cherokee County				
13059	Clarke County				
13063	Clayton County				
13073	Columbia County				
13077	Coweta County				
13083	Dade County				
13089	Dekalb County				
13097	Douglas County				
13117	Forsyth County				
13121	Fulton County				
13129	Gordon County				
13135	Gwinnett County				
13137	Habersham County				
13143	Haralson County				
13147	Hart County				

Land Clearing		Agricultural Fires		Prescribed Burning	
FIPS	COUNTY	FIPS	COUNTY	FIPS	COUNTY
13151	Henry County				
13169	Jones County				
13215	Muscogee County				
13237	Putnam County				
13241	Rabun County				
13291	Union County				
13311	White County				

There were three exceptions to this method.

Exception 1: Use of State Ratios for Wildfires

The first exception was that wildfires estimates were developed using State ratios rather than county ratios. This change was made after initial quality assurance of the draft estimates revealed that some counties were showing unrealistic values created by very short term data records or missing data that created unrealistic ratios. In addition, exceptionally large and small fires were removed from the database since they were felt to be atypical. For example the Blackjack Complex fire in Georgia was removed from the dataset because the number of acres burned was “atypical” in that fire. We also removed all fires less than 0.1 acres from the dataset.

Exception 2: Correction for Blackened Acres on Forest Service Lands

Following discussions with the United States Forest Service (Forest Service) (memo from Cindy Huber and Bill Jackson, dated August 13, 2004), it was determined that the acres submitted by the Forest Service for wildfires and prescribed fires represented perimeter acres rather than “blackened” acres. Thus for wildfires and prescribed fires on Forest Service lands, a further correction was implemented to correct the perimeter acre values to blackened acres. The correction was made based on the size of the fire. For prescribed fires over 100 acres in size the acreage was adjusted to be 80 percent of the initial reported value. For prescribed fires of 100 acres or less the acreage values were maintained as reported. For wildfires, all reported acreage values were adjusted to be 66 percent of their initially reported values. These changes were made to all values reported for Forest Service managed lands.

Exception 3: Missing/Non-reported data

When we did not receive data from a VISTAS State for a particular fire type, a composite average for the entire VISTAS region was used to determine the typical value for that type fire. For example, if no agricultural burning long term acreage data was reported for a particular State, MACTEC determined an overall VISTAS regional average ratio that was used to multiply

times the 2002 values to produce the “typical” values. This technique was applied to all fire types when data was missing.

In addition, for wildfires and prescribed burning, ratios were developed for “northern” and “southern” tier States within the VISTAS region and those ratios were applied to each State with missing data depending upon whether they were considered a “northern” or “southern” tier State. Development of “southern” and “northern” tier data was an attempt to account for a change from a predominantly pine/evergreen ecosystem (southern) to a pine/deciduous ecosystem (northern). States classified as “southern” included: AL, FL, GA, MS, and SC. States classified as “northern” included: KY, NC, TN, VA, and WV.

Finally for land clearing and agricultural fires, there are no NH_3 and SO_2 emissions. This is due to the lack of emission factors for these pollutants for these fire types.

Table 1.2-1 shows fire emissions from the original base year emission inventory (VISTAS 3.1), the actual 2002 emissions and the typical year emissions for the entire VISTAS region. The actual 2002 and typical fire emissions represent the Base F and Base G 2002 emissions. The typical emissions also represent the 2009 and 2018 emissions for all fire types with the exception of prescribed burning. Revisions made to the typical year prescribed fire emissions for 2009 and 2018 are detailed in the projection section. Also, State level Base G emissions from fires for all years can be found in the tables in Appendix A. Values for fires in those tables are “typical” year values.

Figures 1.2-1 through 1.2-4 show the State by State changes in emissions between the original 2002 base year fire inventories, the actual 2002 and the typical year inventories for carbon monoxide (CO) by fire type. Due to the relative magnitude of CO emissions compared to other criteria and PM pollutants from fires; this pollutant is normally chosen to represent the distribution of fires in the example plots.

Table 1.2-1 Emissions from Fires in the VISTAS Region – Comparison between Original Base Year 2002 (VISTAS 3.1), 2002 Actual and Typical Year Base G Emissions.

		CO	NH_3	NO_X	PM_{10}-FIL	PM_{10}-PRI	$PM_{2.5}$-FIL	$PM_{2.5}$-PRI	SO_2	VOC
Total LC	Actual (Base G)	492,409	0	14,568	62,146	62,146	62,146	62,146	0	33,799
	Typical (Base G)	675,838	0	19,995	80,598	80,598	80,598	80,598	0	46,389
	VISTAS 3.1	484,240	0	14,327	61,325	61,325	61,325	61,325	0	33,238
Total Ag	Actual (Base G)	164,273	0	903	30,958	30,958	30,385	30,385	0	21,946
	Typical (Base G)	161,667	0	903	30,465	30,465	29,892	29,892	0	21,595
	VISTAS 3.1	331,073	0	903	41,480	41,480	40,192	40,192	0	41,875
Total WF	Actual (Base G)	298,835	1,333	6,628	28,923	28,923	24,926	24,926	1,611	16,804
	Typical (Base G)	547,174	2,451	11,955	53,070	53,070	45,635	45,635	3,072	28,491
	VISTAS 3.1	275,766	1,230	6,133	26,680	26,680	23,002	23,002	1,476	15,718
Total RX	Actual (Base G)	1,678,216	7,616	36,561	168,938	168,938	145,175	145,175	9,839	78,988
	Typical (Base G)	1,635,776	7,425	35,650	164,811	164,811	141,636	141,636	9,590	76,990
	VISTAS 3.1	1,724,940	7,822	37,556	173,590	173,590	149,181	149,181	10,101	81,188

Key: LC = Land Clearing; Ag = Agricultural burning; WF = wildfires; RX = prescribed burning. Actual and Typical represent Base F and Base G (e.g., no change in methodology for Base F and Base G) for 2002.

Figure 1.2-1 CO Emissions from Agricultural Burning for the Original Base Year, 2002 Actual Base G, and 2002 Typical Base G Inventories.

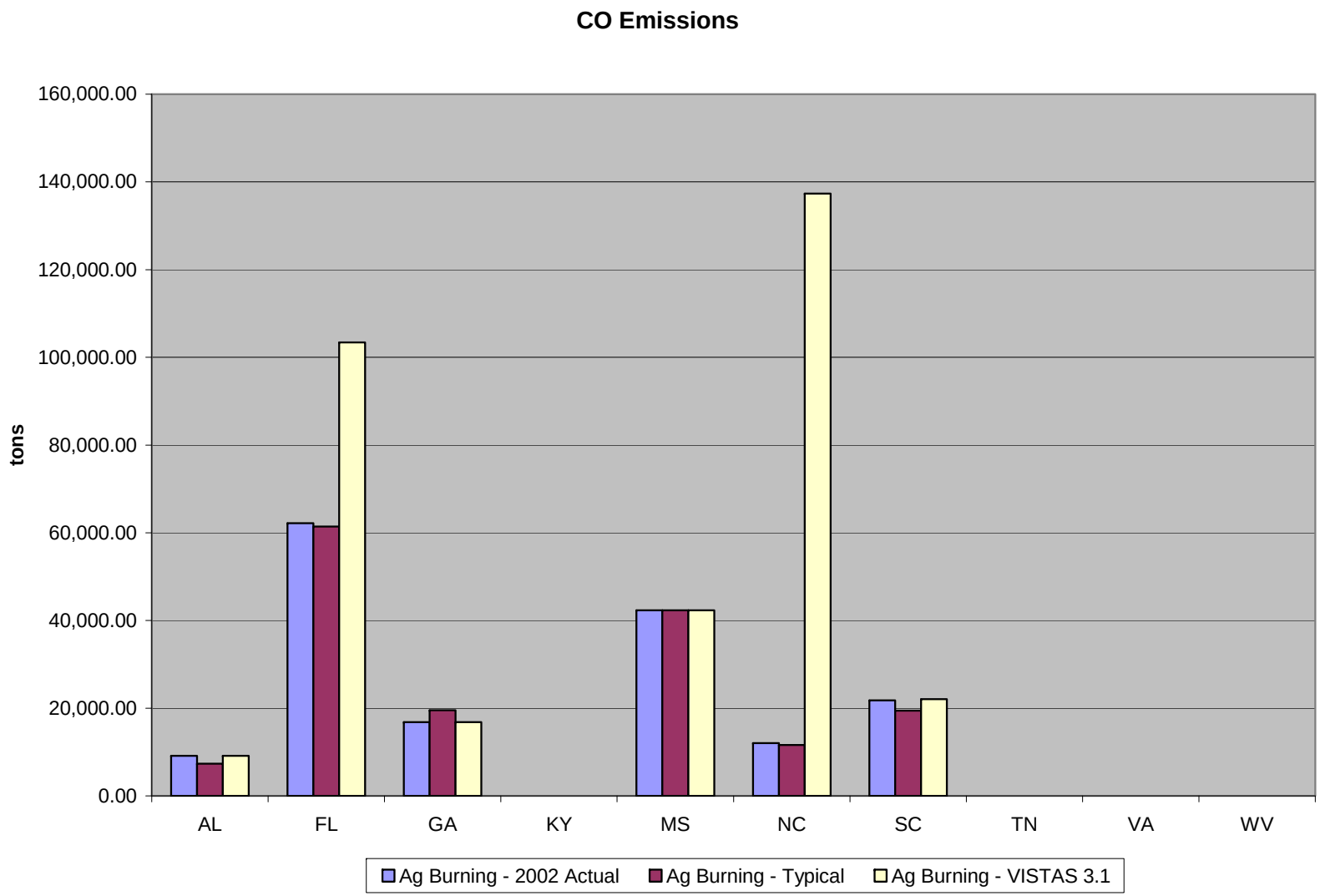


Figure 1.2-2 CO Emissions from Land Clearing Burning for the Original Base Year, 2002 Actual Base G and 2002 Typical Base G Inventories.

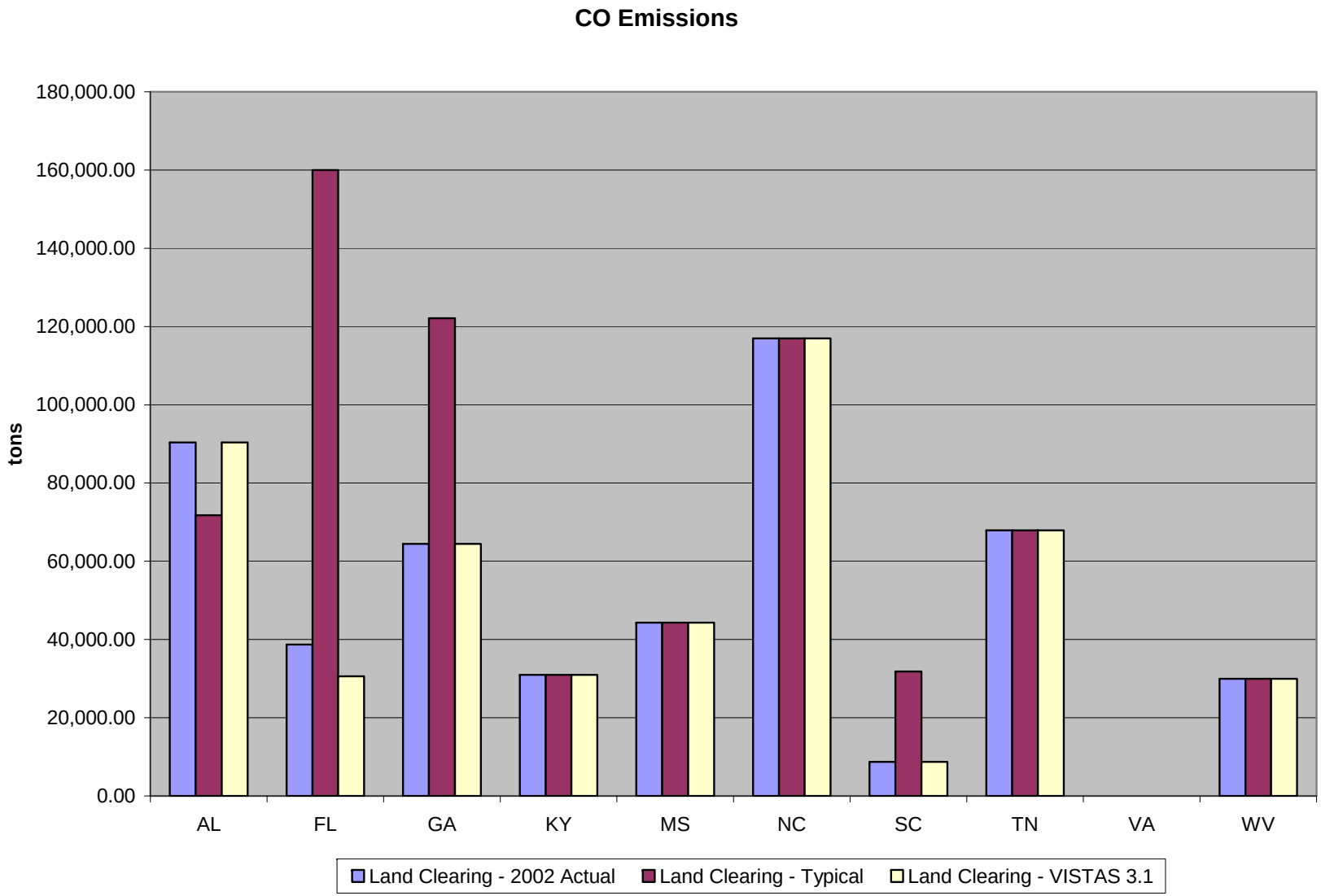


Figure 1.2-3 CO Emissions from Prescribed Burning for the Original Base Year, 2002 Actual Base G and 2002 Typical Base G Inventories.

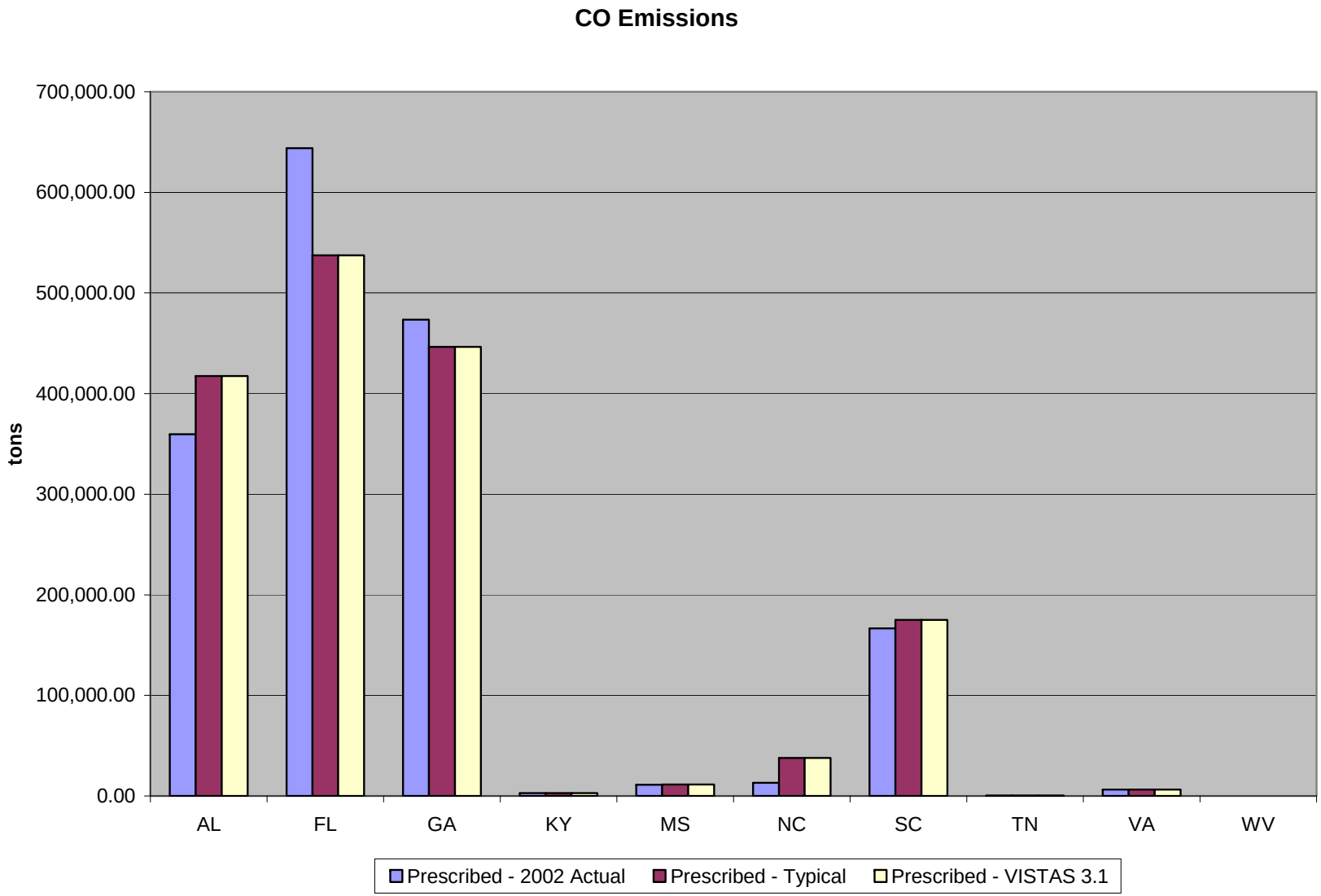
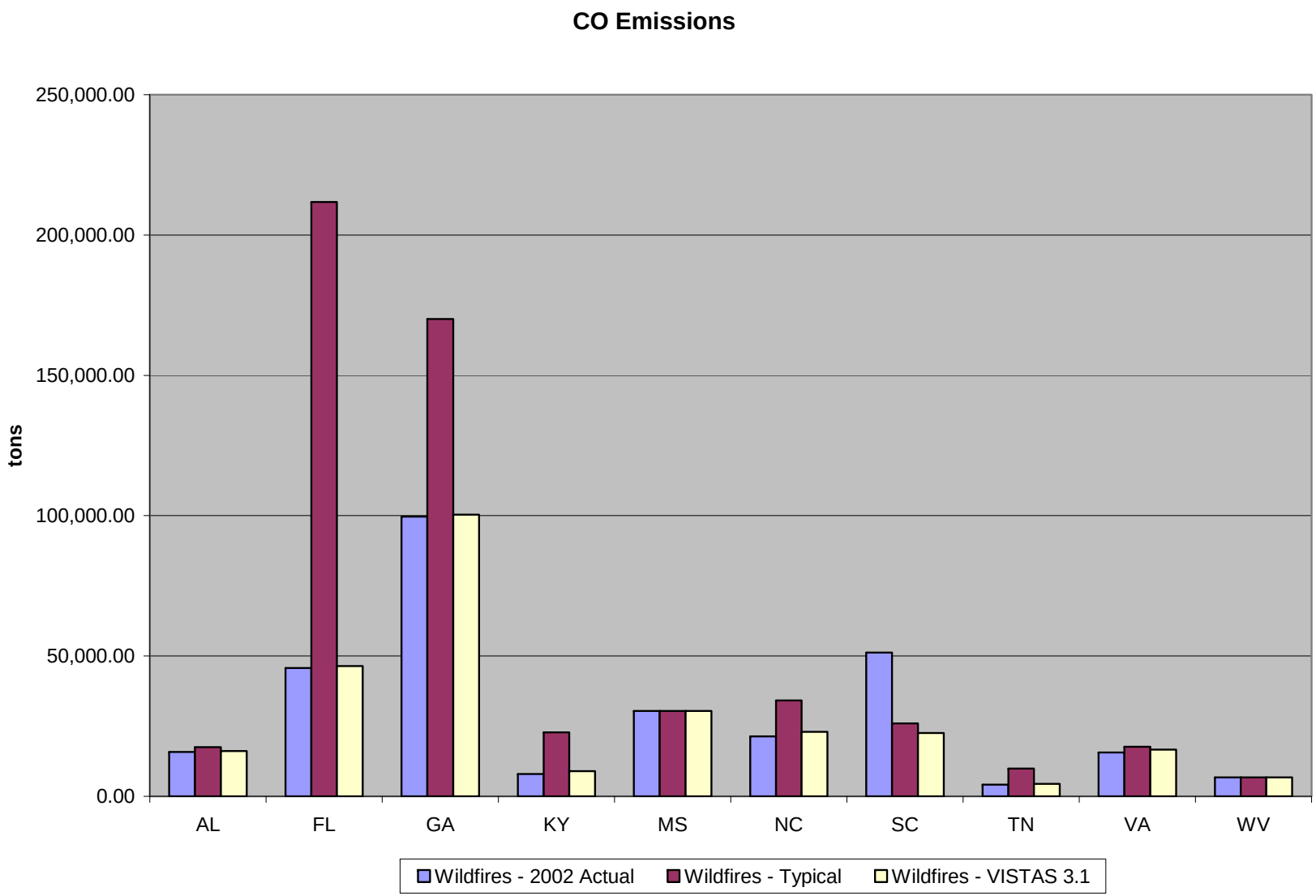


Figure 1.2-4 CO Emissions from Wildfire Burning for the Original Base Year, 2002 Actual Base G and 2002 Typical Base G Inventories.



1.2.2 Development of non-fire inventory

The second task in preparing the area source component of the Base F and Base G 2002 base year inventory was the incorporation of data submitted by the VISTAS States to the EPA as part of the CERR. With few exceptions, Base F and Base G inventories for this component of the inventory are identical. Modifications to the Base F methodology (described below) only resulted from modifications from the VISTAS States during review of the Base F inventory. The changes made to the inventory based on these reviews are described in the last portion of this section of the report. The information presented below describes the method used to incorporate CERR data as part of Base F.

Work on incorporating the CERR data into the 2002 Base F inventory involved: 1) obtaining the data from EPA, 2) evaluating the emissions and pollutants reported in order to avoid double counting and 3) backfilling from the earlier version of the VISTAS 2002 base year inventory for missing sources/pollutants. The processes used to perform those operations are described below. This work did not include any of the fire emission estimates described above. In addition it did not include emission estimates for ammonia from agricultural and fertilizer sources. Finally it did not include PM emissions from paved roads. Each of those categories was estimated separately.

Data on the CERR submittals was obtained from EPA's Draft NEI download file transfer protocol (FTP) site where the data are stored after they've been processed for review. The data submitted in National Emission Inventory Format (NIF) was downloaded from that site. Once all of the files were obtained, MACTEC ran the files through the EPA NIF Format and Content checking tool to ensure that the files were submitted in standard NIF format and that there were no issues with those files. In a couple of cases small errors were found. For example, in one case a county FIPs code that was no longer in use was found. MACTEC contacted each VISTAS State area source contact person to resolve the issues with the files and corrections were made. Once all corrections to the native files were completed, MACTEC continued with the incorporation of the data into the VISTAS area source files.

Our general assumption was that unless we determined otherwise, the CERR submittals represented full and complete inventories. Where a State submitted a complete inventory, our plan was to simply delete the previous 2002 base year data and replace it with the CERR submittal. Prior to this replacement however, we stripped out the following emissions:

1. All wildfire, prescribed burning, land clearing and agricultural burning emissions submitted to EPA by the States as part of the CERR process were removed since they were to be replaced with emissions estimated using methods described earlier.
2. All fertilizer and agricultural ammonia emission records submitted to EPA by the States as part of the CERR process were removed. These were replaced with the estimates developed using the CMU Ammonia model.

3. All emissions from paved roads submitted to EPA by the States as part of the CERR process were removed. These emissions were replaced with updated emissions developed by U.S. EPA as part of their 2002 NEI development effort.

This approach was used for most State and Local emission submittals to prepare the Base F inventory. There were a few cases where alternative data were used to prepare the Base F inventory. In general, these alternatives involved submittal of alternative files to the CERR data by S/L agencies. Table 1.2-2 below summarizes the data used to prepare the Base F inventory. In general the data were derived from one of the following sources:

1. CERR submittal obtained from EPA FTP site as directed by VISTAS States;
2. State submitted file (either revised from CERR submittal or separate format);
3. VISTAS original 2002 base year (VISTAS version 3.1 base year file); or
4. EPA's preliminary 2002 NEI.

Table 1.2-2 Summary of State Data Submittals for the 2002 VISTAS Area Source Base F Inventory

State / Local Program	Area Source Emissions Data Source
AL	B
FL	B
GA	C
KY	A
MS	B
NC	C
SC	B
TN	B
VA	B
WV	A/C
Davidson County, TN	B
Hamilton County, TN	C
Memphis/Shelby County, TN	A
Knox County, TN	B
Jefferson County, AL	* so B from State
Jefferson County, KY	B
Buncombe County, NC	* so C from State
Forsyth County, NC	* so C from State
Mecklenburg County, NC	* so C from State

A = VISTAS 2002 (version 3.1)
B = CERR Submittal from EPA's ftp site
C = Other (CERR or other submittal sent directly from State to MACTEC)
* = No response

In order to track the sources of data in the final Base F and Base G NIF files, a field was added to the NIF format files developed for VISTAS to track each data source. A field named Data_Source was added to the EM table. A series of codes were added to this field to mark the source of each emissions value in the Base F and Base G inventories. Values in this field are detailed in Table 1.2-3.

Table 1.2-3 Data Source Codes and Data Sources for VISTAS 2002 Base F Area Source Emissions Inventory.

Data Source Codes	Data Source
Base F Codes	
CMU Model	CMU Ammonia model v 3.6
E-02-X or E-99-F or L-02-X or S-02-X	EPA CERR submittal (from FTP site)
EPA Paved	EPA Paved Road emissions estimates
EPAPRE02NEI	EPA Preliminary 2002 NEI
STATEFILE	State submitted file
VISTBASYR31	VISTAS 2002 Base Year version 3.1
VISTRATIO	Developed from VISTAS Ratios (used only for missing pollutants)
Additional Base G Codes	
ALBASEGFILE	Base G update file provided by AL
NCBASEGFILE	Base G update file provided by NC
OTAQRPT	Portable Fuel Container Emissions from OTAQ Report
STELLA	Revised data provided by VISTAS EI Advisor Greg Stella
VABASEGFILE	Base G update file provided by VA
VAStateFile	Revisions/additions to Base G update file provided by VA

Most States submitted complete inventories for Base F. Virginia's inventory required a two stage update. Virginia's CERR submittal only contained ozone precursor pollutants (including CO). For Virginia, MACTEC's original plan was to maintain the previous 2002 VISTAS base year emissions for non-ozone pollutants and then do a simple replacement for ozone pollutants. However during the QA phase of the work, MACTEC discovered that there were categories that had ozone precursor or CO emissions in the submittal that weren't in the original 2002 VISTAS base year inventory that should have PM or SO_2 emissions. For those records, MACTEC used an

emissions ratio to build records for emissions of these pollutants. Data for Virginia PM and SO_2 emissions were generated by developing SCC level ratios to NO_x from the VISTAS 2002 base year inventory (version 3.1) or from emission factors and then calculating the emissions based on that ratio.

1.2.3 2002 Base G inventory updates

After the Base F inventory was submitted and used for modeling, VISTAS States were provided an opportunity for further review and comment on the Base F inventory. As a result of this review and comment period, several VISTAS States provided revisions to the Base F inventory.

In addition to and as an outgrowth of some of the comments provided by the States during the review process, some of the changes made to the inventory were made globally across the entire VISTAS region. This section discusses the specific State changes followed by the global changes made to the area source component of the inventory for all VISTAS States.

1.2.3.1 Changes resulting from State review and comment

Alabama

Alabama suggested several changes and had questions concerning a few categories in the Base F inventory. The changes/questions were:

1. For Source Classification Code (SCC) 2102005000 (Industrial Boilers: Residual Oil) and SCC 2103007000 (Institutional/Commercial Heating: Liquefied Petroleum Gas) the Alabama noted that the Base F VISTAS inventory had values for NO_x, VOC and CO for the State, but no values for SO_2, PM_{10} or $PM_{2.5}$.

MACTEC evaluated this information and found that there were actually emissions for two counties in AL for that SCC that had either SO_2 and/or PM emissions. The data used to develop the 2002 Base F inventory for AL came from the preliminary 2002 CERR submittals (see above) which should have included SO_2 and PM but did not except for two counties. According to MACTEC's protocol for use of these files, the files received from EPA were to be used "as is" unless the States provided comments during the Base F comment period to correct the CERR submittal. No comments were received from AL on the CERR submittal used for Base F. For 2002 Base G, AL provided an updated database file for these SCCs for all counties in the State that provided revised values for emissions and included SO_2 and PM. The revised file was used to update the Base F data for Base G.

2. AL noted that the Base F inventory included SCC 2401002000 (Solvent Utilization, Surface Coating, Architectural Coatings - Solvent-based, Total: All Solvent Types) and 2401003000 (Solvent Utilization, Surface Coating,

Architectural Coatings - Water-based, Total: All Solvent Types) as well as SCC 2401001000 (Solvent Utilization, Surface Coating, Architectural Coatings, Total: All Solvent Types). This resulted in double counting of the emissions for this category. AL suggested removal of the breakdown SCCs and use of the total SCC.

MACTEC deleted records for the breakdown SCCs and retained the total all solvents SCC emissions.

3. AL found the SCCs listed below missing from the Base F VISTAS inventory.

SCC	VOC Emissions	SCC Description
2401025000	1139.91	Surface Coatings: Metal Furniture, all coating types
2401030000	425.27	Surface Coatings: Paper, all coating types
2401065000	344.08	Surface Coatings: Electronic and Other Electrical, all coating types
2430000000	504.29	Solvent Utilization, Rubber/Plastics, All Processes, Total: All Solvent Types
2440020000	3043.78	Solvent Utilization, Miscellaneous Industrial, Adhesive (Industrial) Application, Total: All Solvent Types
Total for AL	5457.32	

MACTEC found that the emissions for these SCCs were included in the Base F inventory, but with slightly different total emissions. AL provided an updated county-level emissions file for use in updating the Base G inventory. That file was used to update the NIF records for AL for those SCCs.

4. AL noted that emissions in the Base F inventory were found for SCC 2465000000 and SCCs 2465100000, 2465200000, 2465400000, 2465600000, and 2465800000. These last five SCCs represent a subset of the emissions in the 246500000 SCC resulting in potential double counting of emissions.

MACTEC deleted all emissions associated with the Total SCC 2465000000 and retained the subset SCCs for the Base G inventory.

Florida

Florida provided comments indicating that they felt that emissions from the following sources and counties were too high, especially for CO and PM and were likely zero:

- motor vehicle fire - Palm Beach County
- woodstoves - Miami Dade, Hillsborough, Orange, Polk, Ft Myers, Pasco and Sarasota Counties
- fireplaces - Miami Dade and Hillsborough Counties

Emissions from these sources in the counties specified were set to zero by MACTEC for the Base G inventory.

North Carolina

North Carolina provided corrected emission files for 2002 Base F. A text file with emission values was provided and used to update the Base F emissions to Base G. The updated emissions were applied directly to the Base F NIF file. The file provided was similar to the "EM" NIF table. An update query was used to update the data supplied in the text file to the Access database NIF file. All changes were implemented.

South Carolina

South Carolina had two issues concerning the Base F inventory. These issues related to 1) additional SCCs that were in BASE F 2009 and 2018, but not in 2002 Base F and 2) SCCs that were in the U.S. EPA 2002 NEI inventory, but not in the VISTAS 2002, 2009, or 2018 Base F inventory.

MACTEC investigated the additional SCCs found in 2009 and 2018 Base F and found that the SCCs actually were not missing in the 2002 Base F inventory but only had emissions for PM. Thus the emissions were maintained as they were provided in Base F.

With respect to the SCCs that were found in the U.S. EPA 2002 NEI, MACTEC investigated and found that they were not included in the Base F inventory because they were not included in the 2002 CERR submittal used to produce the Base F updates. The SCCs were apparently added by EPA later in the NEI development process. In addition, MACTEC also evaluated whether or not the SCCs were found in other VISTAS States Base F inventories. MACTEC found that some States included them and some did not, there was no consistency between the States. MACTEC also found that typically emissions for these SCCs were low in emissions, generally with emissions of only a few tons to tens of tons per year. The decision was made with South Carolina concurrence not to add these SCCs to the Base G inventory. These SCCs were: 210205000, 2102011000, 2103007000, 2103011000, 2104007000, 2104011000, 2302002100, 2302002200, 2302003100, 2302003200, 2610000500, 2810001000, and 281001500.

Virginia

Virginia provided an updated 2002 base year emissions file. The data in that file were used to update the Base F inventory emission values to those for Base G. In addition, Virginia provided information on several source categories that required controls for future year projections since the sources were located in counties/cities in northern Virginia and were subject to future year Ozone Transport Commission (OTC) regulations. MACTEC added in the base year control levels to the Base G inventory file for these categories so that they could be estimated correctly in future years. The controls added were for mobile equipment repair/refinishing sources, architectural and industrial maintenance coating sources, consumer products sources, and solvent metal cleaning sources. Minor errors were found in some entries for the initial file provided and VA provided a revised file with corrections and minor additions.

1.2.4 Ammonia and paved road emissions

The final component of the Base F inventory development was estimation of NH_3 emission estimates for livestock and fertilizers and paved road PM emissions. For the NH_3 emission estimates for livestock and fertilizers we used version 3.6 of the CMU NH_3 model (http://www.cmu.edu/ammonia/). Results from this model were used for all VISTAS States. The CMU model version 3.6 was used in large part because it had been just recently been updated to include the latest (2002) Census of Agriculture animal population statistics. Prior to inclusion of the CMU model estimates, MACTEC removed any ammonia records for agricultural livestock or fertilizer emissions from the VISTAS 2002 initial base year inventory. MACTEC also generated emissions from human perspiration and from wildlife using the CMU model and added those emissions for each State.

For the Base G ammonia inventory, MACTEC removed all wildlife and human perspiration emissions. VISTAS decided to remove these emissions from the inventory. Human perspiration was dropped due to a discrepancy in the units used for the emission factor that was not resolved prior to preparing the estimates and wildlife was dropped because VISTAS felt the activity data was too uncertain. Thus all emissions from these two categories were deleted in the Base G 2002 inventory.

For the paved road PM Base F emissions, we used the most recent estimates developed by EPA as part of the NEI development effort (Roy Huntley, U.S. EPA, email communication, 8/30/2004). EPA had developed an improved methodology for estimating paved road emissions for 2002 and had used that method to calculate emissions for that source category. MACTEC obtained those emissions from EPA and those values were substituted directly into the inventory after receiving consensus from all of the VISTAS States to perform the replacement. These files were obtained in March of 2005 in NIF format from the EPA FTP site.

For the Base G emissions, modifications were made to the emissions estimates based on changes suggested by work of the Western Regional Air Partnership and U.S. EPA. Details of these changes are provided below in the section on global changes made as part of the Base G inventory updates.

1.2.5 Global Changes Made for Base G

There were three global changes made between the Base F and the Base G inventory (beyond the removal of wildlife and human perspiration NH_3 emissions). These changes were:

1. Removal of Stage II emissions from the area source inventory and inclusion in the mobile sector of the inventory,
2. Adjustment of fugitive dust $PM_{2.5}$ emissions, and
3. Addition of emissions from portable fuel containers.

As part of the Base F review process, several VISTAS States had expressed surprise that the Stage II refueling emission estimates were in the area source component of the inventory. This decision had been made with SIWG agreement early on in the inventory development process because 1) some States had included it in their CERR submittals and 2) because the non-road and on-road mobile estimates had differing activity factor units and could not be easily combined. However for Base G, the VISTAS States all agreed, especially in light of the different ways in which the emissions were reported in the CERR, to remove the Stage II refueling emissions from the area source inventory and include them in the non-road and on-road sectors. Thus all records related to Stage II refueling were removed from the area source component of the Base G inventory.

$PM_{2.5}$ emissions from several fugitive dust sources were also updated for Base G. The Western Regional Air Partnership (WRAP) and U.S. EPA had been investigating overestimation of the $PM_{2.5}$ / PM_{10} ratio in several fugitive dust categories and U.S. EPA was in the process of making revisions to AP-42 for several categories during preparation of the Base G inventory. Based on data received from U.S. EPA, VISTAS decided to revise the $PM_{2.5}$ emissions from construction, paved roads and unpaved road sources. $PM_{2.5}$ emissions in Base F were multiplied by 0.67, 0.6, and 0.67 for construction, paved roads and unpaved roads respectively to produce the values found in Base G. No changes were made to PM_{10}, only to $PM_{2.5}$.

Finally, as part of Virginia's comments on the Base F inventory, emissions from portable fuel containers were mentioned as being absent from the inventory. MACTEC was tasked with developing a methodology that could be used to add these emissions to the Base G area source inventory. In investigating options for a method of estimating emissions, MACTEC found that the U.S. EPA had prepared a national inventory of emissions by State for portable fuel

containers. Data on emissions from this source prepared by U.S. EPA were presented in, "Estimating Emissions Associated with Portable Fuel Containers (PFCs), Draft Report, Office of Transportation and Air Quality, United States Environmental Protection Agency, Report # EPA420-D-06-003, February 2006".

State-level emission estimates for 2005 derived from Appendix Table B-2 of the PFCs report were used as the starting point for developing 2002 county-level emissions estimates. State emissions were derived from that table by using all of the emission estimates in that table with the exception of values for vapor displacement and spillage from refueling operations. Those components of the State emissions were left out of the State-level emissions to avoid double counting refueling emissions in the non-road sector. For the purposes of 2002 emission estimates for Base G, the 2005 values were assumed equal to 2002 values.

The 2005 State-level estimates minus the refueling component from Appendix Table B-2 of the report were summed for each State and then allocated to the county-level. The county-level allocation was based on the fuel usage information obtained from the NONROAD 2005 model runs conducted as part of the Base G inventory development effort (see the 2002 base year Base G non-road section below). MACTEC used the spillage file from the NONROAD model (normally located in the DATA\EMSFAC directory in a standard installation of NONROAD) to determine the SCCs that used containers for refueling. The spillage file contains information by SCC and horsepower indicating whether or not the refueling occurs using a container or a pump. All SCC and horsepower classes using containers were extracted from the file and cross-referenced with the fuel usage by county for those SCC/horsepower combinations from the appropriate year model runs (2002, 2009 or 2018). Then the fuel usages by county from the NONROAD 2005 runs prepared for VISTAS were summed for those SCCs by county. The county level fuel use was then divided by the State total fuel use for the same SCCs to determine the fraction of total State fuel usage and that fraction was used to allocate the State-level emissions to the county.

1.2.6 Quality Assurance steps

Throughout the inventory development process, quality assurance steps were performed to ensure that no double counting of emissions occurred, and to ensure that a full and complete inventory was developed for VISTAS. Quality assurance was an important component to the inventory development process and MACTEC performed the following QA steps on the area source component of the 2002 Base F inventory:

1. All CERR and NIF format State supplied data submittals were run through EPA's Format and Content checking software.

2. SCC level emission summaries were prepared and evaluated to ensure that emissions were consistent and that there were no missing sources.
3. Tier comparisons (by pollutant) were developed between the revised 2002 base year inventory and the previous (version 3.1) base year inventory.
4. Fields were either added or used within each NIF data table to track the sources of data for each emission record.
5. Data product summaries were provided to both the VISTAS Emission Inventory Technical Advisor and to Area Source and Fires SIWG representatives for review and comment. Changes based on these comments were implemented in the files.
6. Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from 1.0 to 2.0. A minor change would cause a version number to go from 1.0 to 1.1. Minor changes resulting from largely editorial changes would result in a change from 1.00 to 1.01.

In addition, for the fires inventory, data related to fuel loading and fuel consumption was reviewed and approved by the VISTAS Fire SIWG to ensure that values used for each type of fire and each individual fire were appropriate. Members of the VISTAS Fire SIWG included representatives from most State Divisions of Forestry (or equivalent) as well as U.S. Forest Service and National Park Service personnel.

For Base G, similar QA steps to those outlined above for Base F were undertaken. In addition, all final NIF files were checked using the EPA Format and Content checking software and summary information by State and pollutant were prepared comparing the Base F and Base G inventories.

1.3 Mobile Sources

This section describes the revisions made to the initial 2002 VISTAS Base Year emission inventory on-road mobile source input files. For this work actual emission estimates were not made, rather data files consistent with Mobile Emissions Estimation Model Version 6 (MOBILE6) were developed and provided to the VISTAS modeling contractor. These input data files were then run during the VISTAS modeling to generate on-road mobile source emissions using episodic and meteorological specific conditions configured in the sparse matrix operator Kernel Emissions modeling system (SMOKE) emissions processor.

During initial discussions with the VISTAS Mobile Source SIWG, some States indicated a desire to use CERR mobile source emissions data in place of the VISTAS 2002 inventories generated by E.H. Pechan and Associates, Inc. (the initial VISTAS 2002 Base Year inventory files).

However, the CERR emissions data by itself were not sufficient for an inventory process that includes both base and future year inventories. MACTEC needed to be able to replicate the CERR data rather than simply obtain CERR emissions estimates. The reason for this is that only input files were being prepared to provide revised 2002 estimates during the VISTAS modeling process, rather than the actual emission estimates and that the 2002 input data files would be used as a starting point for the projected emission estimates. This meant that the appropriate vehicle miles traveled (VMT), MOBILE6, and/or NONROAD model input data needed to be provided. If these data were provided with the CERR emissions estimates we used it as the starting point for revision of the 2002 Base Year inventory. However MACTEC did not have access to the on-road mobile CERR submissions from EPA, so re-submittal of these data directly to MACTEC was requested in order to begin compiling the appropriate input file data.

In those cases where States did not provide CERR on-road mobile source input data files, our default approach was to maintain the data input files and VMT estimates for the initial 2002 Base Year inventory prepared by Pechan.

1.3.1 Development of on-road mobile source input files and VMT estimates

Development of the 2002 on-road input files and VMT was a multi-step process depending upon what the State mobile source contacts instructed us to use as their data. Information provided below provides incremental revisions made to on-road mobile source inventories or inputs in series from one inventory version to the next. In general the process involved one of three steps from the original 2002 on-road mobile source data.

Base F Revisions

1. The first step was to evaluate the initial 2002 base year files and make any non-substantive changes (i.e., changes only to confirm that the files posted for 2002 by Pechan were executable and that all the necessary external files needed to run MOBILE6 were present). This approach was taken for AL, FL, GA, MS, SC, and WV. For these States the determination was made that the previous files would be okay to use as originally prepared. For SC, the VMT file was updated, but that did not affect the MOBILE6 input files.

2. For other States, modification to the input files was required. The information below indicates what changes were made for other States in the VISTAS region.

KY – For Kentucky, the Inspection and Maintenance (I/M) records in the input files for Jefferson County were updated in order to better reflect the actual I/M program in the Louisville metropolitan area.

NC - Substantial revisions were implemented to these input files based on input from the State. The modifications necessary to reflect the desires of the State led to complete replacement of the previous input files. Among the changes made were:

- The regrouping of counties (including the movement of some counties from one county group to another and the creation of new input files for previously grouped counties). There were originally 32 input files; after the changes there were 49. The pointer file was corrected to reflect these changes.
- Travel speeds were updated in over 3000 scenarios.
- All I/M records were updated.
- All registration distributions were updated.
- I/M VMT fractions were updated (which only affected the pointer file).
- VMT estimates were updated (which has no direct effect on the MOBILE6 input files but does ultimately affect emissions).

3. VA and TN – For these States, new input files were provided due to substantive changes that the State wanted to make relative to the 2002 initial base year input files. In addition, revised VMT data were developed for each State.

Base G Revisions

For the production of the VISTAS 2002 Base G inventory, VISTAS states reviewed the Base F inputs, and provided corrections, updates and supplemental data.

For all states modeled, the Base G updates include:

Adding Stage II refueling emissions calculations to the SMOKE processing.

Revised the HDD compliance for all states. (REBUILD EFFECTS = .1)

In addition to the global changes, individual VISTAS states made the following updates:

KY – updated VMT and M6 input values for selected counties.

NC – revised VMT and registration distributions.

TN - revised VMT and vehicle registration distributions for selected counties.

VA – revised winter RFG calculations in Mobile 6 inputs.

WV – revised VMT input data.

AL, FL, and GA did not provide updates for Base G and therefore the Base F inputs were used for these States.

1.3.1.1 Emissions from on-road mobile sources

The MOBILE6 module of the Sparse Matrix Operator Kernel Emissions (SMOKE) model was used to develop the on-road mobile source emissions estimates for CO, NO_X, NH_3, SO_2, PM, and VOC emissions. The MOBILE6 parameters, vehicle fleet descriptions, and VMT estimates are combined with gridded, episode-specific temperature data to calculate the gridded, temporalized emission estimates. The MOBILE6 emissions factors are based on episode-specific temperatures predicted by the meteorological model. Further, the MOBILE6 emissions factors model accounts for the following:

- Hourly and daily minimum/maximum temperatures;
- Facility speeds;
- Locale-specific inspection/maintenance (I/M) control programs, if any;
- Adjustments for running losses;
- Splitting of evaporative and exhaust emissions into separate source categories;
- VMT, fleet turnover, and changes in fuel composition and Reid vapor pressure (RVP).

The primary input to MOBILE6 is the MOBILE shell file. The MOBILE shell contains the various options (e.g. type of inspection and maintenance program in effect, type of oxygenated fuel program in effect, alternative vehicle mix profiles, RVP of in-use fuel, operating mode) that direct the calculation of the MOBILE6 emissions factors. The shells used in these runs were based on VISTAS Base F modeling inputs as noted in the previous section.

For this analysis, the on-road mobile source emissions were produced using selected weeks (seven days) of each month and using these days as representative of the entire month. This selection criterion allows for the representation of day-of-the-week variability in the on-road motor vehicles, and models a representation of the meteorological variability in each month. The modeled weeks were selected from mid-month, avoiding inclusion of major holidays.

The parameters for the SMOKE runs are as follows:

Episodes:

2002 Initial Base Year, and

2009 and 2018 Future years, using 2009/2018 inventories and modeled using the same meteorology and episode days as 2002.

Episode represented by the following weeks per month:

January 15-21
February 12-18
March 12-18
April16-22
May 14-20
June 11-17
July 16-22
August 13-19
September 17-23
October 15-21
November 12-18
December 17-23

Days modeled as holidays for annual run:

New Year's Day - January 1
Good Friday – March 29
Memorial Day – May 27
July 4th
Labor Day – September 2
Thanksgiving Day – November 28, 29
Christmas Eve – December 24
Christmas Day – December 25

Output time zone:

Greenwich Mean Time (zone 0)

Projection:

Lambert Conformal with Alpha=33, Beta=45, Gamma=-97, and center at (-97, 40).

Domain:

36 Kilometer Grid: Origin at (-2736, -2088) kilometers with 148 rows by 112 columns and 36-km square grid cells.
12 Kilometer Grid: Origin at (108, -1620) kilometers with 168 rows by 177 columns and 12-km square grid cells.

CMAQ model species:

The CMAQ configuration was CB-IV with PM. The model species produced were: CO, NO, NO_2, ALD_2, ETH, FORM, ISOP, NR, OLE, PAR, TERPB, TOL, XYL, NH_3, SO_2, SULF, PEC, PMFINE, PNO_3, POA, PSO_4, and PMC.

Meteorology data:

Daily (25-hour). SMOKE requires the following five types of MCIP outputs: (1) Grid cross 2-d, (2) Grid cross 3-d, (3) Met cross 2-d, (4) Met cross 3-d, and (5), Met dot 3-d.

The reconstructed emissions based on the representative week run were calculated by mapping each day of week (Mon, Tue, Wed, etc.) from the modeled month to the same day of week generated in the representative week run. In the case of holidays, these days were mapped to representative week Sundays. An example of this mapping for the January episode is presented in Table 1.3-1 below. Note that although the emissions were generated for individual calendar years (2002, 2009 and 2018) the meteorology is based on 2002.

Table 1.3-1 Representative day mapping for January episode

(Highlighted representative week)

Modeled Date	Representative Day	Modeled Date	Representative Day	Modeled Date	Representative Day
1/1/2002*	1/20/2002	1/11/2002	1/18/2002	1/22/2002	1/15/2002
1/2/2002	1/16/2002	1/12/2002	1/19/2002	1/23/2002	1/16/2002
1/3/2002	1/17/2002	1/13/2002	1/20/2002	1/24/2002	1/17/2002
1/4/2002	1/18/2002	1/14/2002	1/21/2002	1/25/2002	1/18/2002
1/5/2002	1/19/2002	1/15/2002	1/15/2002	1/26/2002	1/19/2002
1/6/2002	1/20/2002	1/16/2002	1/16/2002	1/27/2002	1/20/2002
1/7/2002	1/21/2002	1/17/2002	1/17/2002	1/28/2002	1/21/2002
1/8/2002	1/15/2002	1/18/2002	1/18/2002	1/29/2002	1/15/2002
1/9/2002	1/16/2002	1/19/2002	1/19/2002	1/30/2002	1/16/2002
1/10/2002	1/17/2002	1/20/2002	1/20/2002	1/31/2002	1/17/2002
		1/21/2002	1/21/2002		
* Modeled holiday					

1.3.2 Development of non-road emission estimates

Emissions from non-road sources were estimated in two steps. First, emissions for non-road sources that are included in the NONROAD model were developed. Second, emissions from sources not included in the NONROAD model were estimated. The sections below detail the procedures used for each group of sources.

1.3.2.1 Emissions from NONROAD model sources

An initial 2002 base year emissions inventory for non-road engines and equipment covered by the EPA NONROAD model was prepared for VISTAS in early 2004. The methods and assumptions used to develop the inventory are presented in a February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc. Except as otherwise stated below, all

aspects of the preparation methodology documented in that report continue to apply to the revised NONROAD modeling discussed in this section.

Revisions to the initial 2002 NONROAD emissions inventory were implemented to ensure that the latest State and local data were considered, as well as to more accurately reflect gasoline sulfur contents for 2002 and correct other State-specific discrepancies. Those revisions comprise the Base F VISTAS non-road inventory. This section details the specific revisions made to the NONROAD model input files for the Base F and Base G VISTAS base year inventories, and provides insight into some key differences between the versions of the NONROAD model employed for the Base F and Base G inventories and the previous version employed for the initial 2002 base year inventory prepared by Pechan.

Revisions to the initial 2002 emissions inventory prepared by Pechan were actually implemented in two stages. An initial set of revisions was implemented in the fall of 2004. Those revisions resulted in the Base F inventory. These were followed by a second set of revisions in the spring of 2006. Those estimates produced the Base G base year inventory. To accurately document the combined effects of both sets of revisions, each set is discussed separately below. Unless otherwise indicated, all revisions implemented in Base F were carried directly into the Base G revision process without change. Thus, the inventories that resulted from the Base F revisions served as the starting point for the Base G revisions.

For Base F, three VISTAS States provided detailed data revisions for consideration in developing revised model inputs. These States were:

1. North Carolina
2. Tennessee (including a separate submission for Davidson County), and
3. Virginia.

The remaining seven VISTAS States indicated that the initial 2002 VISTAS input files prepared by Pechan continued to reflect the most recent data available. These States were:

1. Alabama,
2. Florida,
3. Georgia,
4. Kentucky,
5. Mississippi,
6. South Carolina, and
7. West Virginia.

However, it should be recognized that the NONROAD input files for *all* ten VISTAS States were updated to reflect gasoline sulfur content revisions for the Base F 2002 base year inventory (as

discussed below). The original files prepared by Pechan are available on their FTP site in the /pub/VISTAS/MOB_0104/ directory.

Before presenting the specific implemented revisions, it is important to note that the Base F 2002 base year inventory utilized a newer release of the NONROAD model than was used for the initial 2002 base year inventory (prepared by Pechan). The Base F 2002 base year inventory, as developed in spring 2004, was based on the Draft NONROAD2004 model, which was released by the EPA in May of 2004. This model is no longer available on EPA's website. The initial 2002 base year inventory (prepared by Pechan) was based on the Draft NONROAD2002a version of the model (which is also no longer available on EPA's website). Key differences between the models are as follows:

- Draft NONROAD2004 included the effects of the Tier 4 non-road engine and equipment standards (this did not impact the Base F 2002 inventory estimates, but did affect Base F future year forecasts).
- Draft NONROAD2004 included the *exhaust* emission impacts of the large spark-ignition engine standards; the evaporative impacts of these standards are *not* incorporated (this does not impact 2002 inventory estimates, but does affect future year forecasts).
- Draft NONROAD2004 included revised equipment population estimates.
- The $PM_{2.5}$ fraction for *diesel* equipment in Draft NONROAD2004 had been updated from 0.92 to 0.97.
- Draft NONROAD2004 included revisions to recreational marine activity, useful life, and emission rates.

To the extent that these revisions affect 2002 emissions estimates, they will be reflected as differentials between the initial and Base F 2002 VISTAS base year inventories. It is perhaps important to identify that, at the time of the Base F inventory revisions; the EPA recognized the Draft NONROAD2004 model as an appropriate mechanism for SIP development. Although the model was designated as a draft update, it reflected the latest and most accurate NONROAD planning data at that time, as evidenced by the EPA's use of that version for the Tier 4 Final Rulemaking.

Prior to the Base G inventory revisions implemented in 2006, the EPA released another updated version of the NONROAD model, designated as Final NONROAD2005 (which can be downloaded from: http://www.epa.gov/OMSWWW/nonrdmdl.htm#model). This version ostensibly represents the final version of the model, although certain components of it have been updated since its first release in December 2005. For the Base G inventory developed in the first

half of 2006, all updates of the Final NONROAD2005 model through March 2006 are included. Key differences between Final NONROAD2005 and Draft NONROAD2004 are as follows:

- Final NONROAD2005 reflects the latest basic emission rate and deterioration data.
- Final NONROAD2005 includes emission estimates for a range of evaporative emissions categories not included in Draft NONROAD2004 (tank and hose permeation, hot soak, and running loss emissions).
- Final NONROAD2005 includes a revised diurnal emissions algorithm.
- Final NONROAD2005 includes a revised equipment scrappage algorithm.
- Final NONROAD2005 includes revised state and county equipment allocation data.
- Final NONROAD2005 allows separate sulfur content inputs for marine and land-based diesel fuel.
- Final NONROAD2005 includes revised conversion factors for hydrocarbon emissions.
- Final NONROAD2005 includes the evaporative emission impacts of the large spark-ignition engine standards (this does not impact 2002 inventory estimates, but does affect future year forecasts).

Unfortunately, due to the extensive revisions associated with Final NONROAD2005, input files created for use with Draft NONROAD2004 (e.g., Base F input files) and earlier versions of the model cannot be used directly with Final NONROAD2005 (used for Base G). This created a rather significant impact in that the VISTAS NONROAD modeling process involves the consideration of over 200 unique sets of input data. To avoid creating new input files for each of these datasets, a conversion process was undertaken wherein each of the Draft NONROAD2004 (Base F) input data files were converted into the proper format required for proper execution in Final NONROAD2005 (Base G).[1] This process consisted of the following steps:

- Revise the Draft NONROAD2004 (Base F) input files to include the following two line EPA-developed comment at the end of the input file header (this is a nonsubstantive change implemented solely for consistency with input files produced directly using Final NONROAD2005):

[1] The necessary conversions where developed by comparing substantively identical input files created using the graphical user interfaces for both Draft NONROAD2004 and Final NONROAD2005. The differences between the input files indicated the specific revisions necessary to convert existing VISTAS input files into Final NONROAD2005 format.

```
9/2005 epa: Add growth & tech years to OPTIONS packet
 and Counties & Retrofit files to RUNFILES packet.
```

- Revise the Draft NONROAD2004 (Base F) input files to include the following two command lines after the "Weekday or weekend" command in the PERIOD packet:

```
Year of growth calc:
Year of tech sel  :
```

- Revise the Draft NONROAD2004 (Base F) input files to include the following command line after the "Diesel sulfur percent" command in the OPTIONS packet:

```
Marine Dsl sulfur %: 0.2638
```

  Note that the value 0.2638 (2638 parts per million by weight [ppmW]) is applicable only for 2002 modeling and was accordingly revised (as described below) for both the 2009 and 2018 Base G forecast inventories. The 2638 ppmW sulfur value for 2002 marine diesel fuel was taken from the 48-State (excludes Alaska and Hawaii) tabulation presented in the April 27, 2004 EPA document "*Diesel Fuel Sulfur Inputs for the Draft NONROAD2004 Model used in the 2004 Non-road Diesel Engine Final Rule*." It should also be noted that this value differs by about 5 percent from the 2500 ppmW value previously used for the initial 2002 VISTAS modeling (performed by Pechan). Prior to Final NONROAD2005 (used for Base G), the NONROAD model allowed only a single diesel fuel sulfur input that was applied to both land-based and marine equipment. As documented in the February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc., a value of 2500 ppmW sulfur was used for all 2002 VISTAS NONROAD modeling. Given the ability of Final NONROAD2005 to distinguish a separate sulfur content for marine equipment and the existing EPA guidance document suggesting an appropriate marine sulfur value of 2638 ppmW for 2002, the existing modeling value of 2500 ppmW was modified (for marine equipment only).

- Replace the Draft NONROAD2004 (Base F) input files RUNFILES packet command line:

```
TECHNOLOGY      : c:\non-road\data\tech\tech.dat
```

  with the command lines:

```
EXH TECHNOLOGY   : c:\non-road\data\tech\tech-exh.dat
EVP TECHNOLOGY   : c:\non-road\data\tech\tech-evp.dat
```

- Revise the Draft NONROAD2004 (Base F) input files to include the following two command lines after the "EPS2 AMS" command in the RUNFILES packet:

```
US COUNTIES FIPS  : c:\non-road\data\allocate\fips.dat
RETROFIT      :
```

- Revise the Draft NONROAD2004 (Base F) input files to include the following command line after the "Rec marine outbrd" command in the ALLOC FILES packet:

```
Locomotive NOx   : c:\non-road\data\allocate\XX_rail.alo
```

  Where "XX" varies across input files. For any given file, "XX" is the two digit abbreviation of the state associated with the scenario being modeled (e.g., for Alabama modeling, XX=AL).

- Replace the Draft NONROAD2004 (Base F) input files EMFAC FILES packet command line:

```
Diurnal      : c:\non-road\data\emsfac\diurnal.emf
```

  with the eight command lines:

```
Diurnal      : c:\non-road\data\emsfac\evdiu.emf
TANK PERM     : c:\non-road\data\emsfac\evtank.emf
NON-RM HOSE PERM  : c:\non-road\data\emsfac\evhose.emf
RM FILL NECK PERM : c:\non-road\data\emsfac\evneck.emf
RM SUPPLY/RETURN  : c:\non-road\data\emsfac\evsupret.emf
RM VENT PERM    : c:\non-road\data\emsfac\evvent.emf
HOT SOAKS     : c:\non-road\data\emsfac\evhotsk.emf
RUNINGLOSS     : c:\non-road\data\emsfac\evrunls.emfEVP
```

- Revise the Draft NONROAD2004 (Base F) input files to include the following command line after the "PM exhaust" command in the DETERIORATE FILES packet:

```
Diurnal      : c:\non-road\data\detfac\evdiu.det
```

Once revised in this format, the VISTAS non-road input files developed for use with Draft NONROAD2004 (Base F) were executable under the Final NONROAD2005 model (Base G).

The only additional revisions implemented to develop a Final NONROAD2005-based inventory (Base G) involved elimination of non-default equipment allocation files for North Carolina and West Virginia. Due to concerns about improper equipment allocation across counties under the Draft NONROAD2004 model (used for Base F), as well as for earlier versions of the NONROAD model, North Carolina had produced alternative allocation data files indicating the

number of employees in air transportation by county, the number of wholesale establishments by county, and the number of employees in landscaping services by county. For the same reason, West Virginia had produced alternative equipment allocation files indicating the number of employees in air transportation by county, the tonnage of underground coal production by county, the number of golf courses and country clubs by county, the number of wholesale establishments by county, the number of employees in logging operations by county, the number of employees in landscaping services by county, the number of employees in manufacturing operations by county, the number of employees in oil and gas drilling and extraction operations by county, and the number of recreational vehicle parks and campgrounds by county. These alternative equipment allocation files were used for all VISTAS inventory modeling conducted prior to the release of Final NONROAD2005 (i.e., through Base F). However, both North Carolina and West Virginia determined that the default allocation file revisions associated with the release of Final NONROAD2005 were appropriate to address the concerns that led to the development of the alternative allocation files. As a result, all alternative allocation file commands were removed from VISTAS NONROAD2005 (Base G) input files for North Carolina and West Virginia, so that the entire region under the Base G inventory is now modeled using the default allocation files provided with NONROAD2005.

In addition to the alternative equipment allocation files, North Carolina had previously developed an alternative seasonal adjustment file that was used for the Base F inventory in place of the default file provided with Draft NONROAD2004 (and earlier model versions). The alternative data file implemented a single change, namely reclassifying North Carolina as a southeastern state rather than a mid-Atlantic state (as identified in the default data file). Since Final NONROAD2005 continues to identify North Carolina as a mid-Atlantic state, North Carolina requested that the southeastern reclassification be continued for all NONROAD2005 modeling (Base G). To ensure that any other revisions associated with the seasonal adjustment file released with NONROAD2005 were not overlooked, the previously developed alternative seasonal adjustment file for North Carolina was scrapped and a new alternative file was created from the default seasonal adjustment file provided with Final NONROAD2005 for Base G inventory development. The alternative file, which was used for all North Carolina modeling, reclassifies North Carolina from a mid-Atlantic to a southeastern state. This represents the only non-default data file used for VISTAS NONROAD2005-based (Base G) modeling.

The remainder of this section documents all changes to the originally established VISTAS input file values as documented in the February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc. Unless specifically stated below, all values from that report continue to be used without change in the latest VISTAS modeling.

Base F Revisions:

For the initial 2002 base year inventory (developed by Pechan), all NONROAD modeling runs for VISTAS were performed utilizing a gasoline sulfur content of 339 ppmW and a diesel sulfur content of 2,500 ppmW. Although the EPA-recommended non-road diesel fuel sulfur content for 2002 is 2,283 ppmW, the 2,500 ppmW sulfur content used for the initial 2002 base year VISTAS inventory was designed to remove the effect of lower non-road diesel fuel sulfur limits applicable only in California. (The EPA recommended inputs can be found in "*Diesel Fuel Sulfur Inputs for the Draft NONROAD2004 Model used in the 2004 Non-road Diesel Engine Final Rule*," EPA, April 27, 2004.) This correction is appropriate and was retained for the Base F 2002 inventory. Thus, the Base F inventory continued to assume a diesel fuel sulfur content of 2,500 ppmW across the VISTAS region.

However, 339 ppmW is not the EPA recommended 2002 gasoline sulfur content for either eastern conventional gasoline areas or Federal Reformulated Gasoline (RFG) areas. The recommended sulfur content for eastern conventional gasoline is 279 ppmW year-round, while the recommended sulfur content for RFG areas is 129 ppmW during the summer season and 279 ppmW during the winter season. (Conventional gasoline and RFG sulfur contents for 2002 can be found in "*User's Guide to MOBILE6.1 and MOBILE6.2, Mobile Source Emission Factor Model*," EPA420-R-03-010, U.S. EPA, August 2003 [pages 149-155] (available at link at http://www.epa.gov/otaq/m6.htm) and in the source code for MOBILE6.2 at Block Data BD05.) Given the differences in the EPA-recommended values and the value used to generate the initial 2002 base year inventory, the input files for Base F for *all* VISTAS areas were updated to reflect revised gasoline sulfur content assumptions.

Since the VISTAS NONROAD modeling is performed on a seasonal basis, and since gasoline sulfur content in RFG areas varies with the RFG season, seasonally-specific gasoline sulfur content values were estimated for use in RFG area modeling. In addition, 25 counties in Georgia are subject to a summertime gasoline sulfur limit of 150 ppmW, so that seasonal sulfur content estimates were also estimated for these counties. The initial 2002 base year NONROAD inventory (prepared by Pechan) for these Georgia counties was based on a year-round 339 ppmW gasoline sulfur content, but that oversight was corrected in the Base F 2002 base year inventory. Based on the seasonal definitions employed in the NONROAD model, monthly sulfur contents were averaged to estimate seasonal gasoline sulfur contents as follows:

Month/Season	RFG Areas	Conventional Gasoline Areas	Georgia Gasoline Control Areas
March	279 ppmW	279 ppmW	279 ppmW
April	279 ppmW	279 ppmW	279 ppmW
May	129 ppmW	279 ppmW	150 ppmW
Spring	229 ppmW	279 ppmW	236 ppmW
June	129 ppmW	279 ppmW	150 ppmW
July	129 ppmW	279 ppmW	150 ppmW
August	129 ppmW	279 ppmW	150 ppmW
Summer	129 ppmW	279 ppmW	150 ppmW
September	129 ppmW	279 ppmW	150 ppmW
October	279 ppmW	279 ppmW	279 ppmW
November	279 ppmW	279 ppmW	279 ppmW
Fall	229 ppmW	279 ppmW	236 ppmW
December	279 ppmW	279 ppmW	279 ppmW
January	279 ppmW	279 ppmW	279 ppmW
February	279 ppmW	279 ppmW	279 ppmW
Winter	279 ppmW	279 ppmW	279 ppmW

Note that the seasonal data are based on simple arithmetic averages and do not consider any monthly variation in activity (and fuel sales), and that the transition between summer and winter seasons is also not considered. Additionally, the summer fuel control season is treated as though it applies from May through September, while the summer RFG season actually ends on September 15 and the Georgia fuel control season does not officially begin until June 1. This treatment is consistent with the treatment of both fuel control programs in the VISTAS on-road vehicle modeling. Each of these influences will result in some error in the estimated sulfur content estimates, but it is expected that this error is small relative to the overall correction from a year-round sulfur content estimate of 339 ppmW.

All NONROAD modeling revisions made as part of the Base F inventory preparation process are presented in Table 1.3-2. Due to more involved updates in several areas, the number of NONROAD input files as well as sequence numbers used to represent these files was also updated in a few instances (as compared to the files used to create the initial 2002 VISTAS non-road inventory, as documented in the February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc. These structural revisions are presented in Table 1.3-3, and are provided

solely for the benefit of NONROAD modelers as the indicated revisions have no impact on generated emission estimates.

Table 1.3-2 Summary of Base F NONROAD Modeling Revisions

State	Revisions Implemented
AL	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas).
FL	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas).
GA	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all seasons for conventional gasoline counties. (2) Gasoline sulfur content changed from 339 ppmW to 150 ppmW in the summer for all gasoline control counties. (3) Gasoline sulfur content changed from 339 ppmW to 236 ppmW in the spring and fall for all gasoline control counties. (4) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in the winter for all gasoline control counties. *Gasoline control counties: Barrow, Bartow, Butts, Carroll, Cherokee (a), Clayton (a), Cobb (a), Coweta (a), Dawson, De Kalb (a), Douglas (a), Fayette (a), Forsyth (a), Fulton (a), Gwinnett (a), Hall, Haralson, Henry (a), Jackson, Newton, Paulding (a), Pickens, Rockdale (a), Spalding, and Walton*
KY	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all seasons for conventional gasoline counties. (2) Gasoline sulfur content changed from 339 ppmW to 129 ppmW in the summer for all gasoline control counties. (3) Gasoline sulfur content changed from 339 ppmW to 229 ppmW in the spring and fall for all gasoline control counties. (4) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in the winter for all gasoline control counties. *Gasoline control counties: Boone, Bullitt (b), Campbell, Jefferson, Kenton, and Oldham (b)*
MS	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas).
NC	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas). (2) Utilize revised (i.e., local) allocation files for three equipment categories. (3) Utilize revised (i.e., local) seasonal activity data.
SC	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas).
TN	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas). (2) Gasoline Reid Vapor Pressure (RVP) values changed in accordance with local recommendations. (3) Temperature data changed in accordance with local recommendations. (4) Counties regrouped in accordance with local recommendations.

Table 1.3-2. Summary of Base F NONROAD Modeling Revisions (continued)

State	Revisions Implemented
VA	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all seasons for conventional gasoline counties. (2) Gasoline sulfur content changed from 339 ppmW to 129 ppmW in the summer for all gasoline control counties. (3) Gasoline sulfur content changed from 339 ppmW to 229 ppmW in the spring and fall for all gasoline control counties. (4) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in the winter for all gasoline control counties. (5) Gasoline RVP values changed in accordance with local recommendations. (6) Counties regrouped in accordance with local recommendations. (7) The control effectiveness for counties subject to Stage II controls revised to 77 percent in accordance with local recommendations. *Gasoline control counties: Arlington Co., Fairfax Co., Loudoun Co., Prince William Co., Stafford Co., Alexandria City, Fairfax City, Falls Church City, Manassas City, Manassas Park City, Chesterfield Co., Hanover Co., Henrico Co., Colonial Heights City, Hopewell City, Richmond City, James City, York Co., Chesapeake City, Hampton City, Newport News City, Norfolk City, Poquoson City, Portsmouth City, Suffolk City, Virginia Beach City, and Williamsburg City (c)*
WV	(1) Gasoline sulfur content changed from 339 ppmW to 279 ppmW in all counties and all seasons (all are conventional gasoline areas). (2) Continue to utilize local allocation files for nine equipment categories.

Notes:

(a) County is subject to local control currently, but is scheduled to join the RFG program in January 2005.
(b) Control area is a portion of the county, but modeling is performed as though the control applies countywide.
(c) The EPA also lists Charles City County as an RFG area, but local planners indicate that Charles City County is a conventional gasoline area and it is modeled as such.

Table 1.3-3 Base F NONROAD Input File Sequence and Structural Revisions

State	Initial 2002 Base Year Inventory Input File Sequence Numbers	Revised 2002 Inventory Input File Sequence Numbers	Reason(s) for Change	Number of Revised 2002 Inventory NONROAD Input Files
AL	01-08	01-08	No Structural Changes	32 (at 8 per season)
FL	09-10	09-10	No Structural Changes	8 (at 2 per season)
GA	11-13	11-13	No Structural Changes	12 (at 3 per season)
KY	14-22	14-22	No Structural Changes	36 (at 9 per season)
MS	48	48	No Structural Changes	4 (at 1 per season)
NC	23-25	23-25	No Structural Changes	12 (at 3 per season)
SC	26-32	26-32	No Structural Changes	28 (at 7 per season)
TN	33-34	33-34, 49-52	Counties Regrouped	24 (at 6 per season)
VA	35-43	35-38, 40-43	Counties Regrouped	32 (at 8 per season)
WV	44-47	44-47	No Structural Changes	16 (at 4 per season)
All	**01-48**	**01-38, 40-52**		**204 (at 51 per season)**

Note: (1) All files include internal revisions to reflect the data changes summarized in Table 1.3-3 above. This table is intended to present structural revisions that are of interest in assembling the NONROAD model input files into a complete VISTAS region inventory. The indicated revisions do not (in and of themselves) result in emission estimate changes.

(2) The NONROAD model imposes an eight digit input file name limit, so all input files for the revised 2002 base year inventory follow a modified naming convention to allow each to be distinguished from the input files for the initial 2002 base year inventory. For the initial 2002 base year inventory, the naming convention was:

ss02aaqq, where: ss = the two character State abbreviation,
aa = a two character season indicator as follows: AU = autumn, WI = winter, SP = spring, and SU = summer, and
qq = the two digit sequence number indicated above.

For the revised 2002 inventory, the naming convention was modified to:

ss02aFqq, where: ss = the two character State abbreviation,
a = a one character season indicator as follows: A = autumn, W = winter, S = spring, and X = summer, and
qq = the two digit sequence number indicated above.

Base G Revisions:

As described above, the primary modeling revision implemented for the Base G 2002 inventory was the use of the Final NONROAD2005 model (in place of the Base F use of Draft NONROAD2004). However, there were other minor revisions implemented for 13 Georgia counties and somewhat more significant revisions implemented for Tennessee. In Georgia, Stage II refueling control was assumed for 13 counties that previously were modeled as having no refueling control under Base F. In addition, to accommodate this Stage II change as well as forecast year changes in gasoline vapor pressure, corresponding changes in the structure and sequence of Georgia NONROAD input files were made. With the exception of the minor Stage II impacts, these structural and sequence changes have no impact on 2002 emission estimates, but allow for consistency between 2002 and forecast year input file structure and sequence. In Tennessee, more significant changes were implemented to gasoline vapor pressure assumptions, as well as similar minor changes in Stage II refueling control assumptions.

In accordance with instructions from Georgia regulators, Stage II refueling control was assumed in the following 13 Georgia counties at a control efficiency value of 81 percent for the Base G inventory:

> Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, and Rockdale.

No Stage II control was assumed in these counties in prior inventories.

Tennessee regulators provided revised monthly values for gasoline vapor pressure. Based on the seasonal definitions employed in the NONROAD model, monthly vapor pressures were averaged to estimate seasonal vapor pressures as follows:

Month/Season	Nashville Area	Memphis Area	Remainder of Tennessee
March	13.5 psi	13.5 psi	13.5 psi
April	13.5 psi	13.5 psi	13.5 psi
May	9.0 psi	9.0 psi	9.0 psi
Spring	12.0 psi	12.0 psi	12.0 psi
June	7.8 psi	7.8 psi	9.0 psi
July	7.8 psi	7.8 psi	9.0 psi
August	7.8 psi	7.8 psi	9.0 psi
Summer	7.8 psi	7.8 psi	9.0 psi
September 1-15	7.8 psi	7.8 psi	9.0 psi
September 16-30	11.5 psi	11.5 psi	11.5 psi
October	13.5 psi	13.5 psi	13.5 psi
November	13.5 psi	13.5 psi	13.5 psi
Fall	12.2 psi	12.2 psi	12.4 psi
December	15.0 psi	15.0 psi	15.0 psi
January	15.0 psi	15.0 psi	15.0 psi
February	13.5 psi	13.5 psi	13.5 psi
Winter	14.5 psi	14.5 psi	14.5 psi

Note: The Nashville area consists of Davidson, Rutherford, Sumner, Williamson and Wilson counties, the Memphis area consists of Shelby County.

As with the Base F revisions, the seasonal data are based on simple arithmetic averages and do not consider any monthly variation in activity (and fuel sales), nor is the transition between summer and winter seasons considered. Additionally, a monthly average of the September 1-15 and September 16-30 data is calculated prior to averaging the September-November data to estimate a fall average vapor pressure, so that the month of September is weighted identically to the months of October and November.

Tennessee regulators also indicated that Stage II vapor recovery was not in effect in Shelby County, so the Base F NONROAD input files for the county (which assumed Stage II was in place) were revised accordingly.

All Base G NONROAD modeling revisions are presented in Table 1.3-4. As indicated above, the differentiation of inputs across previously grouped counties also required revision to the overall number and sequence of VISTAS NONROAD input files (as compared to the files used to create both the initial VISTAS non-road inventory, as documented in the February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc., and the Base F revised inventory as

documented above. These structural revisions are presented in Table 1.3-5, and are provided solely for the benefit of NONROAD modelers as the indicated revisions have no impact on generated emission estimates.

Table 1.3-4 Summary of Base G NONROAD Modeling Revisions

State	Revisions Implemented
AL	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
FL	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
GA	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons. (2) Stage II refueling vapor recovery implemented in 13 counties at an efficiency of 81 percent. (3) Counties regrouped to accommodate base and forecast year data differentiations. *Stage II control counties: Cherokee, Clayton, Cobb, Coweta, De Kalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, and Rockdale*
KY	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
MS	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
NC	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons. (2) Revert to default equipment allocation files for all equipment categories. (3) Utilize revised (i.e., local) seasonal activity data.
SC	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
TN	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons. (2) Gasoline RVP values changed in accordance with local recommendations. (3) Stage II vapor recovery eliminated from Shelby County modeling.
VA	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons.
WV	(1) Marine diesel sulfur content changed from 2500 ppmW to 2638 ppmW in all counties and seasons. (2) Revert to default equipment allocation files for all equipment categories.

Table 1.3-5 Spring 2006 NONROAD Input File Sequence and Structural Revisions

State	2002 Inventory Input File Sequence Numbers (Fall 2004)	2002 Inventory Input File Sequence Numbers (Spring 2006)	Reason(s) for Change	Number of Final 2002 Inventory NONROAD Input Files
AL	01-08	01-08	No Structural Changes	32 (at 8 per season)
FL	09-10	09-10	No Structural Changes	8 (at 2 per season)
GA	11-13	11-13, 53-54	Counties Regrouped	20 (at 5 per season)
KY	14-22	14-22	No Structural Changes	36 (at 9 per season)
MS	48	48	No Structural Changes	4 (at 1 per season)
NC	23-25	23-25	No Structural Changes	12 (at 3 per season)
SC	26-32	26-32	No Structural Changes	28 (at 7 per season)
TN	33-34, 49-52	33-34, 49-52	No Structural Changes	24 (at 6 per season)
VA	35-38, 40-43	35-38, 40-43	No Structural Changes	32 (at 8 per season)
WV	44-47	44-47	No Structural Changes	16 (at 4 per season)
All	**01-38, 40-52**	**01-38, 40-54**		**212 (at 53 per season)**

Note: (1) All files include internal revisions to reflect the data changes summarized in Table 1.3-5 above. This table is intended to present structural revisions that are of interest in assembling the NONROAD model input files into a complete VISTAS region inventory. The indicated revisions do not (in and of themselves) result in emission estimate changes.

(2) The NONROAD model imposes an eight digit input file name limit, so all input files for the revised 2002 base year inventory follow a modified naming convention to allow each to be distinguished from the input files for the initial 2002 and fall 2004-revised 2002 base year inventory. For the initial 2002 base year inventory, the naming convention was:

ss02aaqq, where: ss = the two character State abbreviation,
aa = a two character season indicator as follows: AU = autumn, WI = winter, SP = spring, and SU = summer, and
qq = the two digit sequence number indicated above.

For the fall 2004-revised 2002 inventory, the naming convention was modified to:

ss02aFqq, where: ss = the two character State abbreviation,
a = a one character season indicator as follows: A = autumn, W = winter, S = spring, and X = summer, and
qq = the two digit sequence number indicated above.

For the spring 2006-revised 2002 inventory, the naming convention was modified to:

ss02aCqq, where: ss = the two character State abbreviation,
a = a one character season indicator as follows: A = autumn, W = winter, S = spring, and X = summer, and
qq = the two digit sequence number indicated above.

1.3.2.2 Emissions from Commercial Marine Vessels, Locomotives, and Airplanes

An initial 2002 base year emissions inventory for aircraft, locomotives, and commercial marine vessels (CMV) was prepared for VISTAS in early 2004. The methods and data used to develop the inventory are presented in a February 9, 2004 report "*Development of the VISTAS Draft 2002 Mobile Source Emission Inventory (February 2004 Version)*" as prepared by E.H. Pechan & Associates, Inc. A summary of the initial 2002 base year emissions inventory is presented in Table 1.3-6. Except as otherwise stated below, all aspects of the preparation methodology continue to apply to the Base F and Base G emission inventories.

Revisions to the initial 2002 emissions inventory (prepared by Pechan) were implemented to ensure that the latest State and local data were incorporated as well as to correct an overestimation of PM emissions from aircraft. Revisions were actually implemented in two stages. An initial set of revisions was implemented in the fall of 2004. Those revisions constitute the Base F inventory. These were followed by a second set of revisions in 2006, which constitute the Base G inventory. To accurately document the combined effects of both sets of revisions, each set is discussed separately below. Unless otherwise indicated, all revisions implemented for Base F were carried directly into the Base G revision process without change. Thus, the inventories that resulted from the Base F revisions served as the starting point for the Base G revisions.

Base F Revisions:

Revisions to the initial 2002 base year emissions inventory were implemented to ensure that the latest State and local data were incorporated as well as to correct an overestimation of PM emissions from aircraft. Seven of the ten VISTAS States provided revised inventory data in the form of emissions reported to the EPA under the CERR. States providing CERR data were Alabama, Georgia, Mississippi, North Carolina, Tennessee (excluding Davidson, Hamilton, Knox, and Shelby Counties), Virginia, and West Virginia.

In many cases, the CERR data were only marginally different than the initial 2002 base year inventory data, but there were several instances where significant updates were evident. The remaining three VISTAS States (Florida, Kentucky, and South Carolina), plus Davidson, Hamilton, Knox, and Shelby counties in Tennessee, indicated that the initial 2002 VISTAS inventory continued to reflect the most recent data available. Florida did provide updated aircraft emissions data for one county (Miami-Dade) and these data were incorporated into the Base F 2002 inventory as described below.

Since several States recommended retaining the initial 2002 base year inventory data for Base F, the initial step toward revising the 2002 inventory consisted of modifying the estimated aircraft PM emissions of the initial inventory. The overestimation of aircraft PM became evident shortly

after the release of the initial 2002 base year inventory, when it was determined that VISTAS region airports would constitute the top seven, and 11 of the top 15, PM sources in the nation. Moreover, PM emissions for one airport (Miami International) were a full order of magnitude larger than *all* other modeled elemental carbon PM emission sources. In addition, unexpected relationships across airports were also observed, with emissions for Atlanta's Hartsfield International being substantially less than those of Miami International, even though Atlanta handles over twice as many aircraft operations annually. Given the pervasiveness of this problem, and since the CERR data submitted by States was based on the initial 2002 VISTAS inventory data, aircraft PM emissions for the entire VISTAS region were recalculated.

Table 1.3-6 Initial 2002 Base Year Aircraft, Locomotive, and Non-Recreational Marine Emissions as Reported in February 2004 Pechan Report (annual tons)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	3,787	175	688	475	17	196
	FL	28,518	11,955	46,352	31,983	1,050	3,703
	GA	3,175	992	3,919	2,704	94	353
	KY	2,666	657	2,597	1,792	63	263
	MS	1,593	140	553	381	13	96
	NC	6,088	1,548	6,115	4,219	148	613
	SC	6,505	515	452	312	88	863
	TN	6,854	2,665	7,986	5,510	225	920
	VA	17,676	5,607	14,476	9,988	234	3,229
	WV	1,178	78	310	214	8	66
	Total	**78,040**	**24,332**	**83,448**	**57,578**	**1,940**	**10,302**
Commercial Marine (2280)	AL	1,195	9,217	917	843	3,337	736
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,874	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,687	43,233	1,903	1,750	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	4,129	31,397	1,390	1,278	5,753	980
	VA	1,198	3,426	929	855	3,258	596
	WV	2,094	15,882	668	614	720	497
	Total	**29,503**	**218,760**	**10,858**	**9,989**	**40,146**	**7,779**
Military Marine (2283)	VA	136	387	28	26	30	59
	Total	**136**	**387**	**28**	**26**	**30**	**59**
Locomotives (2285)	AL	3,490	26,339	592	533	1,446	1,354
	FL	1,006	9,969	247	222	605	404
	GA	2,654	26,733	664	598	1,622	1,059
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	4,530	44,793	1,110	999	2,689	1,805
	VA	1,928	19,334	1,407	1,266	3,443	798
	WV	1,105	11,150	277	249	681	436
	Total	**21,980**	**211,588**	**6,118**	**5,505**	**14,947**	**8,738**
Grand Total		**129,659**	**455,067**	**100,452**	**73,099**	**57,062**	**26,877**

Aircraft do emit PM while operating. However, official EPA inventory procedures for aircraft generally do not include PM emission factors and, therefore, aircraft PM is generally erroneously reported as zero. In an effort to overcome this deficiency, the developers of the initial VISTAS 2002 base year aircraft inventory (Pechan) estimated PM emission rates for aircraft using estimated NO_x emissions and an unreported PM-to-NO_x ratio (i.e., PM = NO_x times a PM-to-NO_x ratio). According to the initial 2002 base year inventory documentation, this approach was applied only to commercial aircraft NO_x, but a review of that inventory indicates that the technique was also applied to military, general aviation, and air taxi aircraft in many, but not all, instances. Although there is nothing inherently incorrect with this approach, the accuracy and inconsistent application of the assumed PM-to-NO_x ratio results in grossly overestimated aircraft PM.

Through examination of the initial 2002 base year aircraft inventory (prepared by E.H. Pechan and Associates, Inc.), it is apparent that the commercial aircraft PM-to-NO_x ratio used to generate PM emission estimates was approximately equal to 3.95 (i.e., PM = NO_x times 3.95). While the majority of observed commercial aircraft PM-to-NO_x ratios in that inventory are equal to 3.95, a few range as low as 3.00. If all aircraft estimates are included (i.e., commercial plus military, general aviation, and air taxi), observed PM-to-NO_x ratios range from 0 to 123.0, and average 3.43 as illustrated in Table 1.3-7

Table 1.3-7 PM-to-NO_x Ratios by Aircraft Type In Initial 2002 Base Year Inventory.

Aircraft Type	Average PM-to-NO_x	Range of PM-to-NO_x	Average $PM_{2.5}$ / PM_{10}	Range of $PM_{2.5}$ / PM_{10}
Undefined (1)	0.046	0-0.062	0.690	0.690-0.690
Military	0.073	0-92.3	0.688	0.333-1.000
Commercial	3.953	3.00-3.953	0.690	0.667-0.696
General Aviation	2.059	0-9.00	0.689	0.500-1.000
Air Taxi	2.734	0-123.0	0.690	0.500-1.000
Aggregate	3.427	0-123.0	0.690	0.333-1.000

Note: (1) Two counties report aircraft emissions as SCC 2275000000 “all aircraft.”

As indicated, the aggregate PM-to-NO_x ratio is similar in magnitude to the ratio for commercial aircraft. This results from the dominant nature of commercial aircraft NO_x emissions relative to NO_x from other aircraft types. It is surmised that ratios that deviate from 3.95 are based on PM emission estimates generated by local planners, which were retained without change in the PM estimation process (although a considerable number of unexplained “zero PM” records also exist

in the initial 2002 base year inventory dataset). Regardless, based on previous statistical analyses performed in support of aircraft emissions inventory development outside the VISTAS region, a PM-to-NO_x ratio of 3.95 is too large by over an order of magnitude.

In analyses performed for the Tucson, Arizona planning area, PM-to-NO_x ratios for aircraft over a standard aircraft landing and takeoff (LTO) cycle are shown in Table 1.3-8. Data for this table is taken from "Emissions Inventories for the Tucson Air Planning Area, Volume I., Study Description and Results," prepared for the Pima Association of Governments, Tucson, AZ, November 2001. Pages 4-40 through 4-42 of that report, which document the statistical derivation of these ratios, are included in this report as Appendix E.

Table 1.3-8 Tucson, AZ PM-to-NO_x Ratios by Aircraft Type.

Aircraft Type	PM-to-NO_x
Commercial Aircraft	0.26
Military Aircraft	0.88
Air Taxi Aircraft	0.50
General Aviation Aircraft	1.90

Note:

The PM and NO_x emission estimates presented in the Tucson study are for local aircraft operating mode times. For this work, emission estimates for Tucson were recalculated for a standard LTO cycle, so that the ratios presented are applicable to the standard LTO cycle and not a Tucson-specific cycle. Thus, the ratios presented herein vary somewhat from those associated with the emission estimates presented in the Tucson study report.

In reviewing these data, it should be considered that they apply to a standard (i.e., EPA-defined) commercial aircraft LTO cycle.[2] Aircraft PM-to-NO_x ratios vary with operating mode, so that aircraft at airports with mode times that differ from the standard cycle will exhibit varying ratios. However, conducting an airport-specific analysis for all airports in the VISTAS region was beyond the scope of this work. While local PM-to-NO_x ratios could vary somewhat from the indicated standard cycle ratios, any error due to this variation will be significantly less than the order of magnitude error associated with the 3.95 commercial aircraft ratio used for the initial 2002 base year inventory.

It should be recognized that while the Tucson area is far removed from the VISTAS region, the data analyzed to generate the PM-to-NO_x ratios is standard aircraft emission factor data routinely employed for inventory purposes throughout the United States (as encoded in models such as the

[2] As defined in *AP-42, Compilation of Air Pollutant Emission Factors, Volume II, Mobile Sources, a standard commercial aircraft LTO cycle consists of 4 minutes of approach time, 26 minutes of taxi (7 minutes in plus 19 minutes out), 0.7 minutes of takeoff, and 2.2 minutes of climbout time (approach and climbout times being based on a 3000 foot mixing height).*

Federal Aviation Administration's Emissions Data Management Systems [EDMS]). With the exception of aircraft operating conditions, there are no inherent geographic implications associated with the use of data from the Tucson study. As indicated above, issues associated with local operating conditions have been eliminated by recalculating the Tucson study ratios for a standard LTO cycle.

To implement the revised PM-to-NO_x ratios in the Base F inventory, *all* aircraft PM records were removed from the initial 2002 base year inventory (prepared by Pechan). This includes records for which local planners may have estimated PM emissions. This approach was taken for two reasons. First, there is no way to distinguish which records may have been generated by local planners. Second, the data available to local planners may be no better than that used to generate the presented PM-to-NO_x ratio data, so the consistent application of these data to the entire VISTAS region was determined to be the most appropriate approach to generating consistent inventories throughout the region. In undertaking this removal, it became apparent that there was an imbalance in the aircraft NO_x and PM records in the initial 2002 base year inventory. Whereas there were 1,531 NO_x records in the NIF emission data sets for this source category, there were only 1,212 PM records. The imbalance was distributed between three States, South Carolina, Tennessee, and Virginia as follows:

Table 1.3-9 Non-Corresponding Aircraft Emissions Records

Aircraft NO_x records with no corresponding PM record:			
Aircraft Type	**South Carolina**	**Virginia**	**Total**
Military Aircraft	8	100	108
General Aviation Aircraft	14	94	108
Air Taxi Aircraft	5	99	104
Aggregate	27	293	320
Aircraft PM records with no corresponding NO_x record:			
Aircraft Type	**Tennessee**		**Total**
Air Taxi Aircraft	1		1
Aggregate	1		1

The unmatched PM record was for Hamilton County (Chattanooga), Tennessee and when removed, was not replaced since there was no corresponding NO_x record with which to estimate revised PM emissions. It is unclear how this orphaned record originated, but clearly there can be no air taxi PM emissions without other combustion-related emissions. Thus, the removal of the PM_{10} and $PM_{2.5}$ records for Hamilton County permanently reduced the overall size of the 2002 initial base year inventory database used as a starting point for Base F by two records.

Of the 320 unmatched NO_x records, 269 were records for which the reported emission rate was zero. Therefore, even though associated PM records were missing, the overall inventory was not affected. However, the 51 missing records for which NO_x emissions were non-zero, did impact PM estimates for the overall inventory.

Replacement PM_{10} records were calculated for all aircraft NO_x records using the PM-to-NO_x ratios presented above. Aircraft type-specific ratios were utilized in all cases, except for two counties where aircraft emissions were reported under the generic aircraft SCC 2275000000. For these counties (Palm Beach County, Florida and Davidson County, Tennessee), the commercial aircraft PM-to-NO_x ratio was applied since both contain commercial airports (Palm Beach International and Nashville International).

Replacement aircraft $PM_{2.5}$ records were also developed. The initial 2002 base year inventory assumed that aircraft $PM_{2.5}$ was 69 percent of aircraft PM_{10}. The origin of this fraction is not clear, but it is very low for combustion related PM. The majority of internal combustion engine related PM is typically 1 micron or smaller ($PM_{1.0}$), so that typical internal combustion engine $PM_{2.5}$ fractions approach 100 percent. For example, the EPA NONROAD model assumes 92 percent for gasoline engine particulate and 97 percent for diesel engine particulate. Based on recent correspondence from the EPA, it appears that the agency is preparing to recommend a $PM_{2.5}$ fraction of 98 percent for aircraft. (August 12, 2004 e-mail correspondence from U.S. EPA to Gregory Stella of Alpine Geophysics.) This is substantially more consistent with expectations based on emissions test data for other internal combustion engine sources and was used as the basis for the recalculated aircraft $PM_{2.5}$ emission estimates in the Base F inventory.

Although a substantial portion of the initial 2002 base year inventory was ultimately replaced with data prepared by State and local planners under CERR requirements in developing the Base F inventory, it was necessary to first revise the initial 2002 base year aircraft inventory as described so that records extracted from the inventory for areas not supplying CERR data for the Base F update would be accurate. Therefore, in *no case* is the aggregated State data reported for the Base F inventory identical to that of the initial 2002 base year inventory. Even areas relying on the initial 2002 base year inventory will reflect updates in Base F due to changes in emissions of PM_{10} and $PM_{2.5}$ from aircraft.

Table 1.3-10 presents the updated initial 2002 base year inventory estimates. These estimates do not reflect any changes related to modifications made to incorporate the CERR data, but instead indicate the impacts associated solely with the recalculation of aircraft PM emissions alone to apply the more appropriate PM to NO_x ratios. Table 1.3-11 presents a summary of the net impacts of these changes, where an over 90 percent reduction in aircraft PM is observed for all VISTAS areas except South Carolina and Virginia. The reasons for the lesser changes in these two States is that the overall aircraft NO_x inventories for both include a large share of military

aircraft NO_x to which no (or very low) particulate estimates were assigned in the initial 2002 base year inventory. Since these operations are assigned non-zero PM emissions under the revised approach, the increase in military aircraft PM offsets a portion of the reduction in commercial aircraft PM. In Virginia, zero (or near zero) PM military operations were responsible for about 35 percent of total aircraft NO_x, while the corresponding fraction in South Carolina was almost 70 percent. As indicated, aggregate aircraft, locomotive, and commercial marine vessel PM is 70-75 percent lower in the updated 2002 base year inventory.

Table 1.3-10 Initial 2002 Base Year Aircraft, Locomotive, and Non-Recreational Marine Emissions with Modified Aircraft PM Emission Rates (annual tons)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	3,787	175	64	62	17	196
	FL	28,518	11,955	3,193	3,129	1,050	3,703
	GA	3,175	992	269	264	94	353
	KY	2,666	657	179	175	63	263
	MS	1,593	140	44	43	13	96
	NC	6,088	1,548	419	411	148	613
	SC	6,505	515	409	401	88	863
	TN	6,854	2,665	707	692	225	920
	VA	17,676	5,607	2,722	2,667	234	3,229
	WV	1,178	78	25	24	8	66
	Total	**78,040**	**24,332**	**8,030**	**7,870**	**1,940**	**10,302**
Commercial Marine (2280)	AL	1,195	9,217	917	843	3,337	736
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,874	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,687	43,233	1,903	1,750	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	4,129	31,397	1,390	1,278	5,753	980
	VA	1,198	3,426	929	855	3,258	596
	WV	2,094	15,882	668	614	720	497
	Total	**29,503**	**218,760**	**10,858**	**9,989**	**40,146**	**7,779**
Military Marine (2283)	VA	136	387	28	26	30	59
	Total	136	387	28	26	30	59
Locomotives (2285)	AL	3,490	26,339	592	533	1,446	1,354
	FL	1,006	9,969	247	222	605	404
	GA	2,654	26,733	664	598	1,622	1,059
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	4,530	44,793	1,110	999	2,689	1,805
	VA	1,928	19,334	1,407	1,266	3,443	798
	WV	1,105	11,150	277	249	681	436
	Total	**21,980**	**211,588**	**6,118**	**5,505**	**14,947**	**8,738**
Grand Total		**129,659**	**455,067**	**25,034**	**23,390**	**57,062**	**26,877**

Table 1.3-11 Change in Initial 2002 Base Year Emissions due to Aircraft PM Emission Rate Modifications.

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	0%	0%	-91%	-87%	0%	0%
	FL	0%	0%	-93%	-90%	0%	0%
	GA	0%	0%	-93%	-90%	0%	0%
	KY	0%	0%	-93%	-90%	0%	0%
	MS	0%	0%	-92%	-89%	0%	0%
	NC	0%	0%	-93%	-90%	0%	0%
	SC	0%	0%	-9%	+29%	0%	0%
	TN	0%	0%	-91%	-87%	0%	0%
	VA	0%	0%	-81%	-73%	0%	0%
	WV	0%	0%	-92%	-89%	0%	0%
	Total	**0%**	**0%**	**-90%**	**-86%**	**0%**	**0%**
Commercial Marine (2280)	AL	0%	0%	0%	0%	0%	0%
	FL	0%	0%	0%	0%	0%	0%
	GA	0%	0%	0%	0%	0%	0%
	KY	0%	0%	0%	0%	0%	0%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	0%	0%	0%	0%	0%	0%
	VA	0%	0%	0%	0%	0%	0%
	WV	0%	0%	0%	0%	0%	0%
	Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Military Marine (2283)	VA	0%	0%	0%	0%	0%	0%
	Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Locomotives (2285)	AL	0%	0%	0%	0%	0%	0%
	FL	0%	0%	0%	0%	0%	0%
	GA	0%	0%	0%	0%	0%	0%
	KY	0%	0%	0%	0%	0%	0%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	0%	0%	0%	0%	0%	0%
	VA	0%	0%	0%	0%	0%	0%
	WV	0%	0%	0%	0%	0%	0%
	Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Grand Total		**0%**	**0%**	**-75%**	**-68%**	**0%**	**0%**

As indicated above, for the Base F 2002 base year inventory, data for all or portions of seven VISTAS States were replaced with corresponding data from recent (as of the fall of 2004) CERR submissions for 2002. Before replacing these data, however, an analysis of the CERR data was performed to ensure consistency with VISTAS inventory methods. It should perhaps also be noted that three of the CERR datasets provided for the Base F 2002 base year inventory (specifically those for Tennessee, Virginia, and West Virginia) included both annual and daily emissions data. Only the annual data were used. Daily values were removed.

Several important observations resulted from this analysis. First, it was clear that all of the CERR data continued to rely on the inaccurate aircraft PM estimation approach employed for the initial 2002 base year inventory. Therefore, an identical aircraft PM replacement procedure as described above for updating the initial 2002 base year inventory was undertaken for CERR supplied data. As a result, the CERR data for *all* VISTAS States has been modified for inclusion in the Base F 2002 VISTAS base year inventory due to PM replacement procedures.

As was the case with the initial VISTAS 2002 base year inventory, there were a substantial number of aircraft NO_x records without corresponding PM records, so that the number of recalculated PM records added to the CERR dataset is greater than the number of PM records removed. The aggregated CERR inventory data, reflecting data for all or parts of seven States, consisted of 13,656 records, of which 1,211 were aircraft NO_x records. However, the number of corresponding aircraft PM records was 662 (662 PM_{10} records and 662 $PM_{2.5}$ records). This imbalance was distributed as follows:

Table 1.3-12 CERR Aircraft NO_x Records with No Corresponding PM Record.

Aircraft Type	Georgia	Tennessee	Virginia	Total
Military Aircraft			136	136
Commercial Aircraft		4	136	140
General Aviation Aircraft	1		136	137
Air Taxi Aircraft			136	136
Aggregate	**1**	**4**	**544**	**549**

From this tabulation, it is clear that virtually the entire imbalance is associated with the Virginia CERR submission, with minor imbalances in Georgia and Tennessee. Of the 549 unmatched NO_x records, 461 were records for which the reported emission rate was zero. Therefore, even though the associated PM records were missing, the overall inventory was not affected. However, the 88 missing records for which NO_x emissions were non-zero do impact PM emission estimates for the overall inventory.

Replacement aircraft PM records (both PM_{10} and $PM_{2.5}$) were generated for the CERR dataset using procedures identical to those described above for the updated initial 2002 base year inventory.

Further analysis revealed that the CERR data for Virginia included only VOC, CO, and NO_x emissions for all aircraft, locomotives, and non-recreational marine vessels. Since SO_2, PM_{10}, and $PM_{2.5}$ records are included in the 2002 VISTAS inventory, an estimation method was developed for these emission species and applied to the Virginia CERR data. For PM, the

developed methodology was only employed for locomotive and marine vessel data since aircraft PM was estimated using the PM-to-NO_x ratio methodology described above.

Consideration was given to simply adding the Virginia SO_2 and non-aircraft PM records from the initial 2002 VISTAS inventory dataset, but it is very unlikely that either the source distribution or associated emission rates are identical across the CERR and initial VISTAS inventories. This was confirmed through a comparative analysis of dataset CO records. Therefore, an estimation methodology was developed using Virginia source-specific SO_2/CO, PM_{10}/CO, and $PM_{2.5}$/PM_{10} ratios from the initial 2002 base year VISTAS inventory. The calculated ratios were then applied to the source-specific CERR CO emission estimates to derive associated source-specific SO_2, PM_{10}, and $PM_{2.5}$ emissions for the Base F inventory.

Initially, the development of the emissions ratios from the initial 2002 base year inventory was performed at the State (i.e., Virginia), county, and SCC level of detail. However, it readily became clear that there were substantial inconsistencies in ratios for identical SCCs across counties. For example, in one county, the SO_2/CO ratio might be 0.2, while in the next county it would be 2.0. Since the sources in question are virtually identical (e.g., diesel locomotives) and since the fueling infrastructure for these large non-road equipment sources is regional as opposed to local in nature, such variations in emission rates are not realistic. Therefore, a more aggregated approach was employed in which SCC-specific emission ratios were developed for the State as a whole. Through this approach county-to-county variation in emission ratios is eliminated, but the underlying variation in CO emissions does continue to influence the resulting aggregate emission estimates. The applied emission ratios are as follows:

Table 1.3-13 Calculated Emission Ratios for VA.

Source	SCC	SO_2/CO	PM_{10}/CO	$PM_{2.5}$/CO	$PM_{2.5}$/PM_{10}
Military Aircraft	2275001000	0.0215	*Emissions estimated using PM-to-NO_x ratios as described previously.*		
Commercial Aircraft	2275020000	0.3292			
General Aviation Aircraft	2275050000	0.0002			
Air Taxi Aircraft	2275060000	0.0015			
Aircraft Refueling	2275900000	0.0000	0.0000	0.0000	
Diesel Commercial Marine	2280002000	0.3697	0.3434	0.3157	0.92
Residual Commercial Marine	2280003000	0.3697	0.3434	0.3157	0.92
Diesel Military Marine	2283002000	0.2422	0.2248	0.2068	0.92
Line Haul Locomotives	2285002005	3.2757	1.2999	1.1696	0.90
Yard Locomotives	2285002010	2.2908	1.2461	1.1205	0.90

It is important to recognize that the inconsistency of emissions ratios across Virginia counties for sources of virtually identical design, which utilize a regional rather than local fueling infrastructure, has potential implications for other VISTAS States. There is no immediately obvious reason to believe that such inconsistencies would be isolated to Virginia.

One final revision to the CERR dataset was undertaken as part of the Base F effort, and that was the removal of two records for unpaved airstrip particulate (SCC 2275085000) in Alabama. Otherwise identical records for these emissions were reported both in terms of filterable and primary particulate. The filterable particulate records were removed as all other particulate emissions in the VISTAS inventories are in terms of primary particulate. It is also perhaps worth noting that a series of aircraft refueling records (SCC 2275900000) for Virginia were left in place, even through typically such emissions would be reported under SCC 2501080XXX in the area source inventory. If additional VISTAS aircraft refueling emissions are reported under SCC 2501080XXX, then it may be desirable to recode these records.

Finally, data for areas of the VISTAS region not represented in the CERR dataset were added to the CERR data by extracting the appropriate records from the initial 2002 base year inventory (with revisions for aircraft PM to NO_x ratios). Specifically, records applicable to the States of Florida, Kentucky, South Carolina, and the Tennessee counties of Davidson, Hamilton, Knox, and Shelby were extracted from the revised initial 2002 inventory and added to the CERR dataset to establish the 2002 Base F inventory.

Following this aggregation, one last dataset revision was implemented to complete the development of the 2002 Base F inventory. As indicated in the introduction of this section, the initial 2002 base year emission estimates for Miami International Airport were determined to be excessive. Although the reason for this inaccuracy was not apparent, revised estimates for aircraft emissions in Miami-Dade County were obtained from Florida planners and used to overwrite the erroneous estimates. (Aircraft emission estimates were provided in an August 10, 2004 e-mail transmittal from Bruce Coward of Miami-Dade County to Martin Costello of the Florida Department of Environmental Protection.)

Table 1.3-14 presents a summary of the resulting Base F VISTAS 2002 base year inventory estimates for aircraft, locomotives, and non-recreational marine vessels. Table 1.3-15 provides a comparison of the Base F 2002 base year inventory estimates to those of the initial 2002 base year inventory. As indicated, total emissions for VOC, CO, NO_x, and SO_2 are generally within 10 percent, but final PM emissions are reduced by 70-80 percent due to the approximate 90 percent reductions in aircraft PM estimates. In addition, the significant changes in Georgia aircraft emissions are due to the CERR correction of Atlanta Hartsfield International Airport emissions, which were significantly underestimated in the initial 2002 base year inventory. The

reduction in Florida aircraft emissions due to the correction of Miami International estimates is also apparent.

Lastly, Table 1.3-16 provides a direct comparison of emission estimates from the initial and Base F 2002 base year inventories for all 16 VISTAS region airports with estimated annual aircraft NO_x emissions of 200 tons or greater (as identified at the conclusion of the Base F revisions).[3] The table entries are sorted in order of decreasing NO_x and once again, the dramatic reduction in PM emissions is evident. However, in addition, the appropriate reversal of the relationship between Atlanta's Hartsfield and Miami International Airport is also depicted. As a rough method of quality assurance, Table 1.3-15 also includes a *gross* estimate of expected airport NO_x emissions using detailed NO_x estimates developed for Tucson International Airport in conjunction with the ratio of local to Tucson LTOs. (The Tucson NO_x estimates are revised to reflect a standard LTO cycle rather than the Tucson-specific LTO cycle. This should provide for a more realistic comparison to VISTAS estimates.) This is not meant to serve as anything other than a crude indicator of the propriety of the developed VISTAS estimates, and it is clear that the range of estimated-to-expected NO_x emissions has been substantially narrowed in the Base F 2002 base year inventory. Whereas estimated-to-expected ratios varied from about 0.2 to over 3.5 in the initial 2002 base year inventory, the range of variation is tightened on both ends, from about 0.5 to 1.75 for the Base F 2002 base year inventory. In effect, all estimates are now within a factor of two of the expected estimates, which is quite reasonable given likely variation in local and standard LTO cycles and variations in aircraft fleet mix across airports.

It is perhaps important to note that some shifting in county emissions assignments is evident between the initial and Base F 2002 base year aircraft inventories. For example, for the initial 2002 base year inventory, Atlanta Hartsfield estimates were assigned to Fulton County (FIP 13121), while they are assigned to Clayton County (FIP 13063) for the Base F 2002 base year inventory. Similarly, Dulles International Airport emissions were assigned solely to Fairfax County, Virginia (FIP 51059) in the initial 2002 base year inventory, but are split between Fairfax and Loudoun County (FIP 51107) for Base F. Such shifts reflect local planner decision-making and are not an artifact of the revisions described above.

[3] Subsequent revisions performed for Base G result in the addition of the Cincinnati/Northern Kentucky International Airport to the group of airports with aircraft operations generating at least 200 tons of NO_x. These revisions are discussed below, including the addition of an appropriately modified version of the aircraft emissions table.

Table 1.3-14 Base F 2002 Base Year Aircraft, Locomotive, and Non-Recreational Marine Emissions (tons/year)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	3,787	175	226	87	17	196
	FL	25,431	8,891	2,424	2,375	800	3,658
	GA	6,622	5,372	1,475	1,446	451	443
	KY	2,666	657	179	175	63	263
	MS	1,593	140	44	43	13	96
	NC	6,088	1,548	419	411	148	613
	SC	6,505	515	409	401	88	863
	TN	7,251	2,766	734	719	235	943
	VA	9,763	2,756	1,137	1,115	786	2,529
	WV	1,178	78	25	24	8	66
	Total	**70,884**	**22,899**	**7,072**	**6,797**	**2,607**	**9,670**
Commercial Marine (2280)	AL	1,196	9,218	917	844	3,337	737
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,875	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,688	43,233	1,903	1,751	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	3,624	27,555	1,217	1,120	4,974	860
	VA	972	2,775	334	307	359	483
	WV	1,528	11,586	487	448	525	362
	Total	**28,207**	**209,972**	**9,911**	**9,118**	**36,275**	**7,413**
Military Marine (2283)	VA	110	313	25	23	27	48
	Total	**110**	**313**	**25**	**23**	**27**	**48**
Locomotives (2285)	AL	3,490	26,339	592	533	1,446	1,354
	FL	1,006	9,969	247	222	605	404
	GA	2,725	27,453	682	614	1,667	1,086
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	2,626	25,627	633	570	1,439	1,041
	VA	1,186	11,882	1,529	1,375	3,641	492
	WV	1,311	13,224	329	296	808	517
	Total	**19,611**	**187,764**	**5,833**	**5,248**	**14,066**	**7,777**
Grand Total		**118,812**	**420,948**	**22,841**	**21,186**	**52,976**	**24,908**

Table 1.3-15 Change in 2002 Emissions, Base F Inventory Relative to Initial Inventory

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	0%	0%	-67%	-82%	0%	0%
	FL	-11%	-26%	-95%	-93%	-24%	-1%
	GA	+109%	+442%	-62%	-47%	+379%	+26%
	KY	0%	0%	-93%	-90%	0%	0%
	MS	0%	0%	-92%	-89%	0%	0%
	NC	0%	0%	-93%	-90%	0%	0%
	SC	0%	0%	-9%	+29%	0%	0%
	TN	+6%	+4%	-91%	-87%	+4%	+2%
	VA	-45%	-51%	-92%	-89%	+236%	-22%
	WV	0%	0%	-92%	-89%	0%	0%
	Total	**-9%**	**-6%**	**-92%**	**-88%**	**+34%**	**-6%**
Commercial Marine (2280)	AL	+0%	+0%	+0%	+0%	+0%	+0%
	FL	0%	0%	0%	0%	0%	0%
	GA	+0%	+0%	+0%	+0%	+0%	+0%
	KY	0%	0%	0%	0%	0%	0%
	MS	+0%	+0%	+0%	+0%	+0%	+0%
	NC	+0%	+0%	+0%	+0%	+0%	+0%
	SC	0%	0%	0%	0%	0%	0%
	TN	-12%	-12%	-12%	-12%	-14%	-12%
	VA	-19%	-19%	-64%	-64%	-89%	-19%
	WV	-27%	-27%	-27%	-27%	-27%	-27%
	Total	**-4%**	**-4%**	**-9%**	**-9%**	**-10%**	**-5%**
Military Marine (2283)	VA	-19%	-19%	-12%	-12%	-12%	-19%
	Total	**-19%**	**-19%**	**-12%**	**-12%**	**-12%**	**-19%**
Locomotives (2285)	AL	0%	0%	0%	0%	0%	0%
	FL	0%	0%	0%	0%	0%	0%
	GA	+3%	+3%	+3%	+3%	+3%	+3%
	KY	0%	0%	0%	0%	0%	0%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	-42%	-43%	-43%	-43%	-46%	-42%
	VA	-38%	-39%	+9%	+9%	+6%	-38%
	WV	+19%	+19%	+19%	+19%	+19%	+19%
	Total	**-11%**	**-11%**	**-5%**	**-5%**	**-6%**	**-11%**
Grand Total		**-8%**	**-7%**	**-77%**	**-71%**	**-7%**	**-7%**

Table 1.3-16 Base F Comparison of Aircraft Emissions (Airports with Aircraft NO_x > 200 tons per year)

Airport	FIP	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	Approx. LTOs	Predicted NO_x	VISTAS to Predicted
Initial 2002 Base Year Inventory										
Miami	12086	9,757	5,997	23,706	16,357	525	1,641	150,000	1,680	3.57
Orlando	12095	3,456	2,170	8,578	5,919	204	642	150,000	1,680	1.29
Memphis	47157	3,462	1,934	7,645	5,275	185	603	125,000	1,400	1.38
Reagan	51013	3,892	1,806	7,138	4,925	164	302	100,000	1,120	1.61
Hampton	51650	2,690	1,705	0	0	0	611	Military		
Dulles	51059	2,032	1,330	5,246	3,620	0	272	75,000	840	1.58
Orlando-Sanford	12117	3,615	1,225	4,837	3,337	100	351			
Atlanta	13121	1,457	913	3,608	2,490	86	274	420,000	4,704	0.19
Fort Lauderdale	12011	1,930	809	3,196	2,206	75	257	75,000	840	0.96
Charlotte	37119	1,643	788	3,113	2,148	75	255	150,000	1,680	0.47
Tampa	12057	1,399	785	3,101	2,140	74	240	75,000	840	0.93
Nashville	47037	1,819	653	40	28	33	239	60,000	672	0.97
Raleigh	37183	1,584	592	2,338	1,613	56	204	75,000	840	0.70
Louisville	21111	1,073	468	1,851	1,277	45	155	60,000	672	0.70
Jacksonville	12031	871	325	1,284	886	31	112	30,000	336	0.97
Palm Beach	12099	1,156	226	0	0	1	132	30,000	336	0.67
Aggregate		41,836	21,724	75,682	52,220	1,655	6,290			0.19-3.57
Base F 2002 Base Year Inventory										
Atlanta	13063	4,121	5,288	1,435	1,406	443	337	420,000	4,704	1.12
Miami	12086	6,670	2,933	805	789	274	1,596	150,000	1,680	1.75
Orlando	12095	3,456	2,170	568	556	204	642	150,000	1,680	1.29
Memphis	47157	3,462	1,934	506	495	185	603	125,000	1,400	1.38
Orlando-Sanford	12117	3,615	1,225	338	332	100	351			
Fort Lauderdale	12011	1,930	809	217	212	75	257	75,000	840	0.96
Charlotte	37119	1,643	788	206	202	75	255	150,000	1,680	0.47
Tampa	12057	1,399	785	206	202	74	240	75,000	840	0.93
Nashville	47037	1,819	653	170	166	33	239	60,000	672	0.97
Reagan	51013	1,269	635	171	168	193	97	100,000	1,120	0.57
Dulles 1	51107	1,807	595	164	161	252	153	37,500	420	1.42
Raleigh	37183	1,584	592	156	153	56	204	75,000	840	0.70
Dulles 2	51059	1,095	591	156	153	252	115	37,500	420	1.41
Hampton	51650	858	535	471	461	18	305	Military		
Louisville	21111	1,073	468	123	121	45	155	60,000	672	0.70
Jacksonville	12031	871	325	87	85	31	112	30,000	336	0.97
Palm Beach	12099	1,156	226	59	58	1	132	30,000	336	0.67
Aggregate		37,829	20,550	5,838	5,721	2,312	5,793			0.47-1.75
Net Change		**-10%**	**-5%**	**-92%**	**-89%**	**+40%**	**-8%**			

Note: For the Base F inventory, Dulles International Airport emissions are split between two Virginia counties.
Predicted NO_x is based on the ratio of airport LTOs to test airport (Tucson International Airport) LTOs and NO_x.
This is not a rigorous comparison, but rather an approximate indicator of expected magnitude.

Base G Revisions:

Further revisions to the 2002 base year emissions inventory were implemented in response to additional state data submittals in the spring of 2006. The inventories developed through the Base F revision process (as described above) served as the starting point for the 2006 revisions. Thus, unless otherwise indicated below, all documented Base F revisions continue to apply to the Base G-revised 2002 base year inventory.

As part of the Base G review and update process, Virginia regulators provided 443 updated emission records for aircraft. These records reflected revisions to aircraft VOC, CO, and NO_x, and in a few cases SO_2, emissions records that were already in the Base F VISTAS 2002 inventory (as opposed to the addition of previously unreported data). The specific revisions broke down as follows:

Table 1.3-17 Base G VA Aircraft Records Updates

Aircraft Type	VOC	CO	NO_x	SO_2	Total
Military Aircraft	9	9	9	1	28
Commercial Aircraft	12	12	12	17	53
General Aviation Aircraft	65	66	66	0	197
Air Taxi Aircraft	56	56	53	0	165
Aggregate	142	143	140	18	443

Emissions values for each of the 443 records in the Base F 2002 VISTAS inventory were updated for Base G to reflect the revised data. However, as described above for the Base F revisions, all aircraft SO_2, PM_{10}, and $PM_{2.5}$ emissions in Virginia are estimated on the basis of CO (in the case of SO_2) and NO_x emissions (in the cases of PM_{10} and $PM_{2.5}$). Therefore, since Virginia regulators did not provide updated SO_2 emissions for all updated CO emissions records, or updated PM_{10} or $PM_{2.5}$ emissions for all updated NO_x emissions records, it was necessary to re-estimate aircraft SO_2, PM_{10}, and $PM_{2.5}$ emissions in all cases where updated CO or NO_x emissions were provided for Base G (and explicit SO_2 and/or PM_{10} and $PM_{2.5}$ emissions were not).

The procedure used to estimate the SO_2, PM_{10}, and $PM_{2.5}$ emissions revisions was identical to that described above for the Base F inventory revisions, except that revised SO_2-to-CO emissions ratios were calculated for commercial aircraft, where 12 pairs of revised CO and SO_2 emissions estimates were available. Although a single pair of revised CO and SO_2 emissions records was available for military aircraft, this was deemed an insufficient sample with which to replace the military aircraft SO_2-to-CO emissions ratios previously calculated in Base F. However, it is worth noting that the SO_2-to-CO emissions ratio for the revised military aircraft emissions pair

was within 16 percent of the previously calculated ratio, so any error associated with retention of the Base F ratio will be minor. Table 1.3-18 presents the emissions ratios.

Table 1.3-18 Calculated Base G Emission Ratios for VA.

Source	SCC	SO_2/CO (fall 2004)	SO_2/CO (spring 2006)	SO_2/CO (used in 2006)	PM_{10}/NO_x	$PM_{2.5}/PM_{10}$
Military Aircraft	2275001000	0.0215	0.0180	0.0215	0.88	0.98
Commercial Aircraft	2275020000	0.3292	0.0696	0.0696	0.26	0.98
General Aviation Aircraft	2275050000	0.00016	n/a	0.00016	1.9	0.98
Air Taxi Aircraft	2275060000	0.0015	n/a	0.0015	0.5	0.98

Application of the SO_2-to-CO emissions ratios to the 130 revised aircraft CO records, for which no corresponding SO_2 emission revisions were provided, resulted in an additional 130 aircraft SO_2 emission records updates for Virginia. Similarly, application of the PM_{10}-to-NO_x emissions ratios to the 140 revised aircraft NO_x records for which no corresponding PM_{10} emission revisions were provided, resulted in an additional 140 aircraft PM_{10} emission records updates for Virginia. Application of the $PM_{2.5}$-to-PM_{10} emissions ratios to the 140 revised aircraft PM_{10} records resulted in an additional 140 aircraft $PM_{2.5}$ emission records updates for Virginia. Thus, in total, 853 (443+130+140+140) Virginia aircraft emissions records were updated for Base G.

Also as part of the Base G review and update process, Alabama regulators provided 178 updated PM emission records for aircraft (89 records for PM_{10} and 89 records for $PM_{2.5}$), 42 additional emissions records for locomotives (14 records for VOC, 14 records for CO, and 14 records for NO_x), and 179 additional emission records for aircraft (30 records for VOC, 30 records for CO, 30 records for NO_x, 29 records for SO_2, 30 records for PM_{10}, and 30 records for $PM_{2.5}$). After review, it was determined that the 178 updated PM emission records for aircraft actually reflected the original (overestimated) aircraft PM data that was replaced universally throughout the VISTAS region for Base F. Implementing these latest revisions would, in effect, “undo” the Base F aircraft PM revisions. Following discussions with Alabama regulators, it was determined that the 178 aircraft PM records would not be updated for the Base G revisions.

The 42 additional emissions records for locomotives were determined to correspond exactly to existing SO_2, PM_{10}, and $PM_{2.5}$ emissions records already in the Base F VISTAS 2002 inventory. It is not clear why these existing records contained no corresponding data for VOC, CO, and NO_x, but those data are now reflected through the additional 42 records that have now been added to the Base G 2002 VISTAS inventory for Alabama.

After examining the 179 additional aircraft emissions records in conjunction with Alabama regulators, it was determined that 17 of the records (commercial aircraft records in Dale,

Limestone, and Talladega counties) were erroneous and should be excluded from the update. The remaining 162 records reflected additional general aviation, air taxi, and military aircraft activity in 20 counties and were specifically comprised of 27 records each for VOC, CO, NO_x, SO_2, PM_{10}, and $PM_{2.5}$. There were no further issues with the VOC, CO, NO_x, and SO_2 records and these were added to the Base G 2002 VISTAS inventory without change. It was, however, apparent that the PM_{10} and $PM_{2.5}$ records reflected an overestimation of aircraft PM similar to that which was previously corrected throughout the VISTAS region for Base F (as documented above). To overcome this overestimation, the additional aircraft PM_{10} and $PM_{2.5}$ records provided by Alabama regulators were replaced with revised emission estimates developed on the basis of the PM_{10}-to-NO_x and $PM_{2.5}$-to-PM_{10} ratios documented under the Base F revisions above. So although 27 aircraft PM_{10} records and 27 aircraft $PM_{2.5}$ records were added to the 2002 Alabama inventory, they reflected different emissions values than those provided directly by Alabama regulators.

In total, 204 additional emissions records (42 for locomotives and 162 for aircraft) were added to the Base G 2002 Alabama inventory.

Finally, as part of the Base G review and update process, Kentucky regulators provided 12 updated aircraft emission records for Boone County, to correct previously underestimated aircraft emissions associated with the Cincinnati/Northern Kentucky International Airport. VOC, CO, and NO_x emissions data were provided for military, commercial, general aviation, and air taxi aircraft. No associated updates for SO_2, PM_{10}, or $PM_{2.5}$ emissions were provided. Corresponding PM_{10} emission estimates were developed by applying the PM_{10}-to-NO_x ratios presented in Table 1.3-17 above to the updated NO_x emission estimates. $PM_{2.5}$ emission estimates were developed by applying the $PM_{2.5}$-to-PM_{10} ratios from that same table to the estimated PM_{10} emissions. SO_2 emission estimates were developed by applying the SO_2-to-PM_{10} ratios developed from the older data (i.e., the data being replaced) for Boone County aircraft to the updated PM_{10} emissions. Thus, a total of 24 inventory records for Kentucky were updated (VOC, CO, NO_x, SO_2, PM_{10}, and $PM_{2.5}$ for four aircraft types).

Upon implementation of the universe of updates, 877 existing emission records were revised (853 in Virginia and 24 in Kentucky) and 204 additional emission records (all in Alabama) were added to the 2002 VISTAS inventory. The total number of aircraft, locomotive, and commercial marine inventory records thus changed from 22,838 records in Base F to 23,042 records in Base G.

Table 1.3-19 presents a summary of the resulting Base G VISTAS 2002 base year inventory estimates for aircraft, locomotives, and non-recreational marine vessels. Table 1.3-20 provides a comparison of the Base G 2002 base year inventory estimates to those of the Base F 2002 base

year inventory. As indicated, total emissions for VOC, CO, NO_x, and SO_2 are generally within about 5 percent, with changes restricted to the states of Alabama, Kentucky, and Virginia.

Lastly, Table 1.3-21 provides an updated comparison of emission estimates from the Base F and Base G 2002 base year inventories for all 17 VISTAS region airports with estimated annual aircraft NO_x emissions of 200 tons or greater. As compared to Table 1.3-16, the table reflects the Base G addition of the Cincinnati/Northern Kentucky International Airport. Aircraft emission estimates for the other 16 airports are unchanged from their Base F values.

Table 1.3-19 Base G-Revised 2002 Base Year Aircraft, Locomotive, and Non-Recreational Marine Emissions (tons/year)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	5,595	185	238	99	18	276
	FL	25,431	8,891	2,424	2,375	800	3,658
	GA	6,620	5,372	1,475	1,446	451	443
	KY	5,577	925	251	246	88	397
	MS	1,593	140	44	43	13	96
	NC	6,088	1,548	419	411	148	613
	SC	6,505	515	409	401	88	863
	TN	7,251	2,766	734	719	235	943
	VA	11,873	3,885	2,010	1,970	272	2,825
	WV	1,178	78	25	24	8	66
	Total	**77,712**	**24,305**	**8,029**	**7,734**	**2,121**	**10,179**
Commercial Marine (2280)	AL	1,196	9,218	917	844	3,337	737
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,875	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,688	43,233	1,903	1,751	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	3,624	27,555	1,217	1,120	4,974	860
	VA	972	2,775	334	307	359	483
	WV	1,528	11,586	487	448	525	362
	Total	**28,207**	**209,972**	**9,911**	**9,118**	**36,275**	**7,413**
Military Marine (2283)	VA	110	313	25	23	27	48
	Total	**110**	**313**	**25**	**23**	**27**	**48**
Locomotives (2285)	AL	3,518	26,623	592	533	1,446	1,365
	FL	1,006	9,969	247	222	605	404
	GA	2,654	26,733	664	598	1,622	1,059
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	2,626	25,627	633	570	1,439	1,041
	VA	1,186	11,882	1,529	1,375	3,641	492
	WV	1,311	13,224	329	296	808	517
	Total	**19,568**	**187,328**	**5,815**	**5,232**	**14,022**	**7,761**
Grand Total		**125,597**	**421,918**	**23,780**	**22,107**	**52,444**	**25,401**

Table 1.3-20 Change in 2002 Emissions, Base G Inventory Relative to Base F Inventory

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	+48%	+6%	+5%	+14%	+7%	+41%
	FL	0%	0%	0%	0%	0%	0%
	GA	0%	0%	0%	0%	0%	0%
	KY	+109%	+41%	+40%	+40%	+41%	+51%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	0%	0%	0%	0%	0%	0%
	VA	+22%	+41%	+77%	+77%	-65%	+12%
	WV	0%	0%	0%	0%	0%	0%
	Total	**+10%**	**+6%**	**+14%**	**+14%**	**-19%**	**+5%**
Commercial Marine (2280)	AL	0%	0%	0%	0%	0%	0%
	FL	0%	0%	0%	0%	0%	0%
	GA	0%	0%	0%	0%	0%	0%
	KY	0%	0%	0%	0%	0%	0%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	0%	0%	0%	0%	0%	0%
	VA	0%	0%	0%	0%	0%	0%
	WV	0%	0%	0%	0%	0%	0%
	Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Military Marine (2283)	VA	0%	0%	0%	0%	0%	0%
	Total	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Locomotives (2285)	AL	+1%	+1%	0%	0%	0%	+1%
	FL	0%	0%	0%	0%	0%	0%
	GA	0%	0%	0%	0%	0%	0%
	KY	0%	0%	0%	0%	0%	0%
	MS	0%	0%	0%	0%	0%	0%
	NC	0%	0%	0%	0%	0%	0%
	SC	0%	0%	0%	0%	0%	0%
	TN	0%	0%	0%	0%	0%	0%
	VA	0%	0%	0%	0%	0%	0%
	WV	0%	0%	0%	0%	0%	0%
	Total	**+0%**	**+0%**	**0%**	**0%**	**0%**	**+0%**
Grand Total		**+6%**	**+0%**	**+4%**	**+4%**	**-1%**	**+2%**

Table 1.3-21 Base G Comparison of Aircraft Emissions (Airports with Aircraft NO_x > 200 tons per year)

Airport	FIP	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	Approx. LTOs	Predicted NO_x	VISTAS to Predicted
Base F 2002 Base Year Inventory										
Atlanta	13063	4,121	5,288	1,435	1,406	443	337	420,000	4,704	1.12
Miami	12086	6,670	2,933	805	789	274	1,596	150,000	1,680	1.75
Orlando	12095	3,456	2,170	568	556	204	642	150,000	1,680	1.29
Memphis	47157	3,462	1,934	506	495	185	603	125,000	1,400	1.38
Orlando-Sanford	12117	3,615	1,225	338	332	100	351			
Fort Lauderdale	12011	1,930	809	217	212	75	257	75,000	840	0.96
Charlotte	37119	1,643	788	206	202	75	255	150,000	1,680	0.47
Tampa	12057	1,399	785	206	202	74	240	75,000	840	0.93
Nashville	47037	1,819	653	170	166	33	239	60,000	672	0.97
Reagan	51013	1,269	635	171	168	193	97	100,000	1,120	0.57
Dulles 1	51107	1,807	595	164	161	252	153	37,500	420	1.42
Raleigh	37183	1,584	592	156	153	56	204	75,000	840	0.70
Dulles 2	51059	1,095	591	156	153	252	115	37,500	420	1.41
Hampton	51650	858	535	471	461	18	305	Military		
Louisville	21111	1,073	468	123	121	45	155	60,000	672	0.70
Jacksonville	12031	871	325	87	85	31	112	30,000	336	0.97
Palm Beach	12099	1,156	226	59	58	1	132	30,000	336	0.67
Cincinnati	21015	467	144	38	37	14	54	50,000	560	0.26
Aggregate		38,296	20,694	5,876	5,758	2,326	5,847			0.26-1.75
Base G 2002 Base Year Inventory										
Atlanta	13063	4,121	5,288	1,435	1,406	443	337	420,000	4,704	1.12
Miami	12086	6,670	2,933	805	789	274	1,596	150,000	1,680	1.75
Orlando	12095	3,456	2,170	568	556	204	642	150,000	1,680	1.29
Memphis	47157	3,462	1,934	506	495	185	603	125,000	1,400	1.38
Orlando-Sanford	12117	3,615	1,225	338	332	100	351			
Fort Lauderdale	12011	1,930	809	217	212	75	257	75,000	840	0.96
Charlotte	37119	1,643	788	206	202	75	255	150,000	1,680	0.47
Tampa	12057	1,399	785	206	202	74	240	75,000	840	0.93
Nashville	47037	1,819	653	170	166	33	239	60,000	672	0.97
Reagan	51013	1,269	635	171	168	193	97	100,000	1,120	0.57
Dulles 1	51107	1,807	595	164	161	252	153	37,500	420	1.42
Raleigh	37183	1,584	592	156	153	56	204	75,000	840	0.70
Dulles 2	51059	1,095	591	156	153	252	115	37,500	420	1.41
Hampton	51650	858	535	471	461	18	305	Military		
Louisville	21111	1,073	468	123	121	45	155	60,000	672	0.70
Cincinnati	21015	3,378	411	110	107	39	187	50,000	560	0.73
Jacksonville	12031	871	325	87	85	31	112	30,000	336	0.97
Palm Beach	12099	1,156	226	59	58	1	132	30,000	336	0.67
Aggregate		41,207	20,961	5,947	5,828	2,352	5,981			0.47-1.75
Net Change		**+8%**	**+1%**	**+1%**	**+1%**	**+1%**	**+2%**			

Note: For the revised inventory, Dulles International Airport emissions are split between two Virginia counties.
Predicted NO_x is based on the ratio of airport LTOs to test airport (Tucson International Airport) LTOs and NO_x.
This is not a rigorous comparison, but rather an approximate indicator of expected magnitude.

1.3.2.3 Emissions from NONROAD Model Sources in Illinois, Indiana, and Ohio

As part of the Base G update process, VISTAS requested that emissions estimates for 2002 be produced for the states of Illinois, Indiana, and Ohio. These estimates were to be produced at the same spatial (i.e., county level by SCC) and temporal resolution as estimates for the VISTAS region.

The requested estimates were produced by extracting a complete set of county-level input data applicable to each of the three states from the latest version of the EPA's NMIM (National Mobile Inventory Model) model. This included appropriate consideration of all non-default NMIM input files generated by the Midwest Regional Planning Organization (MRPO), as described below. These input data were then assembled into appropriate input files for the Final NONROAD2005 model and emission estimates were produced using the same procedure employed for the VISTAS region as part of the Base G updates.

A complete set of monthly input data was developed for each county in Illinois, Indiana, and Ohio by extracting data from the following NMIM database files (using the NMIM MySQL query browser):

> county, countrynrfile, countyyear, countyyearmonth, countyyearmonthhour, gasoline, diesel, and natural gas

The database files:

> countrynrfile, countyyear, countyyearmonth, and gasoline

were non-default database files provided to VISTAS by the MRPO, and are intended to reflect the latest planning data being used by MRPO modelers.

From these files, monthly data for gasoline vapor pressure, gasoline oxygen content, gasoline sulfur content, diesel sulfur content for land-based equipment, diesel sulfur content for marine-based equipment, natural gas sulfur content, minimum daily temperature, maximum daily temperature, and average daily temperature were developed. In addition, the altitude and Stage II refueling control status of each county, as well as the identity of the associated equipment population, activity, growth, allocation, and seasonal distribution files, was determined. These data were then assembled into Final NONROAD2005 input files on a seasonal basis, with monthly data being arithmetically averaged to produce seasonal equivalents as follows:

Winter	=	Average of December, January, and February
Spring	=	Average of March, April, and May
Summer	=	Average of June, July, and August,
Fall	=	Average of September, October, and November

Unlike the VISTAS Base G approach, this approach results in the use of the following non-default data files during the Final NONROAD2005 modeling process:

Table 1.3-22 Non-Default Files Used for MRPO Modeling

Data File	Illinois	Indiana	Ohio
Activity File	1700002.act	1800002.act	3900002.act
Growth File	17000.grw	18000.grw	39000.grw
Population File	17000.pop	18000.pop	39000.pop
Season File	17000.sea	18000.sea	39000.sea
Inboard Marine Allocation File	17000wib.alo	18000wib.alo	39000wib.alo
Outboard Marine Allocation File	17000wob.alo	18000wob.alo	39000wob.alo
Specific Fuel Consumption	MRPO-specific file provided by MRPO modelers (arbitrarily named “mrpoBSFC.emf” for this work)		

One compromise was made relative to the level of resolution that is available through the basic approach described above, that being the treatment of ambient temperature data. Because NMIM offers a unique temperature profile for every U.S. county -- developed by aggregating temperature data from included and surrounding weather stations on the basis of their distances from the county population centroid -- it is not possible to explicitly group counties with otherwise identical input streams. Ungrouped however, there would be 1,128 distinct input streams to be processed (102 Illinois counties plus 92 Indiana counties plus 88 Ohio counties at four seasons each), or over five times the number of files processed for the entire VISTAS region.

To surmount this problem and allow counties with similar temperature profiles to be grouped an approach was employed wherein counties were considered groupable if *all* temperature inputs[4] are within ± 2 ºF of the corresponding group average. This criterion is quite stringent in that it results in less tolerant grouping than that employed for VISTAS modeling, which uses temperature data from the nearest meteorological station as opposed to "unique" meteorological

[4] Non-road temperature inputs used for county grouping are: winter minimum, spring minimum, summer minimum, fall minimum, winter maximum, spring maximum, summer maximum, fall maximum, winter average, spring average, summer average, and fall average.

data for each county. Under this approach, the actual deviation for grouped counties is *much* less that ± 2º F for the overwhelming majority of the 12 grouped temperature inputs.

In addition to the required temperature consistency, all other input data for counties to be grouped had to be identical for all four seasons. Using this criterion, Illinois emissions were modeled using 12 county groups, Indiana emissions were modeled using 9 county groups, and Ohio emissions were modeled using 10 county groups. Thus, 31 iterations of NONROAD2002 were required per season, as compared to the 53 iterations per season required for the VISTAS region.

It should be noted that a potential quality assurance issue was noted in assembling the NONROAD2005 input data for a number of Indiana counties. Specifically, the gasoline vapor pressure for most Indiana counties reflects a value of 9.0 psi in *all* spring, summer, fall, and winter months. This is likely to indicate a problem with the accuracy of the NMIM databases for these counties, but these data were used as defined for this work.

1.3.3 Quality Assurance steps

Throughout the inventory development process, quality assurance steps were performed to ensure that no double counting of emissions occurred, and to ensure that a full and complete inventory was developed for VISTAS. Quality assurance was an important component to the inventory development process and MACTEC performed the following QA steps on the area source component of the 2002 base year revised:

1. All CERR and NIF format State supplied data submittals were run through EPA's Format and Content checking software.
2. SCC level emission summaries were prepared and evaluated to ensure that emissions were consistent and that there were no missing sources.
3. Tier comparisons (by pollutant) were developed between the revised 2002 base year inventory and the initial base year inventory.
4. Data product summaries were provided to both the VISTAS Emission Inventory Technical Advisor and to Mobile Source SIWG representatives for review and comment. Changes based on these comments were implemented in the files.
5. Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from 1.0 to 2.0. A minor change would cause a version number to go from 1.0 to 1.1. Minor changes resulting from largely editorial changes would result in a change from 1.00 to 1.01.

2.0 Projection Inventory Development

2.1 Point Sources

We used different approaches for different sectors of the point source inventory:

- For the EGUs, VISTAS relied primarily on the Integrated Planning Model® (IPM®) to project future generation as well as to calculate the impact of future emission control programs. The IPM results were adjusted based on S/L agency knowledge of planned emission controls at specific EGUs.
- For non-EGUs, we used recently updated growth and control data consistent with the data used in EPA's CAIR analyses, and supplemented these data with available S/L agency knowledge of planned emission controls or other changes at specific non-EGUs and updated fuel use forecast data for the U.S. Department of Energy.

For both sectors, we generated 2009 and 2018 inventories for a combined on-the-books (OTB) and on-the-way (OTW) control scenario. The OTB/OTW control scenario accounts for post-2002 emission reductions from promulgated and proposed non-EGU federal control programs as of July 1, 2004; the final Clean Air Interstate Rule (CAIR); and State, local, and site-specific control programs as of October 1, 2007. Section 2.1.1 discusses the EGU projection inventory development, while Section 2.1.2 discusses the non-EGU projection inventory development.

2.1.1 EGU Emission Projections

The following subsections discuss the following specific aspects of the development of the EGU projections. First, we present a chronology of the EGU development process and discuss key decisions in selecting the final methods for performing the emissions projections. Next, we describe the development of the final set of IPM runs that are included in the VISTAS Base G inventory. Next, we describe the process of transforming the IPM parsed files into NIF format. Fourth, we discuss the process for ensuring that units accounted for in IPM were not double-counted in the non-EGU inventory. Fifth, we describe the QA/QC checks that were made to ensure that the IPM results were properly incorporated into the VISTAS inventory. Sixth, we document the changes to the IPM results that S/L agencies specified they wanted included in the VISTAS inventory based on new information that were not accounted for in the IPM runs. Finally, we present summaries of the B&F projected EGU emissions by year, state, and pollutant.

2.1.1.1 Chronology of the Development of EGU Projections

At the beginning of the EGU inventory development process, VISTAS considered three options for developing the VISTAS 2009 and 2018 projection inventories for EGUs:

- Option 1 – Use the results of IPM modeling conducted in support of the proposed Clean Air Interstate Rule (CAIR) base and control case analyses as the starting point and refine the projections with readily available inputs from stakeholders; these IPM runs were conducted for 2010 and 2015, which VISTAS would use to represent projected emissions in 2009 and 2018 respectively.
- Option 2 – Use the VISTAS 2002 typical year as the starting point, apply growth factors from the Energy Information Administration, and refine future emission rates with stakeholder input regarding utilization rates, capacity, retirements, and new unit information.
- Option 3 – Use the results of a new round of IPM modeling sponsored by VISTAS and the Midwest Regional Planning Organization (MRPO). These runs incorporated VISTAS specific unit and regulation modified parameters, and generate results for 2009 and 2018 explicitly.

An additional consideration for each of the three options was the inclusion of emission projections developed by the Southern Company specifically for their units. Southern Company is a super-regional company which owns EGUs in Alabama, Florida, Georgia, and Mississippi and participates in VISTAS as an industry stakeholder. Southern Company used their energy budget forecast to project net generation and heat input for every existing and future Southern Company EGU for the years 2009 and 2018. Further documentation of how Southern Company generated the 2009/2018 inventory for their units can be found in *Developing Southern Company Emissions and Flue Gas Characteristics for VISTAS Regional Haze Modeling (April 2005, presented at 14th International Emission Inventory Conference).*

Each of these three options and the Southern Company projections were discussed in a series of conference calls with the VISTAS EGU Special Interest Work Group (SIWG) during the fall of 2004. During a conference call on December 6, 2004, the VISTAS EGU SIWG approved the use of the latest VISTAS/MRPO sponsored IPM runs (Option 3) to represent the 2009 and 2018 EGU forecasts of emissions for the OTB and OTW cases. During the call, Alabama and Georgia specified that they did not wish to use Southern Company provided emissions forecasts of 2009 and 2018 to represent the sources in their States. Mississippi decided to utilize the Southern Company projections to represent activity at Southern Company facilities in Mississippi. After the call, Florida decided against using Southern Company provided emissions forecasts of 2009 and 2018 to represent the sources in their State. Thus, Southern Company data was used only for Southern Company units in Mississippi for both the Base F and Base G projections.

The Option 3 IPM modeling resulted from a joint agreement by VISTAS and MRPO to work together to develop future year utility emissions based on IPM modeling. The decision to use

IPM modeling was based in part on a study of utility forecast methods by E.H. Pechan and Associates, Inc. (Pechan) for MRPO, which recommended IPM as a viable methodology (see *Electricity Generating Unit {EGU} Growth Modeling Method Task 2 Evaluation*, February 11, 2004). Although IPM results were available from EPA's modeling to support their rulemaking for the Clean Air Interstate Rule (CAIR), VISTAS stakeholders felt that certain model inputs needed to be improved. Thus, VISTAS and MRPO decided to hire contractors to conduct new IPM modeling and to post-process the IPM results. Southern Company projections in 2009 were roughly comparable with IPM. For 2018, Southern Company projections were generally less than IPM because of assumptions made by Southern Company on which units would be economical to control and incorrect data in the NEEDS database which feeds IPM.

In August 2004, VISTAS contracted with ICF International, Inc., to run IPM to provide utility forecasts for 2009 and 2018 under two future scenarios – Base Case and CAIR Case. The Base Case represents the current operation of the power system under currently known laws and regulations (as known at the time the run was made), including those that come into force in the study horizon. The CAIR Case is the Base Case with the proposed CAIR rule superimposed. The run results were parsed at the unit level for the 2009 and 2018 run years. Also in August 2004, MRPO contracted with E.H. Pechan to post-process the IPM outputs generated by ICF to provide model-ready emission files. The IPM output files were delivered by ICF to VISTAS in November (*Future Year Electricity Generating Sector Emission Inventory Development Using the Integrated Planning Model (IPM®) in Support of Fine Particulate Mass and Visibility Modeling in the VISTAS and Midwest RPO Regions*, January 2005), and the post-processed data files were delivered by Pechan to the MRPO in December 2004 (*LADCO IPM Model Parsed File Post-Processing Methodology and File Preparation*, February 8, 2005).

On March 10, 2005, EPA issued the final Clean Air Interstate Rule. VISTAS and MRPO, in conjunction with other RPOs, conducted another round of IPM modeling which reflected changes to control assumptions based on the final CAIR as well as additional changes to model inputs based on S/L agency and stakeholder comments. Several conference calls were conducted in the spring of 2005 to discuss and provide comments on IPM assumptions related to six main topics: power system operation, generating resources, emission control technologies, set-up parameters and rule, financial assumptions, and fuel assumptions. Based on these discussions, VISTAS sponsored a new set of IPM runs to reflect the final CAIR requirements as well as certain changes to IPM assumptions that were agreed to by the VISTAS states. This set of IPM runs is documented in *Future Year Electricity Generating Sector Emission Inventory Development Using the Integrated Planning Model (IPM®) in Support of Fine Particulate Mass and Visibility Modeling in the VISTAS and Midwest RPO Regions*, April 2005 (these runs are referred to as the VISTAS Phase I analysis).

Further refinements to the IPM inputs and assumptions were made by the RPOs, and ICF performed the following four runs using IPM during the summer of 2005 (these runs are referred to as the VISTAS/CENRAP Phase II analysis):

- Base Case with EPA 2.1.9 coal, gas and oil price assumptions.
- Base Case with EPA 2.1.9 coal and gas supply curves adjusted for AEO 2005 reference case price and volume relationships.
- Strategy Case with EPA 2.1.9 coal, gas and oil price assumptions.
- Strategy Case with EPA 2.1.9 coal and gas supply curves adjusted for AEO 2005 reference case price and volume relationships.

The above runs were parsed for 2009 and 2018 run years. The above four runs were based on VISTAS Phase I and the EPA 2.1.9 assumptions. The changes that were implemented in the above four runs are summarized below:

- Unadjusted AEO 2005 electricity demand projections were incorporated in the above four runs.
- The gas supply curves were adjusted for AEO 2005 reference case price and volume relationships. The EPA 2.1.9 gas supply curves were scaled such that IPM will solve for AEO 2005 gas prices when the power sector gas demand in IPM is consistent with AEO 2005 power sector gas demand projections.
- The coal supply curves used in EPA 2.1.9 were scaled in such a manner that the average mine mouth coal prices that the IPM is solving in aggregated coal supply regions are comparable to AEO 2005. Due to the fact that the coal grades and supply regions between AEO 2005 and the EPA 2.1.9 are not directly comparable, this was an approximate approach and had to be performed in an iterative fashion. The coal transportation matrix was not updated with EIA assumptions due to significant differences between the EPA 2.1.9 and EIA AEO 2005 coal supply and coal demand region configurations.
- The cost and performance of new units were updated to AEO 2005 reference case levels in all of the above four funs.
- The run years 2008, 2009, 2012, 2015, 2018, 2020 and 2026 were modeled.
- The AEO 2005 life extension costs for fossil and nuclear units were incorporated in the above runs.

- The extensive NEEDS comments provided by VISTAS, MRPO, CENRAP and MANE-VU were incorporated into the VISTAS Phase I NEEDS.
- MANE-VU's comments in regards to the state regulations in the northeast were incorporated.
- Renewable Portfolio Standards (RPS) in the northeast was modeled based on the Regional Greenhouse Gas Initiative analysis. A single RPS cap was modeled for MA, RI, NY, NJ, MD and CT. These states could buy credits from NY, PJM and New England model regions.
- The investments required under the Illinois power, Mirant and First Energy NSR settlements were incorporated in the above runs.

For the VISTAS/CENRAP Phase II set of IPM runs, ICF generated two different parsed files. One file includes all fuel burning units (fossil, biomass, landfill gas) as well as non-fuel burning units (hydro, wind, etc.). The second file contains just the fossil-fuel burning units (e.g., emissions from biomass and landfill gas are omitted). The RPOs decided to use the fossil-only file for modeling to be consistent with EPA, since EPA used the fossil only results for CAIR analyses. For the 10 VISTAS states, non-fossil fuels accounted for only 0.13 percent of the NOx emissions and 0.04 percent of the SO_2 emissions in the 2009 IPM runs.

S/L agencies reviewed the results of the VISTAS/CENRAP Phase II set of IPM runs, which were incorporated into the VISTAS Base F inventory. S/L agencies primarily reviewed and commented on the IPM results with respect to IPM decisions on NO_x post-combustion controls and SO_2 scrubbers. S/L agencies provided the latest information on when and where new SO_2 and NO_x controls are planned to come online. S/L agencies also reviewed the IPM results to verify that existing controls and emission rates were properly reflected in the IPM runs. As directed by the S/L agencies, adjustments to the IPM results were made to specific units with any new information they had as part of the permitting process or other contact with the industry that indicates which units will install controls as a result of CAIR and when these new controls will come on-line. Mississippi decided to continue to use the Southern Company projections instead of the IPM projections to represent emissions at Southern Company facilities in Mississippi. The initial set of state-specified changes to the VISTAS/CENRAP Phase II set of IPM runs were used to create the Base G projection inventory (and are documented later in Section 2.1.1.6). The second set of state specified changes were made only for the 2018 inventory, resulting in the Base G2 2018 inventory (documented later in Section 2.1.1.7). The final set of state specified changes applied to both the 2009 and 2018 inventories and were used to create the B&F 2009 and 2018 inventories (documented later in Section 2.1.1.8).

2.1.1.2 VISTAS IPM runs for EGU sources

The following general summary of the VISTAS IPM® modeling is based on ICF's documentation *Future Year Electricity Generating Sector Emission Inventory Development Using the IPM® in Support of Fine Particulate Mass and Visibility Modeling in the VISTAS and Midwest RPO Regions*, April 2005. The ICF documentation is to be used as an extension to EPA's proposed CAIR modeling runs documented in *Documentation Supplement for EPA Modeling Applications (V.2.1.6) Using the IPM*, EPA 430/R-03-007, July 2003.

IPM provides "forecasts of least-cost capacity expansion, electricity dispatch, and emission control strategies for meeting energy demand and environmental, transmission, dispatch, and reliability constraints." The underlying database in this modeling is U.S. EPA's National Electric Energy Data System (NEEDS) released with the CAIR Notice of Data Availability (NODA). The NEEDS database contains the existing and planned/committed unit data in EPA modeling applications of IPM. NEEDS includes basic geographic, operating, air emissions, and other data on these generating units. VISTAS States and stakeholders provided changes for:

- NO_x post-combustion control on existing units
- SO_2 scrubbers on existing units
- SO_2 emission limitations
- PM controls on existing units
- Summer net dependable capacity
- Heat rate for existing units
- SO_2 and NO_x control plans based on State rules or enforcement settlements

The years 2009 and 2018 were explicitly modeled.

2.1.1.3 Post-Processing of IPM Parsed Files

The following summary of the VISTAS/Midwest Regional Planning Organization (MRPO) IPM modeling is based on Pechan's documentation *LADCO IPM Model Parsed File Post-Processing Methodology and File Preparation*, February 8, 2005. The essence of the IPM model post-processing methodology is to take an initial IPM model output file and transform it into air quality model input files. ICF via VISTAS/MRPO provides an initial spreadsheet file containing unit-level records of both

(1) "existing" units and

(2) committed or new generic aggregates.

All records have unit and fuel type data; existing, retrofit (for SO_2 and NO_x), and separate NO_x control information; annual SO_2 and NO_x emissions and heat input; summer season (May-September) NO_x and heat input; July day NO_x and heat input; coal heat input by coal type;

nameplate capacity megawatt (MW), and State FIPS code. Existing units also have county FIPS code, a unique plant identifier (ORISPL) and unit ID (also called boiler ID) (BLRID); generic units do not have these data. The processing includes estimating various types of emissions and adding in control efficiencies, stack parameters, latitude-longitude coordinates, and State identifiers (plant ID, point ID, stack ID, process ID). Additionally, the generic units are sited in a county and given appropriate IDs. This processing is described in more detail below.

The data are prepared by transforming the generic aggregates into units similar to the existing units in terms of the available data. The generic aggregates are split into smaller generic units based on their unit types and capacity, are provided a dummy ORIS unique plant and boiler ID, and are given a county FIPS code based on an algorithm that sites each generic by assigning a sister plant that is in a county based on its attainment/nonattainment status. Within a State, plants (in county then ORIS plant code order) in attainment counties are used first as sister sites to generic units, followed by plants in PM nonattainment counties, followed by plants in 8-hour ozone nonattainment counties. Note that no LADCO or VISTAS States provided blackout counties that would not be considered when siting generics, so this process is identical to the one used for EPA IPM post-processing.

SCCs were assigned for all units; unit/fuel/firing/bottom type data were used for existing units' assignments, while only unit and fuel type were used for generic units' assignments. Latitude-longitude coordinates were assigned, first using the EPA-provided data files, secondly using the September 17, 2004 Pechan in-house latitude-longitude file, and lastly using county centroids. These data were only used when the data were not provided in the 2002 NIF files. Stack parameters were attached, first using the EPA-provided data files, secondly using a March 9, 2004 Pechan in-house stack parameter file based on previous EIA-767 data, and lastly using an EPA June 2003 SCC-based default stack parameter file. These data were only used when the data were not provided in the 2002 NIF files.

Additional data were required for estimating VOC, CO, filterable primary PM_{10} and PM2.5, PM condensable, and NH_3 emissions for all units. Thus, ash and sulfur contents were assigned by first using 2002 EIA-767 values for existing units or SCC-based defaults; filterable PM10 and PM2.5 efficiencies were obtained from the 2002 EGU NEI that were based on 2002 EIA-767 control data and the PM Calculator program (a default of 99.2 percent is used for coal units if necessary); fuel use was back calculated from the given heat input and a default SCC-based heat content; and emission factors were obtained from an EPA-approved October 7, 2004 Pechan emission factor file based on AP-42 emission factors. Note that this updated file is not the one used for estimating emissions for previous EPA post-processed IPM files. Emissions for 28 temporal-pollutant combinations were estimated since there are seven pollutants (VOC, CO, primary PM_{10} and $PM_{2.5}$, NH_3, SO_2 and NO_x) and four temporal periods (annual, summer season, winter season, July day).

The next step was to match the IPM unit IDs with the identifiers in VISTAS 2002 inventory. A crosswalk file was used to obtain FIPS State and county, plant ID (within State and county), and point ID. If the FIPS State and county, plant ID and point ID are in the 2002 VISTAS NIF tables, then the process ID and stack ID are obtained from the NIF; otherwise, defaults, described above, were used.

Pechan provided the post-processed files in NIF 3.0 format. Two sets of tables were developed : "NIF files" for IPM units that have a crosswalk match and are in the 2002 VISTAS inventory, and "NoNIF files" for IPM units that are not in the 2002 VISTAS inventory (which includes existing units with or without a crosswalk match as well as generic units).

For Base F and Base G projections, VISTAS reviewed the PM and NH_3 emissions from EGUs as provided by Pechan and identified significantly higher emissions in 2009/2018 than in 2002. VISTAS determined that Pechan used a set of PM and NH_3 emission factors that are "the most recent EPA approved uncontrolled emission factors" for estimating 2009/2018 emissions. These factors are most likely not the same emission factors used by States for estimating these emissions in 2002 for EGUs in the VISTAS domain. Thus, the emission increase from 2002 to 2009/2018 was simply an artifact of the change in emission factor, not anything to do with changes in activity or control technology application. Also, VISTAS identified an inconsistent use of SCCs for determining emission factors between the base and future years.

VISTAS resolution of the PM and NH_3 problem is fully documented in *EGU Emission Factors and Emission Factor Assignment,* memorandum from Greg Stella to VISTAS State Point Source Contacts and VISTAS EGU Special Interest Workgroup, June 13, 2005. The first step was the adjustment of the 2002 base year emissions inventory. Using the latest "EPA-approved" uncontrolled emission factors by SCC, Alpine Geophysics utilized CERR or VISTAS reported annual heat input, fuel throughput, heat, ash and sulfur content to estimate annual uncontrolled emissions for units identified as output by IPM. This step was conducted for non-CEM pollutants (CO, VOC, PM, and NH_3) only. For PM emissions, the condensable component of emissions was calculated and added to the resulting PM primary estimations. The resulting emissions were then adjusted by any control efficiency factors reported in the CERR or VISTAS data collection effort. The second adjustment was to the future year inventories. Alpine Geophysics updated the SCCs in the future year inventory to assign the same base year SCC. Using the same methods as described for the 2002 revisions, those non-IPM generated pollutants were estimated using IPM predicted fuel characteristics and base year 2002 SCC assignments.

2.1.1.4 Eliminating Double Counting of EGU Units

The following procedures were used to avoid double counting of EGU emissions in the 2009/2018 point source inventory. The 2002 VISTAS point source emission inventory contains both EGUs and non-EGUs. Since this file contains both EGUs and non-EGU point sources, and

EGU emissions are projected using the IPM, it was necessary to split the 2002 point source file into two components. The first component contains those emission units accounted for in the IPM forecasts. The second component contains all other point sources not accounted for in IPM.

As described in the previous section, Pechan developed 2009/2018 NIF files for EGUs from the IPM parsed files. All IPM matched units were initially removed from the 2009/2018 point source inventory to create the non-EGU inventory (which was projected to 2009/2018 using the non-EGU growth and control factors described in Section 2.1.2). This was done on a unit-by-unit basis based on a cross-reference table that matches IPM emission unit identifiers (ORISPL plant code and BLRID emission unit code) to VISTAS NIF emission unit identifiers (FIPSST state code, FIPSCNTY county code, State Plant ID, State Point ID). When there was a match between the IPM ORISPL/BLRID and the VISTAS emission unit ID, the unit was assigned to the EGU inventory; all other emission units were assigned to the non-EGU inventory.

If an emission unit was contained in the NIF files created by Pechan from the IPM output, the corresponding unit was removed from the initial 2009/2018 point source inventory. The NIF 2009/2018 EGU files from the IPM parsed files were then merged with the non-EGU 2009/2018 files to create the 2009/2018 Base F point source files.

Next, we prepared several ad-hoc QA/QC queries to verify that there was no double-counting of emissions in the EGU and non-EGU inventories:

- We reviewed the IPM parsed files {VISTASII_PC_1f_AllUnits_2009 (To Client).xls and VISTASII_PC_1f_AllUnits_2018 (To Client).xls} to identify EGUs accounted for in IPM. We compared this list of emission units to the non-EGU inventory derived from the VISTAS cross-reference table to verify that units accounted for in IPM were not double-counted in the non-EGU inventory. As a result of this comparison, we made a few adjustments in the cross-reference table to add emission units for four plants to ensure these units accounted for in IPM were moved to the EGU inventory.

- We reviewed the non-EGU inventory to identify remaining emission units with an Standard Industrial Classification (SIC) code of “4911 Electrical Services” or Source Classification Code of “1-01-xxx-xx External Combustion Boiler, Electric Generation”. We compared the list of sources meeting these selection criteria to the IPM parsed file to ensure that these units were not double-counted.

S/L agencies also reviewed the 2009/2018 point source inventory to verify whether there was any double counting of EGU emissions. In two instances, S/L agencies provided corrections where an emission unit was double counted.

2.1.1.5 Quality Assurance Steps

Quality assurance was an important component to the inventory development process. The following QA steps on the EGU component of the VISTAS revised 2009/2018 EGU inventory:

1. Provided parsed files (i.e., Excel spreadsheets that provide unit-level results derived from the model plant projections obtained by the IPM) to the VISTAS EGU SIWG for review.
2. Provided facility level emission summaries for 2009/2018 for both the base case and CAIR case to the VISTAS EGU SIWG to ensure that emissions were consistent and that there were no missing sources.
3. Compared, at the State-level, emissions from the IPM parsed files and the post-processed NIF files to verify that the post-processed NIF files were consistent with the IPM parsed file results.

VISTAS requested S/L review of these files – the changes specified by states as a result of this review are documented in the following subsection.

2.1.1.6 S/L Adjustments to IPM Modeling Results for Base G Projections

After S/L agency review of the final set of IPM runs (as incorporated into the Base F inventory), S/L agencies specified a number of changes to the IPM results to better reflect current information on when and where future controls would occur. These changes to the IPM results primarily involved S/L agency addition or subtraction future emission controls based on the best available data from state rules, enforcement agreements, compliance plans, permits, and discussions/commitments from individual companies.

For example, Dominion Virginia Power released their company-wide plan to reduce emission to meet the requirements of CAIR and other programs. This plan varies substantially from the IPM results both in terms current and future controls and timing of these controls. As a result, VA DEQ developed their best estimates of future controls on EGUs in Virginia. Also, Duke Energy and Progress Energy have updated their plans for complying with North Carolina's Clean Smokestack Act. These plans vary substantially from the IPM results both in terms current and future controls and timing of these controls. As a result, NC DENR replaced the IPM emission projections for 2009 with projections from the Duke Energy and Progress Energy compliance plan. NC DENR elected to use the IPM results for 2018.

Some S/L agencies specified changes to the controls assigned by IPM to reflect their best estimates of emission controls. These changes involved either 1) adding selective catalytic reduction (SCR) or scrubber controls to units where IPM did not predict SCR or scrubber controls, or 2) removing IPM-assigned SCR or scrubber controls at units where the S/L agency indicated their were no firm plans for controls at those units. We generally used a control

efficiency of 90 percent when adding or removing SO_2 scrubber controls (unless a different control efficiency was provided by the State). We generally used a control efficiency of 90 percent when adding or removing NO_x SCR controls at coal-fired plants, 80 percent when adding or removing NO_x SCR controls at gas-fired plants, and 35 percent when adding or removing NO_x SNCR controls (unless a different control efficiency was provided by the State). The changes specified by the S/L agencies are summarized in Table 2.1-1. A comparison of the IPM and VISTAS control assumptions for all coal-fired EGUs in the Base G/G2 inventories are summarized in Appendix H. In addition to the changes to the IPM-assigned controls, the S/L agencies also specified other types of changes to the IPM results. These other specific changes to the IPM results are summarized in Table 2.1-2.

S/L agencies provided information and/or comment on changes in stack parameters from the 2002 inventory for 2009/2018 inventory. Changes to stack parameters were also made in cases where new controls are scheduled to be installed. In cases where an emission unit projected to have a SO_2 scrubber in either 2009 or 2018, some states were able to provide revised stack parameters for some units based on design features for the new control system. Other units projected to install scrubbers by 2009 or 2018 are not far enough along in the design process to have specific design details. For those units, the VISTAS EGU SIWG made the following assumptions: 1) the scrubber is a wet scrubber; 2) keep the current stack height the same; 3) keep the current flow rate the same, and 4) change the stack exit temperature to 169 degrees F (this is the virtual temperature derived from a wet temperature of 130 degrees F). VISTAS determined that exit temperature (wet) of 130 degrees F +/- 5 degrees F is representative of different size units and wet scrubber technology.

2.1.1.7 S/L Adjustments to IPM Modeling Results for Base G2 2018 Projections

Following release of the Base G inventory, four States specified additional changes to reflect their best estimates of emission controls in 2018. These additional changes are marked with an "*" in Tables 2.1-1 and 2.1-2. The following changes were requested and implemented in the VISTAS 2018 Base G2 EGU emissions and modeling inventories:

- **Florida** - Removed scrubbers from Smith units 1 & 2. Added scrubbers to Crist units 4, 5, & 6. Forecast emissions (from 2002 base) using growth factors for Northside units 1A and 2A. These units were estimated to be non operational in the IPM base case run.
- **Georgia** - Added scrubbers to Plant Scherer (Units 1-4) and Plant Yates (Units 6 & 7).
- **North Carolina** - Remove scrubber from F Lee unit 3.
- **West Virginia** - Pleasants Units 1 and 2 had SO2 emissions reduced to account for the facility's inclusion of previously bypassed 15% effluent stream to the scrubber and the control efficiency and emissions will reflect a change from 79.9% to 95% control.

Table 2.1-1 Adjustments to IPM Control Determinations Specified by S/L Agencies for the Base G/G2 2009/2018 EGU Inventories.

State	Plant Name and ID	Unit	NO_x Retrofit Emission Controls				SO_2 Retrofit Emission Controls			
			2009		2018		2009		2018	
			IPM	State	IPM	State	IPM	State	IPM	State
AL	James H. Miller ORISID=6002	1 & 2	SCR during ozone season	SCR probable year round due to CAIR	SCR during ozone season	SCR probable year round due to CAIR	None	None	None	Scrubber
		3 & 4	SCR during ozone season	SCR year round from Consent Decree	SCR during ozone season	SCR year round from Consent Decree	None	None	None	Scrubber
	Barry ORISID=3	1, 2, 3	None	SNCR	SCR	SNCR	None	None	None	None
		4	None	SNCR	SCR	SNCR	None	None	Scrubber	Scrubber
		5	None	None	SCR	SCR	None	None	Scrubber	Scrubber
	E C Gaston ORISID=26	1 - 4	SCR	None	SCR	None	None	None	Scrubber	Scrubber
		5	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
	Gorgas ORISID=8	6 & 7	None	None	None	None	None	None	None	None
		8 & 9	None	None	None	None	None	Scrubber	None	Scrubber
		10	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
	Charles R. Lowman ORISID=56	1	None	None	None	None	None	Scrubber	None	Scrubber
		2 & 3	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
FL	Lansing Smith ORISID=643	1	None	None	SCR	SCR	None	None	Scrubber	None*
		2	None	None	SCR	SCR	None	None	Scrubber	None*
	Northside ORISID=667	1A & 1B	No operation	No operation	No operation	No control, emissions forecasted using growth rates*	No operation	No operation	No operation	No control, emissions forecasted using growth rates*

Table 2.1-1 (continued)

State	Plant Name and ID	Unit	NO_x Retrofit Emission Controls				SO_2 Retrofit Emission Controls			
			2009		2018		2009		2018	
			IPM	State	IPM	State	IPM	State	IPM	State
FL	Crist	4	None	None	None	None	None	None	None	Scrubber*
	ORISID=641	5	None	None	None	None	None	None	None	Scrubber*
		6	None	None	None	None	None	None	None	Scrubber*
GA	Bowen	1BLR	SCR	SCR	SCR	SCR	IPM had retrofit scrubbers but little emission reductions	None	Scrubber	Scrubber
	ORISID=703	2BLR	SCR	SCR	SCR	SCR		None	Scrubber	Scrubber
		3BLR	SCR	SCR	SCR	SCR		Scrubber	Scrubber	Scrubber
		4BLR	SCR	SCR	SCR	SCR		Scrubber	Scrubber	Scrubber
	Wansley	1	SCR	SCR	SCR	SCR	IPM had retrofit scrubbers but little emission reductions	Scrubber	Scrubber	Scrubber
	ORISID=6052	2	SCR	SCR	SCR	SCR		None	Scrubber	Scrubber
	Kraft	1, 2	None	None	None	None	None	None	None	None
	ORISID=733	3	None	None	SCR	None	None	None	None	None
	McIntosh ORISID=6124	1	None	None	SCR	None	None	None	None	None
	Yates	1	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
	ORISID=728	2, 3	None	None	None	None	None	None	None	None
		4, 5	None	None	SCR	SCR	None	None	Scrubber	None
		6, 7	None	None	SCR	SCR	None	None	Scrubber	Scrubber*

Table 2.1-1 (continued)

State	Plant Name and ID	Unit	NO_x Retrofit Emission Controls				SO_2 Retrofit Emission Controls			
			2009		2018		2009		2018	
			IPM	State	IPM	State	IPM	State	IPM	State
GA	Hammond	1	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
	ORISID=708	2	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
		3	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
		4	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
	Scherer	1	None	None	None	None	None	None	None	Scrubber*
	ORISID=6257	2	None	None	None	None	None	None	None	Scrubber*
		3	None	None	None	None	None	None	None	Scrubber*
		4	None	None	None	None	None	None	None	Scrubber*
KY	Ghent	1	None	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
	ORISID=1356	2	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
		3, 4	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
	Coleman	C1	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
	ORISID=1381	C2	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
		C3	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
	HMP&L Station 2	H1	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
		H2	None	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
	E W Brown	1	None	None	None	None	None	Scrubber	None	Scrubber
	ORISID=1355	2	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
		3	None	None	SCR	SCR	None	Scrubber	Scrubber	Scrubber
SC	Jeffries	3	SCR	None	SCR	None	None	None	None	None
	ORISID=3319	4	None	None	None	None	None	None	None	None
	Wateree	WAT1	SCR	SCR	SCR	SCR	None	Scrubber	None	Scrubber
	ORISID=3297	WAT2	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber

Table 2.1-1 (continued)

State	Plant Name and ID	Unit	NO_x Retrofit Emission Controls				SO_2 Retrofit Emission Controls			
			2009		2018		2009		2018	
			IPM	State	IPM	State	IPM	State	IPM	State
SC	Canadys ORISID=3280	CAN1	None	None	None	None	None	None	None	None
		CAN2	None	None	None	None	None	None	None	None
		CAN3	None	None	None	None	None	Scrubber	None	Scrubber
	Rainey ORISID=7834	CT1A	None	SCR	None	SCR	None	None	None	None
		CT1B	None	SCR	None	SCR	None	None	None	None
TN	Kingston ORISID=3407	1 – 8	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
		9	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
	Johnsonville ORISID=3406	1 – 10	SCR	None	SCR	SCR	None	None	None	None
WV	Willow Island ORISID=3946	2	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
	Kammer ORISID=3947	1 -3	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber

Note: See Appendix H for a complete list of IPM and VISTAS control determinations for all coal and oil/gas units.

Table 2.1-2 Other Adjustments to IPM Results Specified by S/L Agencies for the Base G/G2 2009/2018 EGU Inventories.

State	Plant Name and ID	Unit	Nature of Update/Correction
FL	Central Power and Lime ORISID= 10333	GEN1	Central Power and Lime (ORIS10333) is a duplicate entry. This is point 18 in Florida Crushed Stone (12-053-0530021). Removed IPM emissions for Central Power and Lime.
	Cedar Bay Generating ORISID=10672	GEN1	FLDEP disagrees with IPM projections - no knowledge of expansion of this facility and the cogeneration facility should not grow faster than the underlying industry. Cedar Bay is connected to Stone Container (12-031-0310067). Replaced IPM emissions with 2002 emissions for Cedar Bay (12-031-0310337) times the growth factors for Stone Container.
	Indiantown Cogeneration ORISID=50976	GEN1	FLDEP disagrees with IPM projections - no knowledge of expansion of this facility and the cogeneration facility should not grow faster than the underlying industry. Indiantown is connected to Louis Dreyfus Citrus (12-085-0850002). Replaced IPM emissions with 2002 emissions for Indiantown (12-085-0850102) times the growth factors for Louis Drefus Citrus.
GA	Bowen ORISID=703	1BLR 2BLR 3BLR 4BLR	IPM indicated retrofit scrubbers on all 4 units in 2009, but the IPM emissions showed little reductions from 2002 levels. Changed emissions to reflect scrubbers on 3BLR and 4BLR by 2009.
	Wansley ORISID=6052	1, 2	IPM indicated retrofit scrubbers on both units in 2009, but the IPM emissions showed little reductions from 2002 levels. Changed emissions to reflect one scrubber on Unit 1 by 2009.
	Riverside ORISID=734	4	All of plant Riverside was retired from service June 1, 2005; emissions set to zero in 2009 and 2018.
	McIntosh ORISID=727	CT10A CT10B CT11A CT11B	The McIntosh Combined Cycle facility became commercial June 1, 2005. Added 346 tons of NO_x and 121 tons of SO_2 per unit to the 2009 and 2018 inventories.
	Longleaf Energy Station	1, 2	Longleaf Energy Station is being proposed by LS Power Development, Inc. GA specified that the emissions from this proposed plant be included in the 2018 projections. Boilers 1 and 2 added 1,882 tons of NO_x and 3,227 tons of SO_2 per unit to the 2018 inventory.
	Duke Murray (55382)	1	Corrected coordinates to 34.7189 and -84.9353
MS	R D Morrow ORISID=6061	1, 2	Revised the 2018 emissions to reflect controls not indicated by IPM. The SO_2 emissions are much lower than IPM, but their expected NO_x emissions are actually higher than IPM. The controls will be coming online 2009 or 2010, so the 2009 inventory did not change.
	Jack Watson (2049) Victor J Daniel (6073) Chevron Oil (2047)	All	MS DEQ specified that the emission projections provided by the Southern Company for their units in Mississippi were to be used instead of the IPM results.

Table 2.1-2 (continued)

State	Plant Name and ID	Unit	Nature of Update/Correction
NC	G G Allen (2718) Belews Creek (8042)1 Buck (2720) Cliffside (2721) Dan River (2723) Marshall (2727) Riverbend (2732)	All	Replaced all IPM 2009 results with emission projections from Duke Power's NC Clean Air Compliance Plan for 2006. Used IPM results for 2018
	Asheville (2706) Cape Fear (2708) Lee (2709) Mayo (6250) Roxboro (2712) Sutton (2713) Weatherspoon (2716)	All	Replaced all IPM 2009 results with emission projections from Progress Energy's NC Clean Smokestacks Act Calendar Year 2005 Progress Report. Used IPM results for 2018, except for Lee #3* where IPM projected a retrofit scrubber but NC specified that no scrubber was to be applied.
	Dwayne Collier Battle Cogeneration Facility ORISID=10384	GEN1 GEN2	Dwayne Collier Battle is a duplicate entry. This is Cogentrix of Rocky Mount (37-065-3706500146, stacks G-26 and G-27). Duplicate entries were removed both the 2009 and 2018 inventories.
	Kannapolis Energy Partners ORISID=10626	GEN2 GEN3	Kannapolis Energy emissions are being used as credits for another facility. IPM emissions from this facility (37-025-ORIS10626) were removed from the EGU inventory for 2009 and 2018. Emissions from Kannapolis Energy (37-025-3702500113) were carried forward in the 2009/2018 inventory.
SC	Cross ORISID=130	1, 2	Unit 1: upgrade scrubber from 82 percent to 95 percent removal efficiency by June 30, 2006. Recalculate emissions based on upgrade in control efficiency. Unit 2: upgrade scrubber from 70 percent to 87 percent removal efficiency by June 30, 2006. Recalculate emissions based on upgrade in control efficiency.
	Winyah ORISID=6249	1 – 4	Unit 1: Install scrubber that meets 95 percent removal efficiency by Dec. 31, 2008; Upgrade ESP from 0.38 to 0.03 lb/mmBTU by Dec. 31, 2008 Unit 2: Replace scrubber with one that meets 95 percent removal efficiency from 45 percent by Dec. 31, 2008; Upgrade ESP from 0.10 to 0.03 lb/mmBTU by Dec. 31, 2008 Unit 3: Upgrade scrubber from 70 percent to 90 percent removal efficiency by Dec. 31, 2012; Upgrade ESP from 0.10 to 0.03 lb/mmBTU by Dec. 31, 2012 Unit 4: Upgrade scrubber from 70 percent to 90 percent removal efficiency by Dec. 31, 2007; Upgrade ESP from 0.10 to 0.03 lb/mmBTU by Dec. 31, 2007 Recalculated SO_2 and PM emissions based on upgrade in control efficiencies.

Table 2.1-2 (continued)

State	Plant Name and ID	Unit	Nature of Update/Correction
SC	Dolphus Grainger ORISID=3317	1, 2	Unit 1: Upgrade ESP from 0.60 to 0.03 lb/mmBTU by Dec. 31, 2012. Reduced PM_{10} and PM25 emissions in 2018 by 95 percent based on change in allowable emission rate Unit 2: Install low NO_x burners that meet 0.46 lb/mmBTU from 0.9 by May 1, 2004. Recalculated NO_x emissions using 0.46/lbs/mmBtu and IPM heat input Unit 2: Upgrade ESP from 0.60 to 0.03 lb/mmBTU by Dec. 31, 2012. Reduced PM_{10} and PM25 emissions in 2018 by 95 percent based on change in allowable emission rate
	Jeffries ORISID=3319	3, 4	Unit 3: Upgrade ESP from 0.54 to 0.03 lb/mmBTU by Dec. 31, 2012. Reduced PM_{10} and PM25 emissions in 2018 by 94.44 percent based on change in allowable emission rate Unit 4: Upgrade ESP from 0.54 to 0.03 lb/mmBTU by Dec. 31, 2012. Reduced PM_{10} and PM25 emissions in 2018 by 94.44 percent based on change in allowable emission rate
	W S Lee ORISID=3264	1, 2	IPM does not indicate that these units are installing SOFA NO_x control technology by April 30, 2006 to meet 0.27 lb/mmBTU, down from 0.45 lb/mmBtu. Calculated NO_x emissions using IPM heat input and 0.27 lbs/mmBtu
	Generic Unit ORISID=900545	All	All predictions for generic units appear reasonable with the exception of Plant ID ORIS900545 Point ID GSC45 which was modeled in Georgetown County. It will be very difficult to add new generation this close to the Cape Romain Class I area. Santee Cooper has no plans for future generation in Georgetown County, but does have plans for new future generation in Florence County. This unit was moved to coordinates specified in Florence County.
VA	AEP Clinch River ORISID=3775	1, 2, 3	Used IPM results for 2009; replaced all 2018 IPM results with VADEQ's growth and control estimates (no SCR or scrubbers).
	AEP Glen Lyn ORISID=3776	51, 52, 6	Used 2009/2018 IPM results for units 51 and 52; used 2009 IPM for unit 6; replaced 2018 IPM for unit 6 with VADEQ's growth and control estimates (nor SCR or scrubber).
	Dominion Clover ORISID=7213	1, 2	Used 2009/2018 IPM results.
	Dominion Bremo ORISID=3796	3, 4	Used 2009/2018 IPM results.
	Dominion Chesterfield ORISID=3797	3, 4, 5, 6	Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates.
	Dominion Yorktown ORISID=3809	1, 2, 3	Units 1, 2: Used 2009/2018 IPM results for NOx and used VADEQ's growth and control estimates for SO2. Unit 3: IPM predicts zero heat input for this 880 MW #6 oil fired unit. Dominion plans to continue to operate Unit 3. Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates.

Table 2.1-2 (continued)

State	Plant Name and ID	Unit	Nature of Update/Correction
VA	Dominion Chesapeake ORISID=3803	1 – 4	Unit 1: Used 2009/2018 IPM for NOx; used 2009 IPM for SO2; used VADEQ's growth and control estimates for SO2 (added scrubber that IPM did not have) Unit 2: Used 2009/2018 IPM for NOx; used 2009 IPM for SO2; used VADEQ's growth and control estimates for SO2 (added scrubber that IPM did not have) Unit 3: Used VA DEQ's growth and control estimates for 2009 NOx (added SCR that IPM did not have); used IPM result for 2018 NOx; Used 2009/2018 IPM for SO2. Unit 4: Used VA DEQ's growth and control estimates for 2009 NOx (added SCR that IPM did not have); used IPM result for 2018 NOx; Used 2009/2018 IPM for SO2.
	Dominion Possum Point ORISID=3804	3 & 4 5 6	Unit 3&4: IPM had 137 tons of NO_x for these units in 2009 and 111 tons in 2018. VA DEQ specified that the permitted emission rates should be used, which equates to 3,066 tons in 2009 and 2018. Unit 5: IPM had zero heat input. Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates. Unit 6: Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates.
	Potomac River ORISID=3788	1 - 5	Units 1&2: IPM retired these units. Mirant has no plans at this time to retire any units. Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates. Units 3, 4, 5: Replaced all 2009/2018 IPM results using VADEQ's growth and control estimates.
WV	Albright ORISID=3942	1, 2	IPM predicted early retirement for these units. AEP indicated there are no plans for early retirement. For 2009, used 2002 actual emissions as these units are not likely to retire by 2009. For 2018, used IPM prediction of retirement.
	Rivesville ORISID=3945	7, 8	IPM predicted early retirement for these units. AEP indicated there are no plans for early retirement. For 2009, used 2002 actual emissions as these units are not likely to retire by 2009. For 2018, used IPM prediction of retirement.
	Willow Island ORISID=3946	1, 2	Unit 1: IPM predicted early retirement for these units. AEP indicated there are no plans for early retirement. For 2009, used 2002 emissions as these units are not likely to retire by 2009. For 2018, used IPM prediction of retirement. Unit 2: IPM predicted SCR and scrubber for 2009. These controls will not be in place by 2009.
	North Branch ORISID=7537	1A, 1B	SO_2 Permit Rate was corrected from 2.7 to 0.678 lb/MMBtu. Used SO_2 Permit Rate and IPM predicted total fuel used to calculate SO_2 emissions in 2009 and 2018
	Mt. Storm ORISID=3954	1, 2, 3	SO_2 Permit Rate was corrected from 2.7 to 0.15 lb/MMBtu. Used SO_2 Permit Rate of 0.15 lb/MMBtu and IPM predicted total fuel used to calculate SO_2 emissions in 2009 and 2018
	Pleasants Power Station ORISID=6004	1, 2	IPM applied a scrubber with a 79.9% control efficiency; WV indicated that the control efficiency should be 95%.

2.1.1.8 S/L Adjustments to IPM Modeling Results for B&F Projections

For the B&F inventory, the S/L agencies were asked to review the Base G2 inventory with respect to the following items:

- Identify any updates needed to better reflect current information on when and where future controls would occur based on the best available data from state rules, enforcement agreements, compliance plans, permits, and discussions/commitments from individual companies;
- Identify any updates needed to change the IPM determination that most oil/gas steam units would either retire early or have no operation in 2009 or 2018; and
- Identify any updates needed to change the IPM assignment and VISTAS post-processing of generic units with specific information on new capacity.

The changes specified by the S/L agencies are summarized in Table 2.1-3. A comparison of the IPM and VISTAS control assumptions for all coal-fired EGUs in the B&F inventories are summarized in Appendix I.

Table 2.1-3 Additional Adjustments to IPM Results Specified by S/L Agencies for the B&F 2009/2018 EGU Inventories.

State	Plant Name and ID	Unit	Nature of Update/Correction
FL	Cape Canaveral Indian River Port Everglades Turkey Point Manatee Martin Riviera Anclote CD McIntosh Northside B Suwannee River	1, 2 1, 2, 3 1 – 4 1, 2 1, 2 1, 2 3, 4 1, 2 1 3 3	The IPM 2009/2018 solution has either shut-down these oil-fired units or converted them to natural gas only. FLDEP has reason to believe that these units may continue to operate using oil. For some of these units, the owner or operator of the units have provided (and FLDEP approved) an estimate of how the units will be operated in 2009/2018. For others, to be conservative, FLDEP assumed that the oil-fired units will operate in 2009/2018 exactly as they operated in 2002.
	Gulf Power Schultz ORISID=643	1 - 4	Plant is expected to shut down and was taken out of the 2018 projection.
	Northside ORISID=667	1A, 1B	These units were estimated to be non operational by IPM in 2009 and 2018. FLDEP believes these units will continue to operate. Emissions were estimated using the 2002 base case emissions and growth factors for Northside units 1A and 2A. The changes for 2009 were made in the B&F inventory; the changes for 2018 were made in the Base G2 inventory.
	Crist ORISID=641	4, 5 6, 7	IPM did not assign scrubbers to these units. Scrubbers are currently being installed and should be operational in 2009. SO2 emissions reduced by 90%.
GA	Mitchell ORISID=727	SG03	GADNR provided new emission projections for 2018.

Table 2.1-3 (continued)

State	Plant Name and ID	Unit	Nature of Update/Correction
GA	Kraft ORISID=733	SG03	GADNR provided new emission projections for 2018.
	McIntosh ORISID=6124	SG01	GADNR provided new emission projections for 2018.
	Bowen ORISID=703	SG03 SG04	GADNR provided new SO2 emission projections for 2009 and 2018 based on a 95% control efficiency instead of 90%.
	Hammond ORISID=708	SG01 to SG04	GADNR provided new SO2 emission projections for 2009 and 2018 based on a 95% control efficiency instead of 90%.
	Wansley ORISID=6052	SG01	GADNR provided new SO2 emission projections for 2009 and 2018 based on a 95% control efficiency instead of 90%.
KY	John Sherman Cooper ORISID=1384	1	IPM did not assign a scrubber to this unit in 2018. KDAQ believes that a scrubber should be assigned for 2018.
	John Sherman Cooper ORISID=1384	2	IPM assigned SCR in 2009. KDAQ does not expect SCR by then; emissions changed to reflect low-NOx burner.
	Spurlock Station ORISID=6041	1, 2	IPM did not assign scrubbers to these units in 2009. Per a consent decree and for BART, KDAQ specified a 90% reduction in SO2 emissions from SO2 controls.
	Big Sandy ORISID=1353	BSU1	IPM assigned a scrubber and SCR in 2009. KDAQ does not expect scrubber or SCR controls to be operational in 2009.
MS	Entergy Delta Entergy Rex Brown Entergy Baxter Wilson Entergy Gerald Andrus	1, 2 3, 4 1, 2 1	The IPM 2009/2018 solution has either shut-down these oil-fired units or converted them to natural gas only. MSDEQ has reason to believe that these units may continue to operate using oil. To be conservative, MSDEQ assumed that the oil-fired units will operate in 2009/2018 exactly as they operated in 2002.
NC	Cliffside ORISID=2721	7	Removed Unit 7 from the 2018 inventory since the NC Utilities Commission disapproved the permit application.
	Cape Fear ORISID=2798	1, 2	IPM assigned scrubbers to both units in 2018; NCDENR indicated that the facility projected Furnace Sorbent Injection. Increased SO2 emissions to reflect change in control efficiency.
SC	99 Oil-fired Units		The IPM 2009/2018 solution has either shut-down 99 oil-fired units or converted them to natural gas only. SCDHEC has reason to believe that these units may continue to operate using oil. To be conservative, SCDHEC assumed that the oil-fired units will operate in 2009/2018 exactly as they operated in 2002.
SC	Santee Cooper Cross ORISID=130	4	For both 2009 and 2018, added in a new 660 MW Unit 4 (not in IPM) that is identical to the new Unit 3 (which was in IPM). Used the new Unit 4 to replace the IPM-generated 500 MW coal-fired Generic Unit (ORIS900545) located in the adjacent county.

Table 2.1-3 (continued)

State	Plant Name and ID	Unit	Nature of Update/Correction
SC	New Santee Cooper Units Planned for Florence County	1, 2	Santee Cooper is planning two new coal burning units in Florence County, each at 660 MW. These units were not explicitly identified in IPM. Used these new units to replace three IPM-generated 500 MW coal-fired Generic Units (ORIS900145, ORIS900245, ORIS900345) in Darlington and Colleton Counties.
	USDOE SRS Area D ORISID=7652	1	Facility is replacing coal-fired boilers with three biomass boilers. Recalculated emissions for 2018 using emission factors for biomass combustion and IPM heat inputs.
VA	Dominion Chesapeake ORISID=3803	1 - 4	Changed SO2 emissions in 2009 and 2018 to reflect information from the facility on project SO2 controls.
	Dominion Southwest Virginia Project	1	For 2018, replace the IPM generated Generic Unit located in Russell county (ORISID=900251) to Wise County to reflect the planned Dominion facility going into Wise County. Used the potential to emit for the Dominion facility.
	Clinch River ORISID=3775	1, 2, 3	Changed emissions in 2018 to reflect requirements of Consent Order. The CO requires SNCR by 12/31/2009; IPM assigned SCR in 2018. The CO caps SO2 emissions at 16,300 tpy starting Jan 1, 2015.
WV	Pleasants Power Station ORISID=6004	1, 2	For both 2009 and 2018, Units 1 and 2 had SO2 emissions reduced to account for the facility's inclusion of previously bypassed 15% effluent stream to the scrubber. The control efficiency and emissions changed from 79.9% to 95% control.
	Nine Generic Units Generated by IPM		IPM placed 746 MW of new fossil fuel-fired generation in West Virginia - 173 MW coal-fired, 24 MW IGCC, and the remainder gas-fired. A 600 MW pulverized coal-fired EGU is under construction, scheduled to be online in 2010 [Longview]; a 98 MW CFB co-generation unit is permitted and expected to be built [Western Greenbrier]; and a 600 MW IGCC plant is currently in the permitting process [Mountaineer IGCC]. WVDEP decided to replace the IPM generic units in WV with the 3 units mentioned above.
	Longview Site ID: 54- 061-0134	1	For 2018 inventory, added Longview which is permitted, under construction, and scheduled to be online in 2010. The unit is a 600 MW pulverized coal-fired unit with baghouse, LNB, SCR, and wet FGD as required controls. Used permitted emission rates for 2018.
WV	Western Greenbriar Site ID: 54-025-0066	1	For 2018 inventory, added Western Greenbrier, which is permitted but not under construction. The unit is a 98 MW coal-fired CFB burning waste coal. Used permitted emission rates for 2018.
	Mountaineer IGCC Site ID: 54-053-00063	1	For 2018 inventory, added Mountaineer IGCC, which has applied for a permit to construct a nominal 600 MW IGCC. Used emission rates from the permit application for 2018.

2.1.1.9 Conversion of MRPO BaseM 2009 EGU Data to SMOKE Input Format

To support ASIP $PM_{2.5}$ CAMx modeling of the future year 2009, Alpine Geophysics obtained and processed an emission inventory for the 5 MRPO states (Illinois, Indiana, Michigan, Wisconsin, and Ohio). Appendix x details the technical steps that were made as part of the conversion of the MRPO BaseM EGU files into IDA format for ASIP PM-2.5 CAMx modeling of the future year 2009.

2.1.1.10 Summary of 2009/2018 EGU Point Source Inventories

Tables 2.1-4 through 2.1-10 compare the Base G 2002 base year inventory to the Base F, Base G/G2 and B&F 2009/2018 projection inventories. The Base F projections rely primarily on the results of the IPM, while the Base G and B&F projections include the adjustments to the IPM results specified by the S/L agencies in the previous section.

Table 2.1-4 EGU Point Source SO_2 Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	447,828	340,194	378,052	378,052	190,099	135,851	135,851
FL	453,631	195,790	186,055	291,831	141,551	138,340	194,028
GA	514,952	534,469	417,449	408,679	180,178	79,430	68,515
KY	484,057	371,944	290,193	271,669	229,603	226,062	222,102
MS	67,429	85,629	76,579	76,646	27,230	15,146	15,213
NC	477,990	205,018	242,286	242,286	110,382	114,771	120,165
SC	206,399	171,206	124,608	129,122	121,694	93,274	95,377
TN	334,151	255,400	255,410	255,410	112,662	112,672	112,672
VA	241,204	169,714	193,112	174,777	90,935	114,255	98,988
WV	516,084	226,127	277,489	268,952	124,466	105,935	106,199
	3,743,725	**2,555,491**	**2,441,233**	**2,497,423**	**1,328,800**	**1,135,736**	**1,169,110**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-5 EGU Point Source NO_x Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	161,038	70,852	82,305	82,305	42,769	64,358	64,358
FL	257,677	89,610	86,165	132,535	77,080	74,640	87,645
GA	147,517	97,146	98,497	98,497	58,095	75,717	69,856
KY	198,817	107,890	92,021	97,263	64,378	64,378	64,378
MS	43,135	11,475	36,011	47,276	8,945	10,271	21,535
NC	151,853	66,431	66,522	66,521	60,914	62,353	61,110
SC	88,241	43,817	46,915	48,668	48,346	51,456	51,751
TN	157,307	41,767	66,405	66,405	31,725	31,715	31,715
VA	86,886	63,220	62,547	64,358	49,420	66,074	64,344
WV	230,977	63,510	86,328	85,476	51,241	51,241	51,474
	1,523,448	**655,718**	**723,717**	**789,304**	**492,913**	**552,203**	**568,166**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-6 EGU Point Source VOC Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	2,295	2,441	2,473	2,473	2,952	2,952	2,952
FL	2,524	1,867	1,910	2,730	2,324	2,422	3,047
GA	1,244	1,571	2,314	2,314	1,903	2,841	2,816
KY	1,487	1,369	1,369	1,369	1,426	1,426	1,426
MS	648	406	404	564	1,124	1,114	1,274
NC	988	974	954	954	1,272	1,345	1,302
SC	470	660	660	723	906	906	931
TN	926	932	932	932	977	976	976
VA	754	685	778	788	903	1,014	980
WV	1,180	1,342	1,361	1,361	1,387	1,387	1,387
	12,516	**12,247**	**13,155**	**14,208**	**15,174**	**16,383**	**17,091**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-7 EGU Point Source CO Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	11,279	14,948	14,986	14,986	24,342	24,342	24,342
FL	57,113	45,391	35,928	71,072	63,673	54,146	85,495
GA	9,712	20,066	23,721	23,721	32,744	44,476	44,269
KY	12,619	15,812	15,812	15,812	17,144	17,144	17,144
MS	5,303	5,078	5,051	7,116	15,364	15,282	17,348
NC	13,885	15,141	14,942	14,942	19,612	20,223	19,870
SC	6,990	11,135	11,135	11,643	14,786	14,786	14,975
TN	7,084	7,221	7,213	7,214	7,733	7,723	7,723
VA	6,892	11,869	12,509	12,535	14,755	15,564	18,850
WV	10,341	11,328	11,493	11,493	11,961	11,961	12,397
	141,218	**157,989**	**152,790**	**190,535**	**222,114**	**225,647**	**262,413**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-8 EGU Point Source PM_{10}-PRI Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	7,646	6,959	6,969	6,969	7,822	7,822	7,822
FL	21,387	9,384	9,007	20,182	10,310	10,022	12,791
GA	11,224	17,088	17,891	17,891	18,329	20,909	20,732
KY	4,701	6,463	6,463	6,463	6,694	6,694	6,694
MS	1,633	5,487	4,957	5,182	7,624	7,187	7,412
NC	22,754	22,888	22,152	22,152	33,742	37,376	35,275
SC	21,400	28,650	19,395	20,041	37,864	28,826	27,640
TN	14,640	15,608	15,608	15,608	15,941	15,941	15,941
VA	3,960	4,479	5,508	5,606	12,744	13,832	12,551
WV	4,573	5,471	5,657	5,657	6,349	6,349	5,784
	113,918	**122,477**	**113,607**	**125,750**	**157,419**	**154,958**	**152,642**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-9 EGU Point Source $PM_{2.5}$ -PRI Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	4,113	3,916	3,921	3,921	4,768	4,768	4,768
FL	15,643	6,250	5,910	14,790	7,171	6,886	9,417
GA	4,939	10,104	10,907	10,907	11,403	13,983	13,881
KY	2,802	4,279	4,279	4,279	4,434	4,434	4,434
MS	1,138	5,310	4,777	4,996	7,469	7,033	7,252
NC	16,498	16,514	15,949	15,949	26,966	29,792	28,137
SC	17,154	23,366	16,042	16,548	32,180	25,032	23,794
TN	12,166	13,092	13,092	13,092	13,387	13,387	13,387
VA	2,606	3,194	4,067	4,165	11,101	11,976	10,773
WV	2,210	2,850	2,940	2,940	3,648	3,648	3,116
	79,269	**88,875**	**81,884**	**91,587**	**122,527**	**120,939**	**118,959**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-10 EGU Point Source NH_3 Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	Actual Base G	Base F IPM Based	Base G IPM with State/local Updates	B&F IPM with Additional State/local Updates	Base F IPM Based	Base G2 IPM with State/local Updates	B&F IPM with Additional State/local Updates
AL	317	359	359	359	1,072	1,072	1,072
FL	234	1,659	1,631	1,629	3,004	2,976	2,976
GA	83	686	686	686	1,677	1,677	1,677
KY	326	400	400	400	476	476	476
MS	190	333	333	334	827	827	827
NC	54	423	445	445	691	663	663
SC	142	343	343	370	617	617	625
TN	204	227	227	227	241	241	241
VA	127	632	694	694	558	622	606
WV	121	330	330	330	180	180	143
	1,798	**5,392**	**5,448**	**5,474**	**9,343**	**9,351**	**9,306**

Note: Emission summaries above are based on SCCs 1-01-xxx-xx and 2-01-xxx-xx.

2.1.2 Non-EGU Emission Projections

The general approach for assembling future year data was to use growth and control data consistent with the data used in EPA's Clean Air Interstate Rule analyses, supplement these data with available stakeholder input, and provide the results for stakeholder review to ensure credibility. We used the revised 2002 VISTAS base year inventory, based on the 2002 CERR submittals as the starting point for the non-EGU projection inventories. As described in Section 2.1.1.4, we split the point source inventory into EGU and non-EGU components. MACTEC performed the following activities to apply growth and control factors to the 2002 inventory to generate the 2009 and 2018 projection inventories:

- Obtained, reviewed, and applied the most current growth factors developed by EPA, based on forecasts from an updated Regional Economic Models, Inc. (REMI) model (version 5.5) and the latest *Annual Energy Outlook* published by the Department of Energy (DOE);
- Obtained, reviewed, and applied any State-specific or sector-specific growth factors submitted by stakeholders;
- Obtained and incorporated information regarding sources that have shut down after 2002 and set the emissions to zero in the projection inventories;
- Obtained, reviewed, and applied control assumptions for programs "on-the-books" and "on-the-way";
- Provided data files in NIF3.0 format and emission summaries in EXCEL format for review and comment; and
- Updated the database with corrections or new information from S/L agencies based on their review of the Base F 2009/2018 inventories.

The following sections discuss each of these steps.

2.1.2.1 Growth assumptions for non-EGU sources

This section describes the growth factor data used in developing the Base F inventory for 2009 and 2018, as well as the changes to the growth factor data made for the Base G inventory.

The growth factor data used in developing the Base F inventory were consistent with EPA's analyses for the CAIR rulemaking. These growth factors are fully documented in the reports entitled *Development of Growth Factors for Future Year Modeling Inventories* (dated April 30, 2004) and *CAIR Emission Inventory Overview* (dated July 23, 2004). Three sources of data were used in developing the growth factors for the Base F inventory:

- State-specific growth rates from the Regional Economic Model, Inc. (REMI) Policy Insight® model, Version 5.5 (being used in the development of the EGAS Version 5.0). 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.

- Energy consumption data from the DOE's Energy Information Administration's (EIA) *Annual Energy Outlook 2004, with Projections through 2025* for use in generating growth factors for non-EGU fuel combustion sources. These data include regional or national fuel-use forecast data that were mapped to specific SCCs for the non-EGU fuel use sectors (e.g., commercial coal, industrial natural gas). Growth factors for the residential natural gas combustion category, for example, are based on residential natural gas consumption forecasts that are reported at the Census division level. These Census divisions represent a group of States (e.g., the South Atlantic division includes eight southeastern States and the District of Columbia). Although one would expect different growth rates in each of these States due to unique demographic and socioeconomic trends, EIA's projects all States within each division using the same growth rate.
- Specific changes for sectors (e.g., plastics, synthetic rubber, carbon black, cement manufacturing, primary metals, fabricated metals, motor vehicles and equipment) where the REMI-based rates were unrealistic or highly uncertain. Growth projections for these sectors were based on industry group forecasts, Bureau of Labor Statistics (BLS) projections and Bureau of Economic Analysis (BEA) historical growth from 1987-2002.

In addition to the growth data described above, we received two sets of growth projections from VISTAS stakeholders.

The American Forest and Paper Association (AF&PA) supplied growth projections for the pulp and paper sector, which were applied to SIC 26xx Paper and Allied Products. The AF&PA projection factors are for the U.S. industry and apply to all States equally. The numbers come from the 15-year forecast for world pulp and recovered paper prepared by Resource Information Systems Inc. (RISI).

SIC Code	Sector	AF&PA Growth Factor	
		2002 to 2009	2002 to 2018
2611	Pulp Mills	1.067	1.169
2621	Paper Mills	1.067	1.169
2631	Paperboard Mills	1.067	1.169

For both the Base F and Base G inventories, we used the above AF&PA growth factors by SIC instead of the factors obtained from EPA's CAIR analysis.

For the Base F inventory, the NCDENR supplied 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 Base G inventory, NCDENR decided to use a growth factor of 1.0 for these SIC codes for both 2009 and 2018. Although NCDENR has data that shows a steady decline in these industries in NC, NCDENR 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. The specific growth factors for these industrial sectors in North Carolina were:

NCDENR Growth Factors for Specific Industrial Sectors					
SIC Code	**Industrial Sector**	**2009**		**2018**	
		Base F	**Base G**	**Base F**	**Base G**
22xx	Textile Mill Products	0.6239	1.00	0.2792	1.00
23xx	Apparel and Other Fabrics	0.5867	1.00	0.2247	1.00
25xx	Furniture and Fixtures	0.8970	1.00	0.7647	1.00

For the Base G inventory, we made one additional change to the growth factors. The Base F inventory relied on DOE's AEO2004 forecasts for projecting emissions for fuel-burning SCCs (applies mainly to ICI boilers 1-02-xxx-xx and 1-03-xxx-xx, as well as in-process fuel use). We replaced the AEO2004 data 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. We obtained the corresponding AEO2006 projection tables from DOE's web site located at http://www.eia.doe.gov/oiaf/aeo/supplement/supref.html. We developed tables comparing the growth factors based on AEO2004 and AEO2006. These comparison tables were reviewed by the S/L agencies. Based on this review, VISTAS decided to use the AEO2006 growth factors for fuel burning SCCs.

We used the EPA's EGAS model and updated the corresponding AEO2006 projection tables to create growth factors by SCC. We applied the updated growth factors to 2002 actual emissions and replaced the 2009 and 2018 emissions in NIF EM tables for the affected SCCs.

2.1.2.2 Source Shutdowns

A few states indicated that significant source shutdowns have occurred since 2002 and that emissions from these sources should not be included in the future year inventories. These sources are identified in Table 2.1-11.

Table 2.1-11 Summary of Source Shutdowns Incorporated in Base G Inventory.

State	Description of Source Shutdowns
AL	None specified.
FL	The following facilities are shutdown and projected emissions were set to zero in 2009/2018. 0570075 CORONET INDUSTRIES, INC. 1050050 U S AGRI-CHEMICALS CORP. 1050051 U.S. AGRI-CHEMICALS CORPORATION These facilities emitted 2,417 tons of SO_2 and 113 tons of NO_x in 2002.
GA	Georgia indicated that the former Blue Circle (now LaFarge) facility in downtown Atlanta will likely shut down before 2009. The facility has two cement kilns, one of which is already shut down. The second kiln will continue to operate until the new facility in Alabama has enough milling capacity, after which the entire Atlanta facility will be completely closed down. This facility emitted 1,617 tons of SO_2 and 587 tons of NO_x in 2002.
KY	None specified.
MS	AF&PA indicated that the International Paper Natchez Mill (28-001-2800100010) has shut down. This facility emitted 1,398 tons of SO_2 and 1,773 tons of NO_x in 2002.
	The Magnolia Resources - Pachuta Harmony Gas Plant (28-023-00031) is out of business and no longer holds an air permit. This facility emitted 2,257 tons of $SO_2$and 134 tons of NO_x in 2002.
NC	In Base F, two paper mills were identified as being shut down in the 2018 inventory. NCDENR indicated that these mills are not expected to close. The two facilities are Ecusta Business Development (37-175-3717500056) and International Paper (37-083-00007). Their emissions were added back into the Base G 2018 inventory.
	BASF Corporation (37-021-724) in Buncombe County is currently operating but has plans to shut down in 2007. This facility emitted 461 tons of SO_2 and 266 tons of NO_x in 2002.
SC	South Carolina provided a list of facilities that were identified as closing down on or after Jan. 1, 2003. The emissions for these facilities were set to zero in the 2009 and 2018 projection inventories. Emissions from these plants in 2002 were: 6,195 tons of SO_2, 2,994 tons of NO_x, and 2,836 tons of VOC. Most of the emissions were from one facility – Celanese Acetate (45-091-2440-0010) in York County.
TN	Davidson County (Nashville) indicated that significant source shutdowns have occurred since data were submitted for the 2002 CERR. Source number 47-037-00002 (Dupont) shut down a portion of their facility, which was permanently taken out of service. Source 47-037-00050 (Nashville Thermal Transfer Corp.) shut down their municipal waste combustors and replaced them with natural gas fired boilers with propane stand by.
	Weyerhaeuser (AKA Willamette) Power Boiler 7 (47-163-0022, EU ID = 017) is being shut down. This emission unit emitted 4,297 tons of SO_2 and 1,443 tons of NO_x in 2002.
	Liberty Fibers (47-063-0197) in Hamblen County has recently shut down. This facility emitted 5,377 tons of SO_2; 2,057 tons of NO_x; and 9,059 tons of VOC in 2002.
VA	Rock-Tenn (51-680-00097) received a permit dated 9/13/2003 which required the shutdown of units 1 and 2 by 2/27/2004. This permit was part of a netting exercise that allowed the installation of a new NG/DO boiler. These two units emitted 507 tons of SO_2 and 276 tons of NO_x in 2002.
WV	None specified.

2.1.2.3 Control Programs applied to non-EGU sources

We used the same control programs for both the 2009 and 2018 non-EGU point inventory. Two control scenarios were developed: on-the-books (OTB) controls and on-the-way (OTW) controls. The OTB control scenario accounts for post-2002 emission reductions from promulgated federal, State, local, and site-specific control programs. The OTW control scenario accounts for proposed (but not final) control programs that are reasonably anticipated to result in post-2002 emission reductions. The methodologies used to account for the emission reductions associated with these emission control programs are discussed in the following sections.

Table 2.1-12 Non-EGU Point Source Control Programs Included in 2009/2018 Projection Inventories.

On-the-Books (Cut-off of July 1, 2004 for Base 1 adoption)

- Atlanta / Northern Kentucky / Birmingham 1-hr SIPs
- Industrial Boiler/Process Heater/RICE MACT (see Section 2.1.2.3.2)
- NO_x RACT in 1-hr NAA SIPs
- NO_x SIP Call (Phase I- except where States have adopted II already e.g. NC)
- Petroleum Refinery Initiative (October 1, 2003 notice; MS & WV)
- RFP 3 percent Plans where in place for one hour plans
- VOC 2-, 4-, 7-, and 10-year maximum achievable control technology (MACT0 Standards
- Combustion Turbine MACT

On-the-Way

- NO_x SIP Call (Phase II – remaining States & IC engines)

2.1.2.3.1 OTB - NO_x SIP Call (Phase I)

Phase I of the NO_x SIP call applies to certain large non-EGUs, including large industrial boilers and turbines, and cement kilns. States in the VISTAS region affected by the NO_x SIP call have developed rules for the control of NO_x emissions that have been approved by EPA. We reviewed the available State rules and guidance documents to determine the affected sources and ozone season allowances. We also obtained and reviewed information in the EPA's CAMD NO_x Allowance Tracking System – Allowances Held Report. Since these controls are to be in effect by the year 2007, we capped the emissions for NO_x SIP call affected sources at 2007 levels and carried forward the capped levels for the 2009/2018 future year inventories. Since the NO_x SIP call allowances are given in terms of tons per ozone season (5 month period from May to

September), we calculated annual emissions by multiplying the 5-month allowances by a factor of 12 divided by 5.

2.1.2.3.2 OTB - Industrial Boiler/Process Heater MACT

EPA anticipates reductions in PM and SO_2 as a result of the Industrial Boiler/Process Heater MACT standard. The methods used to account for these reductions are the same as those used for the CAIR analysis. Reductions were included for existing units firing solid fuel (coal, wood, waste, biomass) which had a design capacity greater than 10 mmBtu/hr. EPA prepared a list of SCCs for solid fuel industrial and commercial/ institutional boilers and process heaters. We identified boilers greater than 10 mmBtu/hr using either the boiler capacity from the VISTAS 2002 inventory, or if the boiler capacity was missing, a default capacity based on a methodology developed by EPA for assigning default capacities based on SCC. The applied MACT control efficiencies were 4 percent for SO_2 and 40 for percent for PM_{10} and PM2.5 to account for the co-benefit from installation of acid gas scrubbers and other control equipment to reduce HAPs. On June 8, 2007, the U.S. Court of Appeals for the District of Columbia Circuit vacated and remanded the NESHAP for Industrial, Commercial and Institutional Boilers and Process Heaters. VISTAS States decided to leave the emission reductions in place since they envision using a 112(j) strategy (e.g., the “MACT hammer”) to obtain similar levels of control)

2.1.2.3.3 OTB - 2, 4, 7, and 10-year MACT Standards

Maximum achievable control technology (MACT) requirements were also applied, as documented in the report entitled *Control Packet Development and Data Sources*, dated July 14, 2004. The point source MACTs and associated emission reductions were designed from Federal Register (FR) notices and discussions with EPA’s Emission Standards Division (ESD) staff. We 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.

2.1.2.3.4 OTB Combustion Turbine MACT

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

2.1.2.3.5 OTB - Petroleum Refinery Initiative (MS and WV)

Three refineries in the VISTAS region are affected by two October 2003 Clean Air Act settlements under the EPA Petroleum Refinery Initiative. The refineries are: (1) the Chevron

refinery in Pascagoula, MS; (2) the Ergon refinery in Vicksburg, MS; and (3) the Ergon refinery in Newell, WV.

The first consent decree pertained to Chevron refineries in Richmond and El Segundo, CA; Pascagoula, MS; Salt Lake City, UT; and Kapolei, HI. Actions required under the Consent Decree will reduce annual emissions of NO_x by 3,300 tons and SO_2 by 6,300 tons. The consent decree requires a program to reduce NO_x emissions from refinery heaters and boilers through the installation of NO_x controls that meet at least an SNCR level of control. The refineries are to eliminate fuel oil burning in any combustion unit. The consent decree also requires reductions of NO_x and SO_2 from the fluid catalytic cracking unit and control of acid gas flaring incidents. The consent decree does not provide sufficient information to calculate emission reductions for the FCCU or flaring at the Pascagoula refinery. Therefore, we calculated a general percent reduction for NO_x and SO_2 by dividing the expected emission reductions at the five Chevron refineries by the total emissions from these five refineries (as reported in the 1999 NEI). This resulted in applying percent reductions of 45 percent for SO_2 and 28 percent for NO_x to FCCU and flaring emissions at the Chevron Pascagoula refinery.

The second consent decree pertained to the Ergon-West Virginia refinery in Newell, WV; and the Ergon Refining facility in Vicksburg, MS. The consent decree requires the two facilities to implement a 6-year program to reduce NO_x emission from all heaters and boilers greater than 40 mmBtu/hr, and to eliminate fuel oil burning in any combustion unit (except during periods of natural gas curtailment). Specifically, ultra low NO_x burners are required on Boilers A and B at Newell, a low NO_x-equivalent level of control for heater H-101 at Newell and heaters H-1 and H-3 at Vicksburg, and an ultra low NO_x burner level of control for heater H-451 at Vicksburg.

2.1.2.3.6 OTW - NO_x SIP Call (Phase II)

The final Phase II NO_x SIP call rule was finalized on April 21, 2004. States had until April 21, 2005, to submit SIPs meeting the Phase II NO_x budget requirements. The Phase II rule applies to large IC engines, which are primarily used in pipeline transmission service at compressor stations. We identified affected units using the same methodology as was used by EPA in the proposed Phase II rule (i.e., a large IC engine is one that emitted, on average, more than 1 ton per day during 2002). 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. As shown later in Table 2.1-12, several S/L agencies provided move specific information on the anticipated controls at the compressor stations. This information was used in the Base G inventory instead of the default approach used by EPA in the proposed Phase II rule.

2.1.2.3.7 Clean Air Interstate Rule

CAIR does not require or assume additional emission reductions from non-EGU boilers and turbines.

2.1.2.4 Quality Assurance steps

Final QA checks were run on the revised projection inventory data set to ensure that all corrections provided by the S/L agencies and stakeholders were correctly incorporated into the S/L inventories and that there were no remaining QA issues that could be addressed during the duration of the project. After exporting the inventory to ASCII text files in NIF 3.0, the EPA QA program was run on the ASCII files and the QA output was reviewed to verify that all QA issues that could be addressed were resolved

Throughout the inventory development process, quality assurance steps were performed to ensure that no double counting of emissions occurred, and to ensure that a full and complete inventory was developed for VISTAS. Quality assurance was an important component to the inventory development process and MACTEC performed the following QA steps on the point source component of the VISTAS revised 2002 base year inventory:

Facility level emission summaries were prepared and evaluated to ensure that emissions were consistent and reasonable. The summaries included base year 2002 emissions, 2009/2018 projected emissions accounting only for growth, 2009/2018 projected emissions accounting for both growth and emission reductions from OTB and OTW controls.

State-level non-EGU comparisons (by pollutant) were developed for the base year 2002 emissions, 2009/2018 projected emissions accounting only for growth, 2009/2018 projected emissions accounting for both growth and emission reductions from OTB and OTW controls.

Data product summaries and raw NIF 3.0 data files were provided to the VISTAS Emission Inventory Technical Advisor and to the Point Source, EGU, and non-EGU Special Interest Work Group representatives for review and comment. Changes based on these comments were reviewed and approved by the S/L point source contact prior to implementing the changes in the files.

Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from Base F1 to Base F2.

2.1.2.5 Additional Base G Updates and Corrections

Table 2.1-13 summarizes the updates and corrections to the Base F inventory that were requested by S/L agencies and incorporated into the Base G 2009/2018 inventories.

Table 2.1-13 Summary of Updates and Corrections Incorporated into the Base G 2009/2018 Non-EGU Inventories.

State	Nature of Update/Correction
AL	Corrected the latitude and longitude for two facilities: Ergon Terminalling (Site ID: 01-073-010730167) and Southern Power Franklin (Site ID: 01-081-0036).
	Corrections to stack parameters at 10 facilities for stacks with parameters that do not appear to fall into the ranges typically termed "acceptable" for AQ modeling.
FL	Corrected 2009/2018 emission values for the Miami Dade RRF facility (Site ID: 12-086-0250348) based on revised 2002 emissions and application of growth control factors for 2009/2018.
GA	Hercules Incorporated (12-051-05100005) had an erroneous process id (#3) within emission unit id SB9 and was deleted. This removes about 6,000 tons of SO_2 from the 2009/2018 inventories.
	Provided a revised file of location coordinates at the stack level that was used to replace the location coordinated in the ER file.
	There are several sources that have updated their emissions from their BART eligible units. most of these changes were for fairly small (<50 tpy) sources.
NC	Made several changes to Base F inventory to correct the following errors: 1. Corrected emissions at Hooker Furniture (Site ID: 37-081-3708100910), release point G-29, to use the corrected values in 2002 and carry those same numbers through to 2009 and 2018 since NCDENR assumes zero growth for furniture industry. 2. Identified many stack parameters in the ER file that were unrealistic. Several have zero for height, diameter, gas velocity, and flow rate. NC used the procedures outlined in Section 8 of the document ""National Emission Inventory QA and Augmentation Report" to correct unrealistic stack parameters. 3. Identified truncated latitude and longitude values in Base F inventory. NC updated all Title V facility latitude and longitude that was submitted to EPA for those facilities in 2004. Smaller facilities with only two decimal places were not corrected. 4. Corrected 2018 VOC emissions for International Paper (3709700045) Emission Unit ID, G-12, to reflect changes to the 2002 inventory.
	There are three Transcontinental Natural Gas Pipeline facilities in NC that are subject to the NO_x SIP call. NCDENR took 2004 emissions and grew them to 2009 & 2018 and capped those units that are subject to the NO_x SIP Call Rule. These facility IDs are 37-057-3705700300, 37-097-3709700225, and 37-157-3715700131.
	NCDENR applied NO_x RACT to a two facilities located in the Charlotte nonattainment area. NCDENR provided 2009 & 2018 emissions for Philip Morris USA (37-025-3702500048) and Norandal USA (37-159-3715900057).
SC	Corrected PM species emission values. SC DHEC's initial CERR submittal reported particulate matter emissions using the PM-FIL, PM_{10}-FIL, and $PM_{2.5}$ -FIL pollutant codes. In August 2005, SC DHEC indicated that data reported using the PM-FIL, PM_{10}-FIL, and $PM_{2.5}$ -FIL pollutant codes should actually have been reported using the PM-PRI, PM_{10}-PRI, and $PM_{2.5}$ _PRI codes. MACTEC performed a subsequent PM augmentation in April 2006 using the revised pollutant codes. These changes were reflected in the Base G 2009/2018 emission inventory.
	Specified that the Bowater Inc. facility (45-091-2440-0005) in York County conducted an expansion in 2003/2004 and plans a future expansion. SC provided updated emissions for 2009 and 2018 for this facility.

Table 2.1-13. Continued.

State	Nature of Update/Correction
TN	Updated 2009/2018 emissions for Eastman Chemical (47-163-0003) based on final (Feb. 2005) BART rule.
	Updated 2009/2018 emission inventory for the Bowater facility (47-107-0012) based on the facility's updated 2002 emission inventory update.
	Replaced 2009/2018 data from Hamilton County, Tennessee, using data from Hamilton County's CERR submittal as contained in EPA's 2002 NEI (in Base F, the inventory for Hamilton County was based on the draft VISTAS 2002 inventory, which in turn was based on the 1999 NEI); applied growth and control factors to revised 2002 inventory to generate emission projections for 2009/2018.
	Updated 2009/2018 emissions for PCS Nitrogen Fertilizer LP (Site ID: 47-157-00146) based on the facility's updated 2002 emission inventory update.
	The 2002 NEI correctly reports the actual emissions for CEMEX (47-093-0008) after the NO_x SIP call. There is no reason to suspect that that rate would change in 2008, 2009, or 2018. Emissions for 2009/2018 were set equal to 2002 emissions.
	In the Base F 2009/2018 inventories, NO_x controls were applied for two units at Columbia Gulf Transmission (47-111-0004). There are no plans for controls at these units, EO3 and EO4. The assumed control efficiency of 82 percent was backed out in the 2009/2018 inventories.
VA	VADEQ provided 2009/2018 NO_x emission estimates for NO_x Phase II gas transmission sources at three Transco facilities (51-011-00011, 51-137-00027, 51-143-00120) which were used to replace the default NO_x Phase II control assumptions for these facilities.
	VADEQ provided updated 2009/2018 NO_x and SO_2 emissions based on new controls required by a November 2005 permit modification and netting exercise. The entire power plant facility is limited to 213 tons of NO_x and 107 tons of SO_2 per year. The permit also allowed the installation of 3 new boilers, also under the 213 tons of NO_x /year cap.
WV	Updated 2009/2018 emissions for Steel of West Virginia (Site ID: 54-011-0009) based on the facility's updated 2002 emission inventory update.
	Made changes to several Site ID names due to changes in ownership
	Base F emissions were much too high for Weirton Steel (54-021-0029). WV believes that the source is very unlikely to emit the NO_x SIP Call budgeted amounts in 2009 or 2018. WV provided revised emission estimates based on EGAS for 2009/2018.
	Made corrections to latitude/longitude and stack parameters at a few facilities for stacks with parameters that do not appear to fall into the ranges typically termed "acceptable" for AQ modeling.

2.1.2.6 Additional B&F Updates and Corrections

Table 2.1-14 summarizes the updates and corrections to the Base G non-EGU inventory that were requested by S/L agencies and incorporated into the B&F 2009/2018 non-EGU inventories. The changes were primarily related to better information on anticipated BART controls for specific facilities and emission units.

Table 2.1-14 Summary of Updates and Corrections Incorporated into the B&F 2009/2018 Non-EGU Inventories.

State	Nature of Update/Correction
AL	For 2018, incorporated emission changes due to BART controls at Exxon Mobil (Site ID: 01-053-0007), International Paper (Site ID: 01-079-0001), and Solutia (Site ID: 01-103-0010). International Paper (Site ID: 01-079-0001) Unit 004 to be shutdown in the 2018 inventory.
FL	For both 2009 and 2018, incorporated emission changes due to BART controls at Georgia Pacific (Site ID: 12-107-1070005) Unit 15.
MS	For 2018 only, changed SO2 emission estimate for Pursue Energy (Site ID: 28-121-00036) based on the facility's estimates of the gas reserve at the site.
	For 2018 only, changed emission estimates for all pollutants at several emission units at the Chevron Pascagoula Refinery (Site ID: 28-059-00058) to reflect BART source reductions.
SC	For both 2009 and 2018, identified 15 facilities that have permanently closed. Emissions from these facilities set to zero for all pollutants.
TN	For both 2009 and 2018, identified seven facilities that have permanently closed. Emissions from these facilities were set to zero for all pollutants.
	For both 2009 and 2018, identified three emission units that have permanently closed. Emissions from these units were set to zero for all pollutants. 47-009-0130-002 (APAC – TN, Inc.-Harrison Construction – Asphalt plant), 47-009-0130-003 (APAC – TN, Inc.-Harrison Construction – Asphalt crusher), and 47-139-0004-001 (Intertrade - Number 6 acid plant)
	The following individual source will be shut down in 2010: 47-001-0020-002 (DOE, Y-12 – Boilers 1-4). For the 2018 inventory only, emissions from this unit were set to zero for all pollutants.
	A portion of 47-163-0003-020101 (Eastman, B-83-1 Stoker Boilers). This source previously consisted of 14 boilers (Boilers 11-24). Boilers 11-17 have been removed from service. Emissions for both 2009 and 2018 were reduced by 26.64%, based on the portion of the heat input capacity that is being removed from service.
	SO2 emissions in 2018 from 47-163-0003-021520 (Eastman, B-253-1 Tangential PC Boilers) were reduced by 90% to reflect anticipated BART controls.
	Reduced SO2 emissions at 47-157-00475 (Lucite International) in Shelby County as a result of a consent decree with U.S. EPA.
VA	Changed SO2 emissions in 2009 and 2018 for thirteen facilities to reflect updated information from VADEQ regarding projected SO2 controls.
WV	Weirton Steel (54-029-00001) and Wheeling Pittsburgh Steel (54-009-00002) have undergone significant, permanent process changes since 2002. WV DEP staff have consulted with facility staff and determined that calendar year 2004 emissions represent a better basis for future year emissions estimates. Therefore, WVDEP compiled emissions data from the 2004 inventory for these sources and applied the most current VISTAS growth factors to estimate emissions in 2009 and 2018.

2.1.2.7 Conversion of MRPO BaseM 2009 non-EGU Data to SMOKE Input Format

To support ASIP $PM_{2.5}$ CAMx modeling of the future year 2009, Alpine Geophysics obtained and processed an emission inventory for the 5 MRPO states (Illinois, Indiana, Michigan, Wisconsin, and Ohio). Appendix x details the technical steps that were made as part of the conversion of the MRPO BaseM non-EGU files into IDA format for ASIP PM-2.5 CAMx modeling of the future year 2009.

2.1.2.8 Summary of the 2009/2018 non-EGU Point Source Inventories

Tables 2.1-15 through 2.1-21 summarize the revised 2009/2018 non-EGU point source inventories. The "growth only" column does not include the shutdowns (section 2.1.2.2) or control factors (section 2.1.2.3), only the growth factors described in section 2.1.2.1.

Table 2.1-15 Non-EGU Point Source SO_2 Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	96,481	100,744	101,246	101,246	112,703	113,224	103,303
FL	65,090	68,549	65,511	62,651	79,015	75,047	71,810
GA	53,778	61,535	53,987	53,987	68,409	59,349	59,349
KY	34,029	35,470	36,418	36,418	38,806	40,682	40,682
MS	35,960	27,488	25,564	25,564	40,195	26,678	25,674
NC	44,123	48,751	42,536	42,536	50,415	46,314	46,314
SC	53,518	55,975	48,324	47,193	56,968	53,577	52,410
TN	79,604	89,149	70,678	64,964	96,606	77,247	56,682
VA	63,903	63,075	62,560	58,039	69,776	68,909	57,790
WV	54,070	54,698	55,973	55,598	60,137	62,193	61,702
	580,556	**605,434**	**562,797**	**548,196**	**673,030**	**623,220**	**575,716**

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-16 Non-EGU Point Source NO_x Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	83,310	69,676	69,409	69,409	79,101	78,318	77,960
FL	45,156	44,859	46,020	47,125	50,635	51,902	52,959
GA	49,251	51,556	50,353	50,353	57,323	55,824	55,824
KY	38,392	36,526	37,758	37,758	40,363	41,034	41,034
MS	61,526	55,877	56,397	56,398	62,132	61,533	61,252
NC	44,929	44,877	34,767	34,768	47,200	37,801	37,802
SC	42,153	42,501	40,019	39,368	44,480	44,021	43,331
TN	64,344	63,431	57,883	57,514	70,313	63,453	62,519
VA	60,415	51,335	51,046	51,001	56,876	55,945	55,734
WV	46,612	40,433	38,031	38,023	44,902	43,359	43,280
	536,088	**501,071**	**481,683**	**481,715**	**553,325**	**533,190**	**531,695**

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-17 Non-EGU Point Source VOC Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	47,037	46,660	46,644	46,644	54,268	54,291	54,290
FL	38,471	36,675	36,880	36,882	42,787	42,811	42,813
GA	33,709	34,082	34,116	34,116	40,267	40,282	40,282
KY	44,834	47,648	47,785	47,785	55,564	55,861	55,861
MS	43,204	37,921	37,747	37,747	45,769	45,338	45,335
NC	61,182	70,464	61,925	61,925	76,027	70,875	70,875
SC	38,458	38,273	35,665	34,403	44,545	43,656	41,987
TN	84,328	89,380	74,089	73,498	111,608	93,266	92,456
VA	43,152	43,620	43,726	43,725	53,065	53,186	53,186
WV	14,595	14,012	13,810	13,043	16,632	16,565	15,582
	448,970	458,735	432,387	429,768	540,532	516,131	512,667

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-18 Non-EGU Point Source CO Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	174,271	176,899	180,369	180,369	194,280	201,794	201,663
FL	81,933	83,937	87,037	87,661	96,642	96,819	97,438
GA	130,850	147,362	147,427	147,427	168,570	167,904	167,904
KY	109,936	121,727	122,024	122,024	139,121	139,437	139,437
MS	54,568	58,023	57,748	57,749	67,764	66,858	65,884
NC	50,576	53,955	53,744	53,744	61,127	62,197	62,197
SC	56,315	62,144	60,473	59,934	71,318	68,988	68,415
TN	115,264	123,844	119,665	119,216	146,407	140,942	140,556
VA	63,796	67,046	68,346	68,326	74,364	76,998	76,846
WV	89,879	100,248	100,045	93,839	119,318	119,332	111,302
	927,388	**995,185**	**996,878**	**990,289**	**1,138,911**	**1,141,269**	**1,131,642**

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-19 Non-EGU Point Source PM_{10}-PRI Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	25,240	25,450	25,421	25,421	29,973	29,924	29,889
FL	35,857	39,363	39,872	39,947	46,573	46,456	46,492
GA	21,610	23,509	23,103	23,103	27,781	27,273	27,273
KY	16,626	17,164	17,174	17,174	20,142	20,153	20,153
MS	19,472	19,200	19,245	19,244	22,952	22,859	22,837
NC	13,838	14,738	13,910	13,910	15,816	15,737	15,737
SC	14,142	17,631	13,370	12,959	20,197	15,139	14,674
TN	35,174	37,040	34,833	34,581	45,168	42,280	41,999
VA	13,252	13,043	13,048	13,046	15,150	15,112	15,111
WV	17,503	17,723	17,090	11,882	21,699	21,735	14,202
	212,714	224,861	217,066	211,267	265,451	256,668	248,367

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-20 Non-EGU Point Source PM25-PRI Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	19,178	19,256	19,230	19,230	22,628	22,598	22,584
FL	30,504	33,387	33,946	34,019	39,436	39,430	39,486
GA	17,462	19,361	18,982	18,982	22,882	22,416	22,416
KY	11,372	11,680	11,686	11,686	13,734	13,739	13,739
MS	9,906	9,144	9,199	9,199	10,768	10,739	10,719
NC	10,500	11,192	10,458	10,458	11,927	11,825	11,825
SC	10,245	13,101	9,390	9,048	14,947	11,086	10,699
TN	27,807	29,302	27,577	27,367	35,750	33,532	33,293
VA	10,165	9,980	9,988	9,988	11,604	11,594	11,605
WV	13,313	13,364	12,769	7,638	16,474	16,516	9,124
	160,452	**169,767**	**163,225**	**157,615**	**200,150**	**193,475**	**185,490**

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

Table 2.1-21 Non-EGU Point Source NH_3 Emission Comparison for 2002/2009/2018.

	2002	2009			2018		
State	**Base G**	**Base F**	**Base G**	**B&F**	**Base F**	**Base G**	**B&F**
AL	1,883	2,132	2,132	2,132	2,464	2,464	2,464
FL	1,423	1,544	1,544	1,544	1,829	1,829	1,829
GA	3,613	3,963	3,963	3,963	4,799	4,797	4,797
KY	674	733	760	760	839	901	901
MS	1,169	667	668	668	761	764	764
NC	1,180	1,288	1,285	1,285	1,422	1,466	1,466
SC	1,411	1,578	1,578	1,578	1,779	1,779	1,779
TN	1,613	1,861	1,841	1,840	2,240	2,214	2,213
VA	3,104	3,050	3,049	3,045	3,613	3,604	3,604
WV	332	341	341	314	416	413	378
	16,402	**17,157**	**17,161**	**17,129**	**20,162**	**20,231**	**20,195**

Note: Emission summaries above include all SCCs except 1-01-xxx-xx and 2-01-xxx-xx.

2.2 Area Sources

This section describes the methodology used to develop the 2009 and 2018 projection Base F and Base G projection inventories. This section describes two approaches to these projections. Separate methods for projecting emissions were used for non-agricultural (stationary area) and agricultural area sources (predominantly NH_3 emissions). The two methods used for these sectors are described in the sections that follow.

2.2.1 Stationary area sources

The general approach used to calculate Base F projected emissions for stationary area sources was as follows:

1. Use the VISTAS Base F 2002 base year inventory as the starting point for projections.
2. MACTEC then worked with the VISTAS States (via the Stationary Area Source SIWG) to obtain any State specific growth factors and/or future controls from the States to use in developing the projections.
3. MACTEC then back calculated uncontrolled emissions from the Base F 2002 base year inventory based on existing controls reported in the 2002 Base F base year inventory.
4. Controls (including control efficiency, rule effectiveness and rule penetration) provided by the States or originally developed for use in estimating projected emissions for U.S. EPA's Heavy Duty Diesel (HDD) rulemaking emission projections and used in the Clean Air Interstate Rule (CAIR) projections were then used to calculate controlled emissions. State submitted controls had precedence over the U.S. EPA developed controls.
5. Growth factors supplied from the States or the U.S. EPA's CAIR emission projections were then applied to project the controlled emissions to the appropriate year. In some cases EGAS Version 5 growth factors were used if no growth factor was available from either the States or the CAIR growth factor files. The use of EGAS Version 5 growth factors was on a case-by-case basis wherever State-supplied or CAIR factors were not available for SCCs found in the 2002 Base F inventory. Use of the EGAS factors was necessitated due to the CERR submittals used in constructing the Base F 2002 inventory. Use of the CERR data resulted in SCCs that were not found in the CAIR inventory and if no State-supplied growth factor was provided required the use of an EGAS growth factor.
6. MACTEC then provided the final draft Base F projection inventory for review and comment by the VISTAS States.

For Base F stationary area sources, no State-supplied growth or control factors were provided. Thus for all of the sources in this sector of the inventory, growth and controls for Base F were

applied based on controls initially identified for the CAIR and growth factors identified for the CAIR projections.

For the Base G projections, the Base G 2002 base year inventory (see section 1.2.3) was used as a starting point. States provided some updated future controls but growth factors used were identical to those used for Base F. The revised controls for Base G were largely for new sources added as part of the 2002 Base F comments. The calculation of Base G projections was identical to the six steps outlined above with the exception of revisions made to prescribed fire for 2009 and 2018 and for the State of North Carolina. North Carolina provided 2009 and 2018 updated emission files used to update the emissions for each year for several source categories. However not all sources in the inventory were included in these NC updates. As a consequence, the final Base G 2009 and 2018 inventory for NC included emissions updated using the NC supplied files and emissions developed using growth and control factors as outlined above.

In a few cases, additional growth factors had to be added for source categories that had not initially been included in the Base F inventory. These growth factors were obtained from EGAS 5.0. Finally updates to growth factors from EGAS 5.0 were made for fuel fired emission sources. The updated growth factors reflected the most recent data from the Department of Energy's Annual Energy Outlook (AEO). These data were used to reflect changes in energy efficiency resulting from new or updated fuel firing technologies.

2.2.1.1 Stationary area source controls

The controls obtained by MACTEC for the HDD rulemaking were controls for the years 2007, 2020, and 2030. Since MACTEC was preparing 2009 and 2018 projections, control values for intermediate years were prepared using a straight line interpolation of control level between 2007 and 2020. The equation used to calculate the control level was as follows:

$$CE = (((2020\ CE - 2007\ CE)/13)*YRS) + 2007\ CE$$

Where:

CE	=	Control Efficiency for either 2009 or 2018
2020 CE	=	HDD Control Efficiency value for 2020
2007 CE	=	HDD Control Efficiency value for 2007
13	=	Number of years between 2020 and 2007
YRS	=	Number of years beyond 2007 to VISTAS Projection year

For 2009 the value of YRS would be two (2) and for 2018 the value would be eleven (11). Control efficiency values were determined for VOC, CO and PM. Rule penetration values for each year in the HDD controls tables obtained by MACTEC were always 100 percent so those values were maintained for the VISTAS projections.

Prior to performing the linear interpolation of the controls, MACTEC evaluated controls from the CAIR projections (NOTE: Initially the controls came from the IAQTR projections, however the controls used in CAIR were virtually identical to those in IAQTR). Those controls appeared to be identical to those used for the HDD rulemaking. In addition, MACTEC received some additional information on some controls for area source solvents (email from Jim Wilson, E.H. Pechan and Associates, Inc. to Gregory Stella, VISTAS Emission Inventory Technical Advisor, 3/5/04) that were used to check against the controls in the HDD rulemaking files. Where those controls proved to be more stringent than the HDD values, MACTEC updated the control file with those values (which were then used in the interpolation to develop 2009 and 2018 values). Finally, for VOC the HDD controls were initially provided at the State-county-SCC level. However, upon direction from the VISTAS Emission Inventory Technical advisor, the VOC controls were consolidated at the SCC level and applied across all counties within the VISTAS region (email from Gregory Stella, Alpine Geophysics, 3/3/2004) to ensure that no controls were missed due to changes in county FIPS codes and/or SCC designations between the time the HDD controls were developed and 2002.

The equation below indicates how VOC emissions were projected for stationary area sources.

$$VOC_{2018} = VOC_{2002}\ x\left(1-\left(\frac{VOC_CE_{2018}}{100}\right)\left(\frac{VOC_RE_{2018}}{100}\right)\left(\frac{VOC_RP_{2018}}{100}\right)\right)$$

Where:

VOC_{2018} = VOC emissions for 2018

VOC_{2002} = Uncontrolled VOC emissions for 2002

VOC_CE_{2018} = Control Efficiency for VOC (in this example for 2018)

VOC_RE_{2018} = Rule Effectiveness for VOC (in this example for 2018)

VOC_RP_{2018} = Rule Penetration for VOC (in this example for 2018)

A similar equation could be constructed for either PM or CO. It should be noted that the control efficiencies calculated based on the HDD rulemaking were only applied if they were greater than any existing 2002 base year controls. No controls were found for SO_2 or NO_x area sources.

In the pre-Base F 2018 emission estimates, an energy efficiency factor was applied to energy related stationary area sources. The energy efficiency factor was applied along with the growth factor to account for both growth and changes in energy efficiency. That factor was not applied to the Base F projections since information supplied by U.S. EPA related to the CAIR growth factors indicated that growth values for those categories were derived from U.S. Department of Energy (DOE) and were felt to account for changes in growth and projected energy efficiency. For the Base G inventory, these energy efficiency factors were re-instituted and used in conjunction with EGAS 5.0 growth factors in a manner identical to that used for the pre-Base F inventories. The energy efficiency factors were derived from U.S. DOE's Annual Energy Outlook report.

One significant difference between the Base F and Base G control factors was for counties and independent cities in northern Virginia. Several counties and independent cities in northern Virginia are subject to Ozone Transport Commission rules. For these counties and independent cities, controls for portable fuel containers, mobile equipment repair/refinishing, consumer products, solvent metal cleaning, and the architectural and industrial maintenance rules were added. The counties/independent cities (FIPS code) included in the changes for Base G were: Alexandria City (51510), Arlington (51013), Fairfax City (51600), Fairfax (51059), Falls Church City (51610), Fredericksburg City (51630), Loudoun (51107), Manassas City (51683), Manassas Park City (51685), Prince William County (51153), Spotsylvania (51177), and Stafford (51179). Not all OTC rules applied to all counties/cities.

2.2.1.2 Stationary area source growth

As indicated above, growth factors for the Base F and Base G 2009 and 2018 inventories were obtained from the U.S. EPA and are linear interpolations of the growth factors used for the Clean Air Interstate Rule (CAIR) projections. The growth factors for the CAIR obtained by MACTEC were developed using a base year of 2001 and provided growth factors for 2010 and 2015. MACTEC used the TREND function in Microsoft Excel™ to calculate 2002, 2009 and 2018 values from the 2001, 2010 and 2015 values. The TREND function provides a linear interpolation of intermediate values from a known series of data points (in this case the 2001, 2010 and 2015 values) based on the equation for a straight line. These values were calculated at the State and SCC level with the exception of paved road emissions (SCC = 2294000000). The growth factors for paved roads were available in the CAIR data set at the State, county and SCC level so they were applied at that level.

Prior to utilizing the growth factors from the CAIR projections, MACTEC confirmed that all SCCs found in the VISTAS 2002 base year inventory were in the CAIR file (for Base F the starting point was the version 3.1 2002 base year inventory, for Base G the starting point was the Base F 2002 base year inventory). Some SCCs were not found in the CAIR file. For those SCCs,

the growth factors used were derived in one of five ways. First where possible, they were taken from a beta version of EGAS 5.0. In other cases, the growth factor was set to one (i.e., no growth). In other cases, a similar SCC that had a CAIR growth factor was used. In a few cases a growth factor based on an average CAIR growth at the 6 digit SCC level was calculated. Finally a number of records used population as the growth surrogate. For the Base G inventory, CAIR growth factors for fuel fired area sources were replaced with EGAS 5.0 growth factors (used in conjunction with AEO fuel efficiency factors). A comment field in the growth factor file was used to mark those records that were not taken directly from the CAIR projection growth factors.

2.2.1.3 Differences between 2009/2018

Methodologically, there was no difference in the way that 2009 and 2018 emissions were calculated for stationary area sources. The individual control and growth factors were different (due to the linear interpolation used to calculate the values) but the calculation methods were identical. This applies to both Base F and Base G.

The only exception to this is for the State of North Carolina for Base G. North Carolina provided an emissions update file used to override calculated projections for a number of area source categories. The values in these files (provided for both 2009 and 2018) were used to overwrite the calculated projected emissions in the final NIF file.

2.2.2 Agricultural area sources

The general approach used to calculate projected emissions for agricultural area sources (predominantly NH_3 emission sources) was as follows:

1. MACTEC used the version 3.1 2002 base year inventory data (which was based on the CMU ammonia model version 3.6).
2. MACTEC worked with the VISTAS States (via the Agricultural Sources SIWG) to obtain any State specific growth and/or future controls from the States for agricultural sources.
3. Since the base year emissions were uncontrolled, and no future controls for these sources were identified, MACTEC projected the agricultural emissions using State-specific growth if available, otherwise the U.S. EPA's Interstate Air Quality Transport Rule (IAQTR)/Ammonia inventory was used to develop the growth factors used to project the revised 2002 base year inventory to 2009 or 2018. Since the IAQTR inventory was only used to construct growth factors rather than using the emissions directly, no updated growth factors were prepared from the CAIR inventory values.

4. MACTEC then provided the final draft inventory for review and comment by the VISTAS States.

No change in the agricultural area source emission projections were made between Base F and Base G other than the removal of wild animal and human perspiration as a result of their removal from the 2002 base year file for Base G.

2.2.2.1 Control assumptions for agricultural area sources

No controls were identified either by the individual VISTAS States or in the information provided in the EPA's IAQTR or CAIR Ammonia inventory documents. Thus all projected emissions for agricultural area sources represent simple growth with no controls.

2.2.2.2 Growth assumptions for agricultural area sources

Growth for several agricultural area source livestock categories was developed using the actual emission estimates developed by the EPA as part of the NEI. That work included projections for the years 2002, 2010, 2015, 2020, and 2030. The actual emissions themselves were not used other than to develop growth factors since the 2002 NEI upon which the growth projections were based was prepared prior to the release of the 2002 Census of Agriculture data which was included in the CMU model (version 3.6) used to develop the Base F 2002 VISTAS base year inventory. Thus VISTAS Agricultural Sources SIWG decided to use the NEI ammonia inventory projected emissions to develop the 2009 and revised 2018 growth factors used to project emission for VISTAS. Details on the NEI inventory and projections can be found at:

http://www.epa.gov/ttn/chief/ap42/ch09/related/nh3inventorydraft_jan2004.pdf. The actual data files for the projected emissions can be found at:

http://www.epa.gov/ttn/chief/ap42/ch09/related/nh3output01_23_04.zip.

In order to use the NEI projected emissions as growth factors, several steps were required. These steps were as follows:

1. NEI projected emissions were only available for the years 2002, 2010, 2015, 2020, and 2030, thus the first task was to calculate intermediate year emissions for 2009 and 2018. These values were calculated based on linear interpolation of the existing data.

2. Once the intermediate emissions were calculated, MACTEC developed emission ratios to provide growth factors for 2009 and 2018. Ratios of emissions were established relative to the 2002 NEI emissions.

3. Once the growth factors were established, MACTEC then evaluated whether or not all agricultural SCCs within the revised 2002 base year inventory had corresponding

growth factors. MACTEC established that not all SCCs within the base year inventory had growth factors. These SCCs fell into one of two categories:

b. SCCs that had multiple entries in the NEI but only a single SCC in the 2002 VISTAS base year inventory. The NEI was established using a process model and for some categories of animals, emissions were calculated for several aspects of the process. The CMU model version 3.6 which was the basis for the VISTAS 2002 Base F inventory did not use a process model. As a consequence a mapping of SCCs in the NEI projections and corresponding SCCs in the CMU inventory was made and for those SCCs an average growth factor was calculated from the NEI projections for use with the corresponding SCC in the CMU based 2002 Base F inventory.

c. There were also State, county, SCC trios in the 2002 VISTAS Base F inventory which had no corresponding emissions in the NEI files. For these instances, MACTEC first developed State level average growth factors from the NEI projections for use in growing these records. Even after developing State level average growth factors there were still some State/SCC pairs that did not have matching growth. For these records, MACTEC developed VISTAS regional average growth factors at the SCC level from the NEI data.

1. Once all of the growth factors were developed, they were used to project the emissions to 2009 and 2018. Growth factors were first applied at the State, county and SCC level. Then remaining records were grown with the State/SCC specific growth factors. Finally, any remaining ungrown records were projected at the SCC level using the VISTAS regional growth factor.

For the livestock categories, the NEI emission projections only had data for beef and dairy cattle, poultry and swine. Thus for other livestock categories and for fertilizers alternative growth factors were required.

The growth factors for other livestock categories and fertilizers were obtained from growth factors used for the IAQTR projections made by the U.S. EPA. The methodology for these categories was identical to that used for dairy, beef, poultry and swine with the exception that State/SCC and VISTAS/SCC growth factors were not required for these categories since the IAQTR data contained State, county and SCC level growth factors. The IAQTR data provided growth factors for 1996, 2007, 2010, 2015 and 2020. Linear interpolation was used to develop the growth factors for the intermediate years 2009 and 2018 required for the VISTAS projections.

There were a few exceptions to the methods used for projecting agricultural sources for the VISTAS projections. These exceptions were:

1. All swine emissions for North Carolina were maintained at 2002 levels for each projection year to capture a moratorium on swine production in that State.
2. Ammonia growth factors for a few categories (mainly feedlots) were assigned to be the same as growth factors for PM emissions from the NEI projections. This assignment was made because the CMU model showed emissions from these categories but the NEI projections did not show ammonia emissions but did show PM emissions.
3. No growth factors were found for horse and pony emissions. These emissions were held constant at 2002 levels.

There was no change in this method between Base F and Base G. Thus Base F and Base G agricultural emissions are the same in each inventory. Future efforts on the agricultural emissions category should look at any changes made to the CMU model to reflect the model farm approach used by EPA in their inventory plus any updated growth factors that may be more recent than the EPA inventory used to develop growth estimates for Base F/G.

2.2.2.2.1 Differences between 2009/2018

Methodologically, there was no difference in the way that 2009 and 2018 emissions were calculated for agricultural area sources. The growth factors were different (due to the linear interpolation used to calculate the values) but the calculation methods were identical. In addition there was no difference between Base F and Base G for this category. Thus Base F and Base G agricultural emissions are the same in each inventory.

Tables 2.2-1 show the differences between Base F and Base G emissions for all area sources (including agricultural sources but excluding fires) for the 2002 base year and 2009 and 2018 by State and pollutant.

Table 2.2-1 2002 Base Year Emissions and Percentage Difference for Base F and Base G (based on actual emissions).

State	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC
Actual Area 2002 - Base G							
AL	83,958	58,318	23,444	393,588	56,654	52,253	182,674
FL	71,079	37,446	28,872	443,346	58,878	40,491	404,302
GA	108,083	80,913	36,142	695,414	103,794	57,559	299,679
KY	66,752	51,135	39,507	233,559	45,453	41,805	95,375
MS	37,905	58,721	4,200	343,377	50,401	771	131,808
NC	345,315	161,860	36,550	280,379	64,052	5,412	237,926
SC	113,714	28,166	19,332	260,858	40,291	12,900	161,000
TN	89,828	34,393	17,844	212,554	42,566	29,917	153,307
VA	155,873	43,905	51,418	237,577	43,989	105,890	174,116
WV	39,546	9,963	12,687	115,346	21,049	11,667	60,443
Base F							
AL	83,958	59,486	23,444	393,093	73,352	47,074	196,538
FL	105,849	44,902	29,477	446,821	81,341	40,537	439,019
GA	107,889	84,230	36,105	695,320	133,542	57,555	309,411
KY	66,752	51,097	39,507	233,559	52,765	41,805	100,174
MS	37,905	59,262	4,200	343,377	63,135	771	135,106
NC	373,585	164,467	48,730	303,492	69,663	7,096	346,060
SC	113,714	29,447	19,332	260,858	51,413	12,900	187,466
TN	89,235	35,571	17,829	211,903	49,131	29,897	161,069
VA	155,873	46,221	51,418	237,577	52,271	9,510	129,792
WV	39,546	10,779	12,687	115,346	25,850	11,667	61,490
Percentage Difference (negative values means Base G increased from Base F)							
AL	0.00%	1.96%	0.00%	-0.13%	22.76%	-11.00%	7.05%
FL	32.85%	16.61%	2.05%	0.78%	27.62%	0.12%	7.91%
GA	-0.18%	3.94%	-0.10%	-0.01%	22.28%	-0.01%	3.15%
KY	0.00%	-0.07%	0.00%	0.00%	13.86%	0.00%	4.79%
MS	0.00%	0.91%	0.00%	0.00%	20.17%	0.00%	2.44%
NC	7.57%	1.59%	24.99%	7.62%	8.05%	23.74%	31.25%
SC	0.00%	4.35%	0.00%	0.00%	21.63%	0.00%	14.12%
TN	-0.67%	3.31%	-0.09%	-0.31%	13.36%	-0.07%	4.82%
VA	0.00%	5.01%	0.00%	0.00%	15.84%	-1013.45%	-34.15%
WV	0.00%	7.57%	0.00%	0.00%	18.57%	0.00%	1.70%

Table 2.2-2 2009 Projection Year Emissions and Percentage Difference for Base F and Base G (based on actual emissions).

State	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC
Actual Area 2009 - Base G							
AL	66,654	64,268	23,930	413,020	58,699	48,228	143,454
FL	57,011	38,616	28,187	503,230	64,589	36,699	420,172
GA	94,130	89,212	37,729	776,411	112,001	57,696	272,315
KY	57,887	53,005	42,088	242,177	46,243	43,087	94,042
MS	27,184	63,708	4,249	356,324	51,661	753	124,977
NC	301,163	170,314	39,954	292,443	69,457	5,751	187,769
SC	90,390	30,555	19,360	278,299	41,613	13,051	146,107
TN	74,189	35,253	18,499	226,098	44,124	30,577	154,377
VA	128,132	46,639	52,618	252,488	44,514	105,984	147,034
WV	31,640	10,625	13,439	115,089	20,664	12,284	55,288
Base F							
AL	68,882	65,441	26,482	411,614	76,248	17,818	157,405
FL	101,356	46,950	31,821	507,515	90,487	52,390	462,198
GA	103,579	92,838	38,876	776,935	146,691	57,377	294,204
KY	64,806	53,023	42,122	242,345	54,397	40,779	94,253
MS	37,161	64,289	4,789	356,516	65,321	637	125,382
NC	332,443	173,187	53,550	317,847	75,570	7,607	252,553
SC	95,826	31,966	20,852	278,852	54,230	12,945	176,104
TN	82,196	36,578	19,148	225,650	51,753	29,787	160,265
VA	133,738	49,173	53,344	252,924	54,587	10,619	120,022
WV	37,704	11,461	13,816	115,410	25,835	12,156	57,082
Percentage Difference (negative values means Base G increased from Base F)							
AL	3.24%	1.79%	9.64%	-0.34%	23.02%	-170.67%	8.86%
FL	43.75%	17.75%	11.42%	0.84%	28.62%	29.95%	9.09%
GA	9.12%	3.91%	2.95%	0.07%	23.65%	-0.56%	7.44%
KY	10.68%	0.03%	0.08%	0.07%	14.99%	-5.66%	0.22%
MS	26.85%	0.90%	11.27%	0.05%	20.91%	-18.10%	0.32%
NC	9.41%	1.66%	25.39%	7.99%	8.09%	24.41%	25.65%
SC	5.67%	4.41%	7.16%	0.20%	23.27%	-0.82%	17.03%
TN	9.74%	3.62%	3.39%	-0.20%	14.74%	-2.65%	3.67%
VA	4.19%	5.15%	1.36%	0.17%	18.45%	-898.09%	-22.51%
WV	16.08%	7.29%	2.73%	0.28%	20.02%	-1.06%	3.14%

Table 2.2-3 2018 Projection Year Emissions and Percentage Difference for Base F and Base G (based on actual emissions).

State	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC
Actual Area 2018 - Base G							
AL	59,626	71,915	25,028	445,256	62,323	50,264	153,577
FL	53,903	40,432	30,708	578,516	72,454	38,317	489,975
GA	93,827	99,885	41,332	880,199	123,704	59,729	319,328
KY	54,865	55,211	44,346	256,052	47,645	44,186	103,490
MS	22,099	69,910	4,483	375,495	53,222	746	140,134
NC	290,809	180,866	43,865	315,294	71,262	6,085	189,591
SC	83,167	33,496	20,592	304,251	44,319	13,457	161,228
TN	68,809	36,291	19,597	246,252	46,692	31,962	182,222
VA	121,690	50,175	56,158	275,351	46,697	109,380	150,919
WV	28,773	11,504	14,828	121,549	21,490	12,849	60,747
Base F							
AL	63,773	73,346	28,754	445,168	82,449	49,975	168,507
FL	100,952	49,889	35,047	582,832	101,872	59,413	533,141
GA	105,059	103,911	42,260	880,800	163,925	61,155	342,661
KY	65,297	55,356	45,597	256,544	57,110	42,326	102,117
MS	36,425	70,565	5,230	375,931	68,338	831	139,419
NC	327,871	184,167	60,073	345,275	85,018	8,273	234,207
SC	89,343	35,082	22,467	304,940	58,441	13,517	196,946
TN	81,242	37,812	20,928	245,893	55,712	31,047	188,977
VA	129,037	53,023	56,668	275,790	58,141	11,479	128,160
WV	36,809	12,390	15,079	121,964	27,088	13,450	62,164
Percentage Difference (negative values means Base G increased from Base F)							
AL	6.50%	1.95%	12.96%	-0.02%	24.41%	-0.58%	8.86%
FL	46.61%	18.96%	12.38%	0.74%	28.88%	35.51%	8.10%
GA	10.69%	3.87%	2.20%	0.07%	24.54%	2.33%	6.81%
KY	15.98%	0.26%	2.74%	0.19%	16.57%	-4.40%	-1.34%
MS	39.33%	0.93%	14.28%	0.12%	22.12%	10.19%	-0.51%
NC	11.30%	1.79%	26.98%	8.68%	16.18%	26.45%	19.05%
SC	6.91%	4.52%	8.34%	0.23%	24.16%	0.44%	18.14%
TN	15.30%	4.02%	6.36%	-0.15%	16.19%	-2.95%	3.57%
VA	5.69%	5.37%	0.90%	0.16%	19.68%	-852.83%	-17.76%
WV	21.83%	7.15%	1.66%	0.34%	20.66%	4.46%	2.28%

2.2.3 Changes to Prescribed Fire for 2009/2018 Base G

Just prior to release of version 3.1 of the VISTAS inventory several Federal agencies indicated that they had plans for increased prescribed fire burning in future years and that the “typical” fire inventory would likely not adequately capture those increases (memo from Bill Jackson and Cindy Huber, August 13, 2004). However data were not readily available to incorporate those changes up through the Base F inventory. As a consequence MACTEC worked with Federal Land Managers to acquire the data necessary to provide 2009 and 2018 specific projections for the prescribed fire component of the Base G fire inventory. The 2009 and 2018 projections developed using the method described below are being used by VISTAS as the 2009 and 2018

base case inventories for all States except FL. For FL the supplied data from the FLMs is not being used as FL felt that their data adequately reflected current and future prescribed burning practices. The “typical” fire projection is the 2002 base prescribed fire projection.

One of the biggest issues in preparing the projection was how best to incorporate the data. Two agencies submitted data: Fish and Wildlife Service (FWS) and Forest Service (FS). FWS submitted annual acreage data by National Wildlife Refuge (NWR) and county with estimates of acres burned per day for each NWR. FS provided fire-by-fire acreage estimates based on mapping projected burning acreage to current 2002 modeling days. However, FWS did not submit data for VISTAS original base year preparation process, thus there was no known FWS data in the 2002 actual or typical inventories. Thus MACTEC had to develop a method that could use the county level data submitted by FWS.

In addition, despite the fact that the FS submitted fire-by-fire data for the 2002 actual inventory and had mapped the projections to current burn days in the 2002 actual inventory, MACTEC could not do a simple replacement of those records with the 2009/2018 projections. This situation was created because several VISTAS States run a prescribed fire permitting program. To avoid double counting, only State data was used in those States for the 2002 actual inventory. Thus there were no Federal data in those States since the Federal data could have potentially duplicated State-supplied prescribed fire data. In VISTAS States without permit programs, the FS supplied data for 2002 was used and those records were marked in database. Thus for those States, the FS supplied 2009/2018 data could be directly substituted for the 2002 data.

The method used by MACTEC to include the FS data applied a county level data approach for FS data where a State had a prescribed fire permitting program and a fire-by-fire replacement for FS data in States without permit programs. MACTEC used a county level approach for all of the FWS data. The approach used for each data set is discussed below.

For the FWS data MACTEC summed the annual acres burned supplied by the FWS across all NWRs in a county. We then subtracted out 2002 acreage for that county from the FWS projected acreage annual total to avoid double counting. The remaining acreage was then multiplied by 0.8 to account for blackened acres instead of the total perimeter acres that were reported. The revised total additional FWS acreage was then added to the total county “typical” acreage to determine future acreage burned for either 2009 or 2018. MACTEC then allocated the increased acreage to current modeling days. The average daily acres burned data provided by FWS per NWR/county was used to allocate the acreage to the correct number of days required to burn all of the acres. Guidance supplied by FWS indicated that up to three times the average daily acres burned could potentially be allocated to any one day. Thus if the estimated acreage per day were 100 acres then up to 300 acres could actually be allocated to a particular day. This approach (use of up to three times the average daily acres burned) was used if there were an insufficient number of 2002

modeling days available to account for all of the acreage increase. MACTEC used an incremental approach to using the increase above the base average daily acres. First we used twice the average daily acreage if that was sufficient to completely allocate the increased acreage over the total number of days available. If that wasn't sufficient then we used three times the average daily acres burned to allocate the acreage. We applied the highest increases to days in the database that already had the highest acreage burned since we felt those days were most likely to represent days with representative conditions for conducting prescribed burns.

The approach used by MACTEC for the FS was slightly different. For States that had permit programs, we used similar approach to the FWS county level approach. First we summed the FS data at county level, we then added that value to the typical acreage and then we allocated the acres to current modeling days. The mapping to current modeling days was performed by Bill Jackson of the USFS and provided to MACTEC. For States that do not have a prescribed fire permit program, MACTEC simply replaced the current fire-by-fire records in the database with fire-by-fire records from the FS and recalculated emissions based on fuel model and fuel loading. We also applied the same 0.8 correction for blackened acres applied to all FS supplied acreage as the supplied values represented perimeter acres.

An additional problem with developing year-specific prescribed fire projections was how to adequately capture the temporal profile for those fires. In the 2002 actual fire inventory, fires occur on same days as state/FLM records. In the 2002 "typical" year inventory, fire acreage increased or decreased from acreage on the same fire days as were in the 2002 actual inventory, since the acres were simply increased for each day based on a multiplier used to convert from actual to typical.

When prescribed fires acreage was added to a future year, MACTEC added acreage to individual fire days proportional to the annual increase (if acreage on a day is 10 percent of annual, add 10 percent of projected increase to that same day).

The table below shows how the FWS data for Okefenokee NWR were allocated for 2009 for Clinch County (Okefenokee NWR is located in four different counties). You can see that the total additional acres for the Clinch County portion of Okefenokee NWR was 1,956 acres. Two hundred eighty (280) acres were the estimated average daily acres burned for that NWR/county combination. Thus to allocate the entire 1,956 acres would require almost 7 burn days (1,956 divided by 280). However only 5 burn days were found for Clinch County in the 2002 actual fire database. Thus we allocated twice the average acreage to the burn day with the most acres burned in the 2002 actual fire database (since our method allowed us to increase the average daily acres burned up to three times the recommended level). Thus the first burn day received 560 acres and all others received 280 except the final day which received 276 to make the total equal to the required 1,956 acres. The table also indicates that the increased acres burned

provided increases of from 10-48 percent in the acres burned on the individual burn days and an average of approximately 14 percent for the year as a whole.

CLINCH COUNTY	3/1/2002	4/1/2002	2/1/2002	1/1/2002	11/1/2002	12/1/2002	Total Annual
Acres (typical)	3,757	2,612	1,996	1,801	616	472	11,764
Add on FWS Projection	560	280	280	280	280	276	1,956
Total	4,316	2,891	2,276	2,080	895	747	13,720
Percent Increase	14.9%	10.7%	14.0%	15.6%	45.5%	58.5%	14.3%

The figure below shows the increases for prescribed burning in the four counties that comprise the Okefenokee NWR area (which also includes FS land). In this figure you can see the additional acreage added for the burn days from FWS and the individual day increases caused by projected increases in prescribed burning based on FS data. It should be noted that while the emissions represent 2009, all fire event dates listed are for 2002 to match up with the base year meteorology used in modeling exercises.

Table 2.2-4 shows the percentage difference between the 2009 and 2018 projections developed for Base F and Base G. Base G includes the revised prescribed burning estimates described above. Values are calculated using Base F as the basis for change, thus negative values imply an increase in emissions for Base G.

Figure 2.2-1 Prescribed Fire Projection for Okeefenokee NWR for 2009

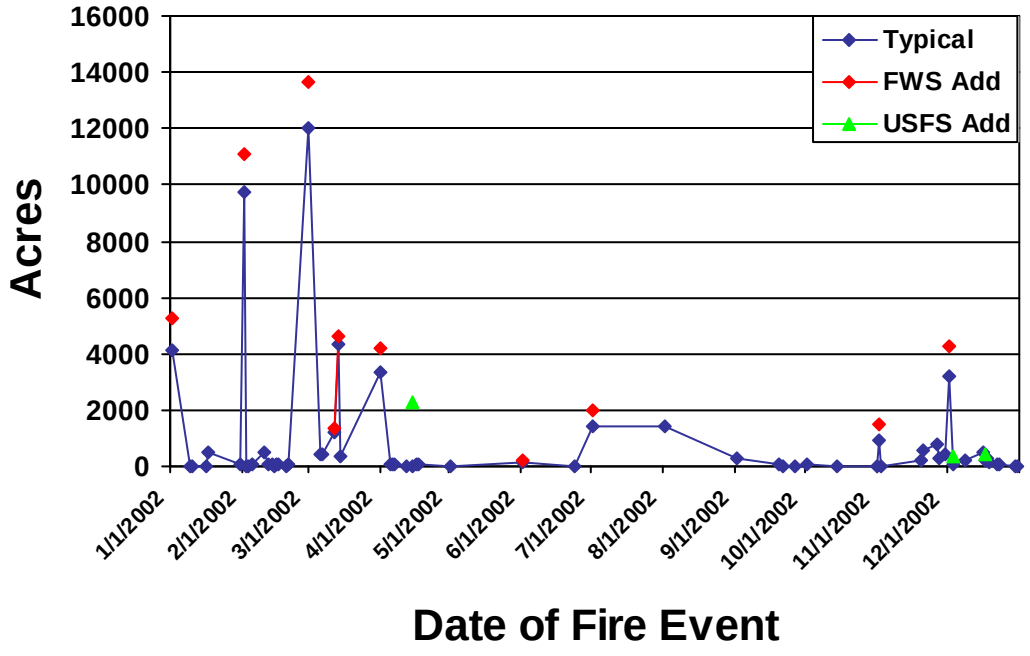


Table 2.2-4 Percentage Difference Between Base F and Base G Fire Emissions by State

State	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC
2009 Fires Base G								**2018 Fires Base G**						
AL	534,873	2,050	11,901	52,851	46,543	2,681	27,502	535,658	2,054	11,918	52,927	46,608	2,686	27,539
FL	923,310	3,157	19,791	98,470	88,756	4,129	51,527	923,310	3,157	19,791	98,470	88,756	4,129	51,527
GA	637,177	2,229	14,243	63,973	57,116	2,914	34,710	637,177	2,229	14,243	63,973	57,116	2,914	34,710
KY	31,810	143	682	3,093	2,653	187	1,497	33,296	150	714	3,237	2,777	196	1,567
MS	48,160	217	1,033	4,683	4,016	283	2,266	50,037	225	1,073	4,865	4,173	294	2,355
NC	96,258	433	2,065	9,359	8,027	566	4,530	111,266	501	2,387	10,819	9,279	655	5,236
SC	282,307	1,039	5,899	29,153	25,955	1,359	16,045	282,307	1,039	5,899	29,153	25,955	1,359	16,045
TN	17,372	78	373	1,689	1,449	102	817	18,860	85	405	1,834	1,573	111	888
VA	21,130	95	453	2,054	1,762	124	994	26,923	121	578	2,618	2,245	158	1,267
WV	3,949	18	85	384	329	23	186	5,013	23	108	487	418	29	236
2009 Fires Base F								**2018 Fires Base F**						
AL	514,120	1,957	11,456	50,833	44,812	2,559	26,526	514,120	1,957	11,456	50,833	44,812	2,559	26,526
FL	923,310	3,157	19,791	98,470	88,756	4,129	51,527	923,310	3,157	19,791	98,470	88,756	4,129	51,527
GA	620,342	2,153	13,882	62,336	55,712	2,815	33,918	620,342	2,153	13,882	62,336	55,712	2,815	33,918
KY	56,686	110	1,460	6,667	6,310	136	3,338	56,686	110	1,460	6,667	6,310	136	3,338
MS	128,471	177	3,328	14,693	13,680	100	13,625	128,471	177	3,328	14,693	13,680	100	13,625
NC	200,564	324	5,005	20,488	19,491	423	12,499	200,564	324	5,005	20,488	19,491	423	12,499
SC	253,005	908	5,270	26,304	23,511	1,187	14,666	253,005	908	5,270	26,304	23,511	1,187	14,666
TN	78,370	46	2,232	8,875	8,730	59	5,153	78,370	46	2,232	8,875	8,730	59	5,153
VA	19,159	159	978	18,160	17,361	99	912	19,159	159	978	18,160	17,361	99	912
WV	32,656	12	944	3,276	3,239	16	2,184	32,656	12	944	3,276	3,239	16	2,184
Percentage Difference (negative number means an increase in Base G emissions)														
AL	-4.04%	-4.77%	-3.89%	-3.97%	-3.86%	-4.77%	-3.68%	-4.19%	-4.95%	-4.03%	-4.12%	-4.01%	-4.95%	-3.82%
FL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
GA	-2.71%	-3.52%	-2.60%	-2.63%	-2.52%	-3.52%	-2.34%	-2.71%	-3.52%	-2.60%	-2.63%	-2.52%	-3.52%	-2.34%
KY	43.88%	-29.52%	53.25%	53.61%	57.96%	-37.90%	55.15%	41.26%	-35.57%	51.07%	51.44%	56.00%	-44.34%	53.06%
MS	62.51%	-22.07%	68.95%	68.13%	70.64%	-183.85%	83.37%	61.05%	-26.83%	67.74%	66.89%	69.50%	-194.91%	82.72%
NC	52.01%	-33.75%	58.74%	54.32%	58.82%	-33.75%	63.76%	44.52%	-54.60%	52.31%	47.19%	52.40%	-54.60%	58.11%
SC	-11.58%	-14.52%	-11.93%	-10.83%	-10.39%	-14.52%	-9.40%	-11.58%	-14.52%	-11.93%	-10.83%	-10.39%	-14.52%	-9.40%
TN	77.83%	-69.40%	83.30%	80.97%	83.41%	-74.42%	84.14%	75.93%	-83.92%	81.87%	79.34%	81.98%	-89.36%	82.78%
VA	-10.29%	40.36%	53.67%	88.69%	89.85%	-25.40%	-9.03%	-40.53%	24.00%	40.97%	85.59%	87.07%	-59.79%	-38.93%
WV	87.91%	-48.65%	91.03%	88.28%	89.83%	-49.46%	91.49%	84.65%	-88.70%	88.61%	85.12%	87.09%	-89.73%	89.20%

2.2.4 Quality Assurance steps

Throughout the inventory development process, quality assurance steps were performed to ensure that no double counting of emissions occurred, to ensure that a full and complete inventory was developed for VISTAS, and to make sure that projection calculations were working correctly. Quality assurance was an important component to the inventory development process and MACTEC performed the following QA steps on the stationary and agricultural area source components of the 2009 and revised 2018 projection inventories:

1. All final files were run through EPA's Format and Content checking software.
2. SCC level emission summaries were prepared and evaluated to ensure that emissions were consistent and that there were no missing sources.
3. Tier comparisons (by pollutant) were developed between the 2002 base year inventory and the 2009 and 2018 projection inventories. In addition, total VISTAS pollutant summaries were prepared to compare total emissions by pollutant between versions of the inventory (e.g., between Base F and Base G).
4. Data product summaries were provided to both the VISTAS Emission Inventory Technical Advisor and to the SIWG representatives for review and comment. Changes based on these comments were implemented in the files.
5. Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from 1.0 to 2.0. A minor change would cause a version number to go from 1.0 to 1.1. Minor changes resulting from largely editorial changes would result in a change from 1.00 to 1.01.

2.3 Mobile Sources

Our general approach for assembling data was to use as much existing data from the pre-Base F preliminary projections as possible for these inventories, supplement these data with easily available stakeholder input, and provide the results for stakeholder review to ensure credibility. To develop the "base case" projections, MACTEC originally assembled data to develop two 2009 and 2018 base case inventories: 1) an inventory that included all "on-the-books" control programs and 2) an "on-the-way" inventory that included controls that were likely to be "on-the-way". For the Base F and Base G emission forecasts to the mobile source sector, "on-the-books" and "on-the-way" are defined with the same strategies and therefore only a single projection scenario was developed for each forecast year.

To ensure consistency across evaluation years, the 2009 and 2018 base case inventories were developed, to the maximum extent practical, using methodologies identical to those employed in

developing the 2002 on-road portion of the revised 2002 VISTAS base year inventory. All modifications to the 2002 inventory methods were developed in consultation with the Mobile Source Special Interest Workgroup (MSSIWG). Generally, modifications were only made to properly account for actual changes expected in the intervening period (i.e., between 2002 and 2009 and between 2002 and 2018), but the underlying inventory development methodology was identical, except to the extent requested by VISTAS or the MSSIWG.

MACTEC developed a preliminary 2018 inventory in early 2004. That inventory was designed to 1) be used for modeling sensitivity evaluations and 2) help establish the methods that would be used for the final 2018 inventory and the initial 2009 inventory. Since that work took place prior to the revision of the 2002 base year inventory data files, MACTEC provided a review of the data and methods used to develop on-road mobile source input files for the initial 2002 base year inventory prior to developing the preliminary 2018 inventory. Through this review, MACTEC determined the following:

- On-road VMT. Most States provided local data for 2002 (or a neighboring year that was converted to 2002 using appropriate VMT growth surrogates such as population). Since these data were not applicable to 2018 due to intervening growth, input for 2018 was solicited from the MSSIWG. At the same time we researched county-specific growth rate data utilized for recent national rulemakings as a backstop approach to State supplied VMT projections.
- Modeling Temperatures. Actual 2002 temperatures were used for the initial 2002 base year inventory.
- Vehicle Registration Mix (age fractions by type of vehicle). A mix of State, local, and MOBILE6 default data were used for the 2002 initial base year inventory. Forecast data were solicited from the States, with a fallback position that we hold the fractions constant at their 2002 values.
- Vehicle Speed by Roadway Type. For the 2002 initial base year inventory, speeds varying by vehicle and road type were used.
- VMT Mixes (fraction of VMT by vehicle type). A mix of State, local, and quasi MOBILE6 default (i.e., MOBILE6 defaults normalized to better reflect local conditions) data were used for the 2002 initial base year inventory. Forecast data were solicited from the States.
- Diesel Sales Fractions. As with the VMT mix data, the diesel sales fraction data employed for the 2002 initial base year inventory represents a mix of State, local, and quasi MOBILE6 default data. The issues related to updating these data to 2018 are also

similar, but are complicated by the fact that MOBILE6 treats diesel sales fraction on a model year, rather than age specific basis. Therefore, diesel sales fractions generally cannot be held constant across time. Once again, we solicited any local projections, with a fallback position that we would keep the data for 2002 and earlier model years constant for the forecast inventory, supplemented with MOBILE6 default data for 2003 and newer model years.

- State/Local Fuel Standards. For the 2002 initial base year inventory, these data were based on appropriate local requirements and updated data for 2018 was only required if changes were expected between 2002 and 2018. There are some national changes in required fuel quality for both on-road and non-road fuels that are expected to occur between 2002 and 2018 and these would be reflected in the 2018 inventory in the absence of more stringent local fuel controls. Expected changes in local fuel control programs were solicited.
- Vehicle Standards. The 2002 initial base year inventory assumed NLEV applicability. This was altered to reflect Tier 2 for 2018, unless a State indicated a specific plan to adopt the California LEV II program. If so, we made the required changes to implement those plans for the preliminary 2018 inventory.
- Other Local Controls. This includes vehicle emissions inspection (i.e., I/M) programs, Stage II vapor recovery programs, anti tampering programs, etc. By nature, the assumptions used for the 2002 initial base year inventory vary across the VISTAS region, but our presumption is that these data accurately reflected each State's situation as it existed in 2002. If a State had no plans to change program requirements between 2002 and 2018, we proposed to maintain the 2002 program descriptions without change. However, if a State planned changes, we requested information on those plans. In the final implementation of the Base F and earlier inventories, Stage II controls were exercised in the area source component of the inventory, since the units used to develop Stage II refueling estimates are different between MOBILE6 and the NONROAD models. However, in the Base G inventories, Stage II refueling was moved to the on-road and non-road sectors.

Once the preliminary 2018 (pre-Base F) base case projection inventory data were compiled, MACTEC applied the data and methods selected and proceeded to develop the preliminary (pre-base F) base case 2018 projection inventories. The resulting inventories were provided to the MSSIWG in a user-friendly format for review. After stakeholder review and comment, the final preliminary 2018 base case inventories and input files were provided to VISTAS in formats identified by the VISTAS Technical Advisor (in this case, MOBILE input files and VMT, NONROAD input files and annual inventory files for NONROAD in NIF 3.0 format). Annual

inventory files for MOBILE were not developed as part of this work, only input files and VMT forecasts. MOBILE emissions were calculated by VISTAS air quality modeling contractor using the provided files.

2.3.1 Development of on-road mobile source input files

As indicated above, MACTEC prepared a preliminary version of the 2018 base case mobile inventory input data files. These files were then updated to provide a final set of 2018 base case inventory input data files as well as a set of input files for 2009. The information below describes the updates performed on the preliminary 2018 files and the development of the 2009 input data files for Base F emission estimation.

Our default approach to preparing the revised 2018 and initial 2009 projection inventories for on-road mobile sources was to estimate the emissions by using either:

1. the revised 2002 data provided by each State coupled with the projection methods employed for the preliminary 2018 inventory, or
2. the same data and methods used to generate the preliminary 2018 inventory.

We also investigated whether or not there was more recent VMT forecasting data available (e.g., from the CAIR and if appropriate revised the default VMT growth rates accordingly. This did not affect any State that provided local VMT forecasting data, but would alter the VMT estimates used for other areas.

Since no preliminary 2009 inventory was developed there did not exist an option (2) above for 2009. As a consequence, MACTEC crafted the 2009 initial inventory for on-road mobile sources using methods identical to those employed for the 2018 preliminary inventories coupled with any changes/revisions provided by the States during the review of the revised 2002 base year and the 2018 preliminary inventories. Therefore, as was the case for 2018, we obtained from the States any input data revisions, methodological revisions, and local control program specifications (to the extent that they differed from 2002/2018).

2.3.1.1 Preparation of revised 2018 input data files

Preparation of the revised 2018 inventories required the following updates:

1. The evaluation year was updated to 2018 in all files.
2. The diesel fuel sulfur content was revised from 500 ppm to 11 ppm, consistent with EPA data for 2018 in all files.
3. Since the input data is model year, rather than age, specific for diesel sales fractions (with data for the newest 25 model years required), we updated all files that included

diesel sales fractions. In the revised 2002 base year files, the data included applied to model years 1978-2002. For 2018, the data included would reflect model years 1994-2018. To forecast the 2002 data, MACTEC took the data for 1994-2002 from the 2002 files and added data for 2003-2018. To estimate the data for these years, we employed the assumption employed by "default" in MOBILE6 -- namely that diesel sales fractions for 1996 and later are constant. Therefore, we set the diesel sales fractions for 2003-2018 at the same value as 2002.

4. VMT mix fractions must be updated to reflect expected changes in sales patterns between 2002 and 2018. If explicit VMT mix fractions are not provided, these changes are handled internally by MOBILE6 or externally through absolute VMT distributions. However, files that include explicit VMT mix fractions override the default MOBILE6 update and may or may not be consistent with external VMT distributions. MACTEC updated the VMT mix in such files as follows:

   First, we calculated the VMT fractions for LDV, LDT1, LDT2, HDV, and MC from the external VMT files for 2018. This calculation was performed in accordance with section 5.3.2 of the MOBILE6 Users Guide which indicates:

   LDV = LDGV + LDDV

   LDT1 = LDGT1 + LDDT

   LDT2 = LDGT2

   HDV = HDGV + HDDV

   MC = MC

   The resulting five VMT fractions were then split into the 16 fractions required by MOBILE6 using the distributions for 2018 provided in Appendix D of the MOBILE6 Users Guide. This approach ensures that explicit input file VMT fractions are consistent with the absolute VMT distributions prepared by MACTEC. These changes were made to all files that included VMT mixes.

5. All other input data were retained at 2002 values, except as otherwise instructed by the States. This includes all control program descriptions (I/M, Anti-Tampering Program [ATP], Stage II, etc.), all other fuel qualities (RVP, oxy content, etc.), all other vehicle descriptive data (registrations age distributions, etc.), and all scenario descriptive data. The State-specific updates performed are described below.

Kentucky:

MACTEC revised the 2018 input files for the Louisville, Kentucky area (Louisville Air Pollution Control District [APCD]) based on comments received relative to several components of

MOBILE input data. Based on these comments, the input files for Jefferson County, Kentucky were updated accordingly as follows:

a) I/M and tampering program definitions were removed since the program was discontinued at the end of 2003.

b) The "Speed VMT", "Facility VMT" and "Registration Age Distribution" file pointers were updated to reflect revised 2002 files provided by the Louisville APCD.

c) The "VMT Mix" data, which was previously based on the default approach of "growing" 2002 data, was replaced by 2018-specific data provided by the Louisville APCD.

North Carolina:

North Carolina provided a wide range of revised input data, including complete MOBILE6 input files for July modeling. MACTEC did not use the provided input files directly as they did not match the 2002 NC input files for critical elements such as temperature distributions and gasoline RVP (while they were close, they were slightly different). To maintain continuity between 2002 and 2018 modeling, MACTEC instead elected to revise the 2002 input files to reflect all control program and vehicle-related changes implied by the new 2018 files, while retaining the basic temperature and gasoline RVP assumptions at their 2002 values. Under this approach, the following changes were made:

a) NC provided a county cross reference file specific to 2018 that differed from that used for 2002. We removed files that were referenced in the 2002 input data and replaced those files with those referenced in the 2018 data. In addition, since NC only provided 2018 input files for July, we estimated the basic data for these new files for the other months by cross referencing the target files for 2002 by county against the target files for 2018 by county.

b) We then revised the 2002 version of each input file to reflect the 2018 "header" data included in the NC-provided 2018 files. These data are exclusively limited to I/M and ATP program descriptions, so that the 2002 I/M and ATP data were replaced with 2018 I/M and ATP data.

c) We retained the registration age fractions at their 2002 "values" (external file pointers) as per NC instructions.

d) We retained all scenario-specific data (i.e., temperatures, RVP, etc.) at 2002 values, which (as indicated above), were slightly different in most cases from data included in the 2018 files provided by NC. We believe these differences were due to small deviations between the data assembled to support VISTAS 2002 and the process used to generate the 2018 files provided by NC, and that revising the VISTAS 2002 data to

reflect these variations was not appropriate given the resulting inconsistencies that would be reflected between VISTAS 2002 and VISTAS 2018.

e) NC also provided non-I/M versions of the 2018 input files that would generally be used to model the non-I/M portion of VMT. While these files were retained they were not used for the 2018 input data preparation.

Finally, NC also provided a speed profile file and a speed profile cross reference file for 2018. We did not use these in our updates as they have no bearing on the MOBILE6 input files, but they were maintained in case they needed to be included in SMOKE control files for a future year control strategy scenario.

Virginia:

In accordance with instructions from VA, the input files that referenced an external I/M descriptive program file (VAIM02.IM) were revised to reference an alternative external file (VAIM05.IM). This change was to make the I/M program more relevant to the year 2018.

One additional important difference was made with respect to the revised 2018 and initial 2009 on-road mobile source input data files for all States. MACTEC developed updated SMOKE ready input files rather than MOBILE6 files so that the input data could be used directly by the VISTAS modeling contractor to estimate on-road mobile source emissions during modeling runs.

2.3.1.2 Preparation of initial 2009 input data files

The methodology used to develop the 2009 on-road input files was based on forecasting the previously developed revised 2002 base year input files and is identical to that previously described for the revised 2018 methodology except as follows:

1. The evaluation year was updated to 2009.
2. Diesel fuel sulfur content was revised from 500 ppm to 29 ppm. The 29 ppm value was derived from an EPA report entitled "Summary and Analysis of the Highway Diesel Fuel 2003 Pre-compliance Reports" (EPA420-R-03-013, October 2003), which includes the Agency's estimates for the year-to-year fuel volumes associated with the transition from 500 ppm to 15 ppm diesel fuel. According to Table 2 of the report, there will be 2,922,284 barrels per day of 15 ppm diesel distributed in 2009 along with 110,488 barrels per day of 500 ppm diesel. Treating the 15 ppm diesel as 11 ppm on average (consistent with EPA assumptions and assumptions employed for the 2018 input files) and sales weighting the two sulfur content fuels results in an average 2009 diesel fuel sulfur content estimate of 29 ppm.

3. Diesel sales fractions were updated identically to 2018 except that the diesel sales fractions for 2003-2009 were set at the same value as those for 2002 (rather than 2003-2018).
4. VMT mix fractions were updated to 2009 using an identical method to that described for 2018.
5. All other input data were retained at 2002 values, except as otherwise instructed by individual States (see below). This includes all control program descriptions (I/M, ATP, Stage II, etc.), all other fuel qualities (RVP, oxy content, etc.), all other vehicle descriptive data (registration age distributions, etc.), and all scenario descriptive data.

In addition to the updates described above that were applied to all VISTAS-region inputs, the following additional State-specific updates were performed:

KY – Identical changes to those made for 2018 (but specific to 2009) were made for the 2009 input files.

NC – Identical changes to those made for 2018 (but specific to 2009) were made for the 2009 input files.

VA – Identical changes to those made for 2018 were made for 2009.

2.3.2 VMT Data

The basic methodology used to generate the 2009 and 2018 VMT for use in estimating on-road mobile source emissions was as follows:

1. All estimates start from the final VMT estimates used for the 2002 revised base year inventory.
2. Initial 2009 and 2018 VMT estimates were based on linear growth rates for each State, county, and vehicle type as derived from the VMT data assembled by the U.S. EPA for their most recent HDD (heavy duty diesel) rulemaking. The methodology used to derive the growth factors is identical to that employed for the preliminary 2018 VMT estimates (which is described in the next section).
3. For States that provided no independent forecast data, the estimates derived in step 2 are also the final estimates. These States are: Alabama, Florida, Georgia, Kentucky, Mississippi, and West Virginia. For States that provided forecast data, the provided data were used to either replace or augment the forecast data based on the HDD rule. These States, and the specific approaches employed, are detailed following the growth method description.

The steps involved in performing the growth estimates for VMT were as follows:

1. Linear growth estimates were used (although MACTEC investigated the potential use of nonlinear factors and presented that information to the MSSIWG, the decision was made to use linear growth factors instead of nonlinear).
2. Estimates were developed at the vehicle class (i.e., LDGV, LDGT1, LDGT2, etc.) level of detail since the base year 2002 estimates were presented at that level of resolution. In effect, the county and vehicle class specific growth factors were applied to the 2002 VMT estimates for each vehicle and road class.
3. Overall county-specific VMT estimates for each year (developed by summing the vehicle and road class specific forecasts) were then compared to overall county-specific growth. Since overall county growth is a more appropriate controlling factor as it includes the combined impacts of all vehicle classes, the initial year-specific vehicle and road class VMT forecasts were normalized so that they matched the overall county VMT growth. Mathematically, this process is as follows:

   (Est_rv_f) = (Est_rv_i) * (C_20XX / Sum(Est_rv_i))

where:

Est_rv_f = the final road/vehicle class-specific estimates,

Est_rv_i = the initial road/vehicle class-specific estimates, and

C_20XX = the county-specific growth target for year 20XX.

Table 2.3-1 presents a basic summary of the forecasts for the preliminary 2018 inventory for illustrative purposes:

Table 2.3-1 2002 versus 2018 VMT (million miles per year)

State	2002	2018	Growth Factor
Alabama	55,723	72,966	1.309
Florida	178,681	258,191	1.445
Georgia	106,785	148,269	1.388
Kentucky	51,020	66,300	1.299
Mississippi	36,278	46,996	1.295
North Carolina	80,166	110,365	1.377
South Carolina	47,074	63,880	1.357
Tennessee	68,316	91,647	1.342
Virginia	76,566	102,971	1.345
West Virginia	19,544	24,891	1.274

The following States provided some types of forecast data for VMT. The information presented below indicates how those data were processed by MACTEC for use in the VISTAS projection inventories.

Kentucky:

Revised 2009 and 2018 VMT mix data were provided by the Louisville APCD. Therefore, the distribution of Jefferson County VMT by vehicle type within the KY VMT file was revised to reflect the provided mix. This did not affect the total forecasted VMT for either Jefferson County or the State, but does alter the fraction of that VMT accumulated by each of the eight vehicle types reflected in the VMT file. The following procedure was employed to make the VMT estimates consistent with the provided 2009/2018 VMT mix:

a) The 16 MOBILE6 VMT mix fractions were aggregated into the following five vehicle types: LDV, LDT1, LDT2, HDV, and MC.

b) The 8 VMT mileage classes were aggregated into the same five vehicle types (across all roadway types) and converted to fractions by normalizing against the total Jefferson County VMT.

c) The ratio of the "desired" VMT fraction (i.e., that provided in the Louisville APCD VMT mix) to the "forecasted" VMT fraction (i.e., that calculated on the basis of the forecasted VMT data) was calculated for each of the five vehicle classes.

d) All forecasted VMT data for Jefferson County were multiplied by the applicable ratio from step c as follows:

new LDGV = old LDGV * LDV ratio
new LDGT1 = old LDGT1 * LDT1 ratio
new LDGT2 = old LDGT2 * LDT2 ratio
new HDGV = old HDGV * HDV ratio
new LDDV = old LDDV * LDV ratio
new LDDT = old LDDT * LDT1 ratio
new HDDV = old HDDV * HDV ratio
new MC = old MC * MC ratio

The total forecasted VMT for Jefferson County was then checked to ensure that it was unchanged.

North Carolina:

North Carolina provided both VMT and VMT mix data by county and roadway type for 2018. Therefore, these data replaced the data developed for North Carolina using HDD rule growth

rates in their entirety. Similar data were submitted for 2009. Table 2.3-2 presents the resulting VMT estimates which differ from the "default" HDD rule estimates as follows:

Table 2.3-2 VMT and HDD Rule Estimates for North Carolina (million miles per year)

North Carolina		
2002	106,795	
	State Data	**HDD Data**
2009	123,396	124,626
2018	129,552	146,989

As indicated, there are substantial reductions in the State-provided forecast data relative to that derived from the HDD rule. The growth rates for both 2009 and 2018 are only about half that implied by the HDD data (1.15 versus 1.17 for 2009 and 1.21 versus 1.38 for 2018). The resulting growth rates are the lowest in the VISTAS region.

NC did not provide VMT mix data for 2009. Therefore, the VMT mix fractions estimated using the "default" HDD rule growth rates were applied to the State-provided VMT estimates to generate vehicle-specific VMT. Essentially, the default HDD methodology produces VMT estimates at the county-road type-vehicle type level of detail, and these data can be converted into VMT fractions at that same level of detail. Note that these are not HDD VMT fractions, but VMT fractions developed from 2002 NC data using HDD vehicle-specific growth rates. In effect, they are 2002 NC VMT fractions "grown" to 2009.

The default VMT mix fraction was applied to the State-provided VMT data at the county and road type level of detail to generate VMT data at the county-road type-vehicle type level of detail. The one exception was for county 063, road 110, for which no VMT data were included in the HDD rule. For this single county/road combination, State-aggregate VMT mix fractions (using the HDD growth methodology) were applied to the county/road VMT data. The difference between road 110 VMT fractions across all NC counties is minimal, so there is no effective difference in utilizing this more aggregate approach vis-à-vis the more resolved county/road approach.

South Carolina:

South Carolina provided county and roadway type-specific VMT data for several future years. Data for 2018 was included and was used directly. Data for 2009 was not included, but was linearly interpolated from data provided for 2007 and 2010. The data were disaggregated into vehicle type-specific VMT using the VMT mixes developed for South Carolina using the HDD rule VMT growth rates. Table 2.3-3 presents the resulting VMT estimates which differ from the "default" HDD rule estimates as follows:

Table 2.3-3 VMT and HDD Rule Estimates for South Carolina (million miles per year)

South Carolina		
2002	**47,074**	
	State Data	**HDD Data**
2009	55,147	54,543
2018	65,133	63,880

Tennessee:

In general, Tennessee estimates are based on the HDD rule growth rate as described in step two. However, Knox County provided independent VMT estimates for 2018 and these were used in place of the HDD rule-derived estimates. The Knox County estimates were total county VMT data only, so these were disaggregated into roadway and vehicle-type VMT using the distributions developed for Knox County in step two using the HDD rule VMT growth rates. No data for Knox County were provided for 2009, so the estimates derived using the HDD rule growth factors were adjusted by the ratio of "Knox County provided 2018 VMT" to "Knox County HDD Rule-derived 2018 VMT." Table 2.3-4 presents the resulting VMT estimates which differ from the "default" HDD rule estimates as follows:

Table 2.3-4 VMT and HDD Rule Estimates for Tennessee (million miles per year)

Tennessee		
2002	68,316	
	State Data	**HDD Data**
2009	78,615	78,813
2018	91,417	91,647

Virginia:

Virginia provided county and roadway type-specific annual VMT growth rates and these data were applied to Virginia -provided VMT data for 2002 to estimate VMT in both 2009 and 2018. Virginia provided VMT mix data for 2002, but not 2009 or 2018. Therefore, the estimated VMT data for both 2009 and 2018 were disaggregated into vehicle type-specific VMT using the VMT mixes developed for VA using the HDD rule VMT growth rates. Table 2.3-5 presents the resulting VMT estimates which differ from the "default" HDD rule estimates as follows:

Table 2.3-5 VMT and HDD Rule Estimates for Virginia (million miles per year)

Virginia		
2002	77,472	
	State Data	**HDD Data**
2009	88,419	89,196
2018	104,944	104,164

2.3.3 Base G Revisions

For the development of the VISTAS 2009 and 2018 Base G inventories and input files, VISTAS states reviewed the Base F inputs, and provided corrections, updates and supplemental data as noted below.

For all states modeled, the Base G updates include:

- Adding Stage II refueling emissions calculations to the SMOKE processing.
- Revised the HDD compliance. (REBUILD EFFECTS = .1)
- Revised Diesel sulfur values in 2009 to 43 ppm and 2018 to 11 ppm

In addition to the global changes, individual VISTAS states made the following updates:

KY – updated VMT and M6 input values for selected counties

NC – revised VMT estimates, speeds and vehicle distributions and updated registration distributions for Mobile 6.

TN - revised VMT and vehicle registration distributions for selected counties.

WV – revised VMT input data

AL, FL, and GA and VA did not provide updates for 2009/2018 Base G, and the Base F inputs were used for these States.

2.3.4 Development of non-road emission estimates

The sections that follow describe the projection process used to develop 2009 and 2018 non-road projection estimates, as revised through the spring of 2006, for sources found in the NONROAD model and those sources estimated outside of the model (locomotives, airplanes and commercial marine vessels).

2.3.4.1 NONROAD model sources

NONROAD model input files were prepared in both the fall of 2004 (Base F) and the spring of 2006 (Base G) based on the corresponding 2002 base year inventory input files available at the

time the forecasts were developed, with appropriate updates for the projection years. Generally, this means that the Base F 2002 base year input files (as updated through the fall of 2004) were used as the basis for Base F projection year input file development and Base G 2002 base year input files as updated through the spring of 2006 were used as the basis for Base G projection year input file development. Thus, all base year revisions are inherently incorporated into the associated projection year revisions. Other specific updates for the projection years for NONROAD model sources consist of:

1. Revise the emission inventory year in the model (as well as various output file naming commands) to be reflective of the projection year.
2. Revise the fuel sulfur content for gasoline and diesel powered equipment.
3. Implement a limited number of local control program charges (national control program changes are handled internally within the NONROAD model, so explicit input file changes are not required).

All equipment population growth and fleet turnover impacts are also handled internally within the NONROAD model, so that explicit changes input file changes are not required.

Base F Input File Changes:

To correctly account for diesel fuel sulfur content differences between the base and projection years, two sets of input and output files were prepared for each forecast year, one set for land-based equipment and one set for marine equipment. This two-step projection process was required for Base F, because diesel fuel sulfur contents varied between land-based and marine-based non-road equipment and the Draft NONROAD2004 used for Base F allowed only a single diesel fuel sulfur input. Thus, the model was executed separately for land-based and marine-based equipment for Base F, and the associated outputs subsequently combined. The specific diesel fuel sulfur contents modeled were as follows:

Diesel S (ppm)	2002	2009	2018
Land-Based	2500	348	11
Marine-Based	2500	408	56

As indicated, the Draft NONROAD2004 model was run with both sets of input files and the output file results were then combined to produce a single NONROAD output set.

To correctly account for the national reduction in gasoline sulfur content (a national control not explicitly handled by the NONROAD model), all NONROAD input files for both 2009 and 2018 were revised to reflect a gasoline fuel sulfur content of 30 ppmW.

Base G Input File Changes:

With the release of Final NONROAD2005 that was used for the Base G projection year inventory development, the NONROAD model is capable of handling separate diesel fuel sulfur inputs for land-based and marine-based non-road equipment in a single model execution. Therefore, the two step modeling process described above for Base F updates was no longer required. Instead, the differential diesel fuel sulfur values are assembled into a single NONROAD input file as follows:

Diesel S (ppm)	2002	2009	2018
Land-Based	2500	348	11
Marine-Based	2638	408	56

Additionally, revised gasoline vapor pressure data were provided by Georgia regulators for 20 counties[5] where reduced volatility requirements were established in 2003. Since this requirement began after the 2002 base year, the vapor pressure values in the base year input files for these counties are not correct for either the 2009 or 2018 forecast years. Therefore, to correctly forecast emissions in these counties, the forecast year gasoline vapor pressure inputs were revised to:

Gasoline RVP (psi)	2002	2009	2018
Spring	9.87	9.2	9.2
Summer	9.0	7.0	7.0
Fall	9.87	9.2	9.2
Winter	12.5	12.5	12.5

The summer vapor pressure was simply set equal to the 2003 control value, while the spring and fall vapor pressures were adjusted to reflect a single month of the reduced volatility limit. The winter volatility was assumed to be unaffected by the summertime control requirement.

2.3.4.1.1 Differences between 2009/2018

Other than diesel fuel sulfur content and the year of the projections, there are no differences in the methodology used to estimate emissions from NONROAD model sources. As indicated above, however the Base F 2009/2018 projections were developed using Draft NONROAD2004, while the Base G 2009/2018 projections were made using Final NONROAD2005.

[5] The specific counties are: Banks, Chattooga, Clarke, Floyd, Gordon, Heard, Jasper, Jones, Lamar, Lumpkin, Madison, Meriwether, Monroe, Morgan, Oconee, Pike, Polk, Putnam, Troup, and Upson.

2.3.4.2 Non-NONROAD model sources

Using the 2002 base year emissions inventory for aircraft, locomotives, and commercial marine vessels (CMV) prepared as described earlier in this document, corresponding emission projections for 2009 and 2018 were developed in both the fall of 2004 (Base F) and the spring of 2006 (Base G). This section describes the procedures employed in developing those inventories. The information presented is intended to build off of that presented in the section describing the 2002 Base F base year inventory. It should be recognized that for both the Base F and Base G inventories, the base year inventory used to develop the emission forecasts was the latest available at the time of forecast development. Generally, this means that the 2002 base year inventory as updated through the fall of 2004 was used as the basis for the Base F projection year inventory development, and the Base F 2002 base year inventory was used as the basis for Base G projection year inventory development. Thus, all base year revisions (as described earlier in this document) are inherently incorporated into the associated projection year revisions.

Base F Revisions:

Table 2.3-6 shows the 2002 base year emissions for each State in the VISTAS region for aircraft, locomotives and CMV (as they existed prior to Base F development).

Table 2.3-6 Pre-Base F 2002 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons, as of the fall of 2004)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	3,787	175	226	87	17	196
	FL	25,431	8,891	2,424	2,375	800	3,658
	GA	6,620	5,372	1,475	1,446	451	443
	KY	2,666	657	179	175	63	263
	MS	1,593	140	44	43	13	96
	NC	6,088	1,548	419	411	148	613
	SC	6,505	515	409	401	88	863
	TN	7,251	2,766	734	719	235	943
	VA	9,763	2,756	1,137	1,115	786	2,529
	WV	1,178	78	25	24	8	66
	Total	**70,882**	**22,899**	**7,072**	**6,797**	**2,607**	**9,670**
Commercial Marine (2280)	AL	1,196	9,218	917	844	3,337	737
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,875	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,688	43,233	1,903	1,751	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	3,624	27,555	1,217	1,120	4,974	860
	VA	972	2,775	334	307	359	483
	WV	1,528	11,586	487	448	525	362
	Total	**28,207**	**209,972**	**9,911**	**9,118**	**36,275**	**7,413**
Military Marine (2283)	VA	110	313	25	23	27	48
	Total	**110**	**313**	**25**	**23**	**27**	**48**
Locomotives (2285)	AL	3,490	26,339	592	533	1,446	1,354
	FL	1,006	9,969	247	222	605	404
	GA	2,654	26,733	664	598	1,622	1,059
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	2,626	25,627	633	570	1,439	1,041
	VA	1,186	11,882	1,529	1,375	3,641	492
	WV	1,311	13,224	329	296	808	517
	Total	**19,540**	**187,044**	**5,815**	**5,232**	**14,022**	**7,750**
Grand Total		**118,739**	**420,228**	**22,823**	**21,170**	**52,931**	**24,881**

Although some of the data utilized was updated, the methodology used to develop the Base F 2009 and 2018 emissions forecasts for aircraft, locomotives, and CMV is identical to that used earlier to develop preliminary 2018 Base 1 ("On the Books") and 2018 Base 2 ("On the Way") inventories. Briefly, the methodology relies on growth and control factors developed from inventories used in support of recent EPA rulemakings, and consists of the following steps:

(a) Begin with the 2002 base year emission estimates for aircraft, locomotive, and CMV as described above (at the State-county-SCC-pollutant level of detail).

(b) Detailed inventory data (both before and after controls) for these same emission sources for 1996, 2010, 2015, and 2020 were obtained from the EPA's Clean Air Interstate Rule (CAIR) Technical Support Document (which can be found at http://www.epa.gov/cair/pdfs/finaltech01.pdf). Using these data, combined growth and control factors for the period 2002-2009 and 2002-2018 were estimated using straight line interpolation between 1996 and 2010 (for 2009) and 2015 and 2020 (for 2018). This is done at the State-county-SCC-pollutant level of detail.

(c) The EPA growth and control data are matched against the 2002 VISTAS base year data using State-county-SCC-pollutant as the match key. Ideally, there would be a one-to-one match and the process would end at this point. Unfortunately, actual match results were not always ideal, so additional matching criteria were required. For subsequent reference, this initial (highest resolution) matching criterion is denoted as the "CAIR-Primary" criterion.

(d) A second matching criterion is applied that utilizes a similar, but higher-level SCC (lower resolution) matching approach. For example, SCC 2275020000 (commercial aircraft) in the 2002 base year inventory data would be matched with SCC 2275000000 (all aircraft) in the CAIR data. This criterion is applied to records in the 2002 base year emissions file that are not matched using the "CAIR-Primary" criterion, and is also performed at the State-county-SCC-pollutant level of detail. For subsequent reference, this is denoted as the "CAIR-Secondary" criterion. At the end of this process, a number of unmatched records remained, so a third level matching criterion was required.

(e) In the third matching step, the most frequently used SCC in the EPA CAIR files for each of the aircraft, locomotive, and commercial marine sectors was averaged at the State level to produce a "default" State and pollutant-specific growth and control factor for the sector. The resulting factor is used as a "default" growth factor for all unmatched county-SCC-pollutant level data in each State. In effect, State-specific growth data are applied to county level data for which an explicit match between the VISTAS 2002 base year data and EPA CAIR data could not be developed. The default growth and control

SCCs are 2275020000 (commercial aircraft) for the aircraft sector, 2280002000 (commercial marine diesel total) for the CMV sector, and 2285002000 (railroad equipment diesel total) for the locomotive sector. Matches made using this criterion are denoted as "CAIR-Tertiary" matches.

(f) According to EPA documentation, the CAIR baseline emissions include the impacts of the (then proposed) Tier 4 (T4) non-road diesel rulemaking, which implements a low sulfur fuel requirement that affects both future CMV and locomotive emissions. However, the impacts of this rule were originally intended to be excluded from the initial VISTAS 2018 forecast, which was to include only "on-the-books" controls. (The T4 rule was finalized subsequent to the development of the preliminary 2018 inventory in March of 2004.) Given its final status, T4 impacts were moved into the "on the books" inventory for non-road equipment. In addition, since there are no other proposed rules affecting the non-road sector between 2002 and 2018, there is no difference between the 2018 "on the books" and 2018 "on the way" inventories for the sector; so that only a single forecast inventory (for each evaluation year) was developed. Nevertheless, since the algorithms developed to produce the VISTAS forecasts were developed when there was a distinction between the "on the books" and "on the way" inventories, the distinct algorithms used to produce the two inventories have been maintained even though the conceptual distinctions have been lost. This approach was taken for two reasons. First, it allowed the previously developed algorithms to be utilized without change. Second, it allowed for separate treatment of the T4 emissions impact which was important as those impacts changed between the proposed and final T4 rules. Thus, previous EPA inventories that include the proposed T4 impacts would not be accurate. Therefore, the procedural discussion continues to reflect the distinctions between non-T4 and T4 emissions, as these distinctions continue to be intrinsically important to the forecasting process. Therefore, a second set of EPA CAIR files that excluded the Tier 4 diesel impacts was obtained and the same matching exercise described above in steps (b) through (e) was performed using these "No T4" files. It is important to note that the matching exercise described in steps (b) through (e) cannot simply be replaced because the "No T4" files obtained from the EPA include only those SCCs specifically affected by the T4 rule (i.e., diesel CMV and locomotives). So in effect, the matching exercise was augmented (rather than replaced) with an additional three criteria analogous to those described in steps (c) through (e), and these are denoted as the "No T4-Primary," "No T4-Secondary," and "No T4-Tertiary" criteria. Because they exclude the impacts of the proposed T4 rule, matches using the "No T4" criteria supersede matches made using the basic CAIR criteria (as described in steps (c) through (e) above).

(g) The CAIR matching criteria were overridden for any record for which States provided local growth data. Only North Carolina provided these forecasts, as that State has provided specific growth factors for airport emissions in four counties. Because the provided data were based on forecasted changes in landings and takeoffs at major North Carolina airports, the factors were applied only to commercial (SCC 2275020000) and air taxi (SCC 2275060000) emissions. Emissions forecasts for military and general aviation aircraft operations, as well as all aircraft operations in counties other than the four identified in the North Carolina growth factor submission, continued to utilize the growth factors developed according to steps (b) through (f) above. Table 2.3-7 presents the locally generated growth factors applied in North Carolina.

Table 2.3-7 Locally Generated Growth Factors for North Carolina

FIP	2009 Factor	2018 Factor
37067	0.71	0.84
37081	0.97	0.89
37119	1.15	1.01
37183	0.88	0.81

Note:
Growth factor = Year Emissions/2002 Emissions.
Under CAIR approach, 2009 = 1.16 to 1.17 for all 4 counties.
Under CAIR approach, 2018 = 1.36 to 1.37 for all 4 counties.

(h) Using this approach, each State-county-SCC-pollutant was assigned a combined growth and control factor using the EPA CAIR forecast or locally provided data. The 22,838 data records for aircraft, locomotives, and CMV in the 2002 revised base year emissions file were assigned growth factors in accordance with the following breakdown:

48 records matched State-provided growth factors,
4,179 records matched using the CAIR-Primary criterion,
240 records matched using the CAIR-Secondary criterion,
7,463 records matched using the CAIR-Tertiary criterion,
720 records matched using the No T4-Primary criterion,
3,858 records matched using the No T4-Secondary criterion, and
6,330 records matched using the No T4-Tertiary criterion.

(i) Finally, the impacts of the T4 rule as adopted were applied to the grown “non T4” emission estimates. The actual T4 emission standards do not affect aircraft, locomotive, or CMV directly, but associated diesel fuel sulfur requirements do affect locomotives and CMV. Lower fuel sulfur content affects both SO_2 and PM emissions. Expected fuel sulfur

contents were obtained for each evaluation year from the EPA technical support document for the final T4 rule (*Final Regulatory Analysis: Control of Emissions from Non-road Diesel Engines*, EPA420-R-04-007, May 2004). According to that document, the average diesel fuel sulfur content for locomotives and CMV is expected to be 408 ppmW in 2009 and 56 ppmW in 2018. These compare to expected non-T4 fuel sulfur levels of 2599 ppmW in 2009 and 2336 ppmW in 2018. Table 2.3-8 uses calculated emissions estimates for base and T4 control scenarios to estimate emission reduction impacts.

Table 2.3-8 Estimated Emission Reduction Impacts based on T-4 Rule

				2009	2018
CMV SO_2	=	Non-T4 SO_2	×	0.1569	0.0241
Locomotive SO_2	=	Non-T4 SO_2	×	0.1569	0.0241
CMV PM	=	Non-T4 PM	×	0.8962	0.8762
Locomotive PM	=	Non-T4 PM	×	0.8117	0.7734

However, since the diesel fuel sulfur content assumed for the 2002 VISTAS base year inventory, upon which both the 2009 and 2018 inventories were based, is 2500 ppmW, a small adjustment to the emission reduction multipliers calculated from the T4 rule is appropriate since they are measured relative to modestly different sulfur contents (2599 ppmW for 2009 and 2336 ppmW for 2018). Correcting for these modest differences produces the emission reduction impact estimates relative to forecasts based on the VISTAS 2002 inventory shown in Table 2.3-9.

Table 2.3-9 Estimated Emission Reduction Impacts Relative to VISTAS 2002 Base Year Values

				2009	2018
CMV SO_2	=	Non-T4 SO_2	×	0.1632	0.0225
Locomotive SO_2	=	Non-T4 SO_2	×	0.1632	0.0225
CMV PM	=	Non-T4 PM	×	0.9004	0.8685
Locomotive PM	=	Non-T4 PM	×	0.8187	0.7610

These factors were applied directly to the non-T4 emission forecasts to produce the final VISTAS 2009 and 2018 emissions inventories for aircraft, locomotive, and CMV.

The only exception is for Palm Beach County, Florida, where CMV emissions are reported as “all fuels” rather than separately by residual and diesel fuel components. To estimate T4 impacts in Palm Beach County, the ratio of diesel CMV emissions to total

CMV emissions in the remainder of Florida was calculated and the T4 impact estimates for Palm Beach County were adjusted to reflect that ratio. Table 2.3-10 shows the calculated diesel CMV ratios.

Table 2.3-10 Diesel CMV Adjustment Ratios for Palm Beach County, FL

GROWTH BASIS	SO_2	PM
2009 (1996, 2020 Growth Basis)	0.2410	0.7861
2009 (1996, 2010, 2015, and 2020 Growth Basis)	0.1279	0.7875
2018 (1996, 2020 Growth Basis)	0.2432	0.7925
2018 (1996, 2010, 2015, and 2020 Growth Basis)	0.2624	0.7918

The differences between the growth bases are discussed in detail below.

Combining these ratios with the T4 impact estimates for diesel engines, as presented above, yields the following impact adjustment factors for Palm Beach County:

Table 2.3-11 Overall Adjustment Factors for Palm Beach County, FL

GROWTH BASIS		
2009 SO_2 (19, 20 Growth Basis)	0.7894	[0.1632×0.2410+(1-0.2410)]
2009 SO_2 (96, 10, 15, and 20 Growth Basis)	0.8930	[0.1632×0.1279+(1-0.1279)]
2018 SO_2 (96, 20 Growth Basis)	0.7623	[0.0225×0.2432+(1-0.2432)]
2018 SO_2 (96, 10, 15, and 20 Growth Basis)	0.7436	[0.0225×0.2624+(1-0.2624)]
2009 PM (19, 20 Growth Basis)	0.9217	[0.9004×0.7861+(1-0.7861)]
2009 PM (96, 10, 15, and 20 Growth Basis)	0.9216	[0.9004×0.7875+(1-0.7875)]
2018 PM (96, 20 Growth Basis)	0.8958	[0.8685×0.7925+(1-0.7925)]
2018 PM (96, 10, 15, and 20 Growth Basis)	0.8959	[0.8685×0.7918+(1-0.7918)]

The differences between the growth bases are discussed in detail below.

Utilizing this approach, emission inventory forecasts for both 2009 and 2018 were developed. As indicated in step (b) above, basic growth factors were developed using EPA CAIR inventory data for 1996, 2010, 2015, and 2020. From these data, equivalent EPA CAIR inventories for 2002 and 2009 were developed through linear interpolation of the 1996 and 2010 inventories, while an equivalent CAIR inventory for 2018 was developed through linear interpolation of the 2015 and 2020 inventories. Growth factors for 2009 and 2018 were then estimated as the ratios of the CAIR 2009 and 2018 inventories to the CAIR 2002 inventory.

During the development of the preliminary 2018 VISTAS inventory in March 2004, this process yielded reasonable results and exhibited no particular systematic concerns. However, when the 2009 Base F inventory was developed, significant concerns related to SO_2 and PM were encountered. Essentially, what was revealed by the Base F 2009 forecast was a series of apparent

inconsistencies in the CAIR 2010 and 2015 emission inventories (as compared to the 1996 and 2020 CAIR inventories) that were masked during the construction of the "longer-term" 2018 inventory.

The apparent inconsistencies are best illustrated by looking at the actual data extracted from the CAIR inventory files. Note that although a limited example is being presented, the same general issue applies throughout the CAIR files. For FIP 01001 (Autauga County, Alabama) and SCC 2285002000 (Diesel Rail), the CAIR inventories indicate SO_2 emission estimates as shown in Table 2.3-12.

Table 2.3-12 SO_2 Emissions for Diesel Rail in Autauga County, AL from the CAIR Projections

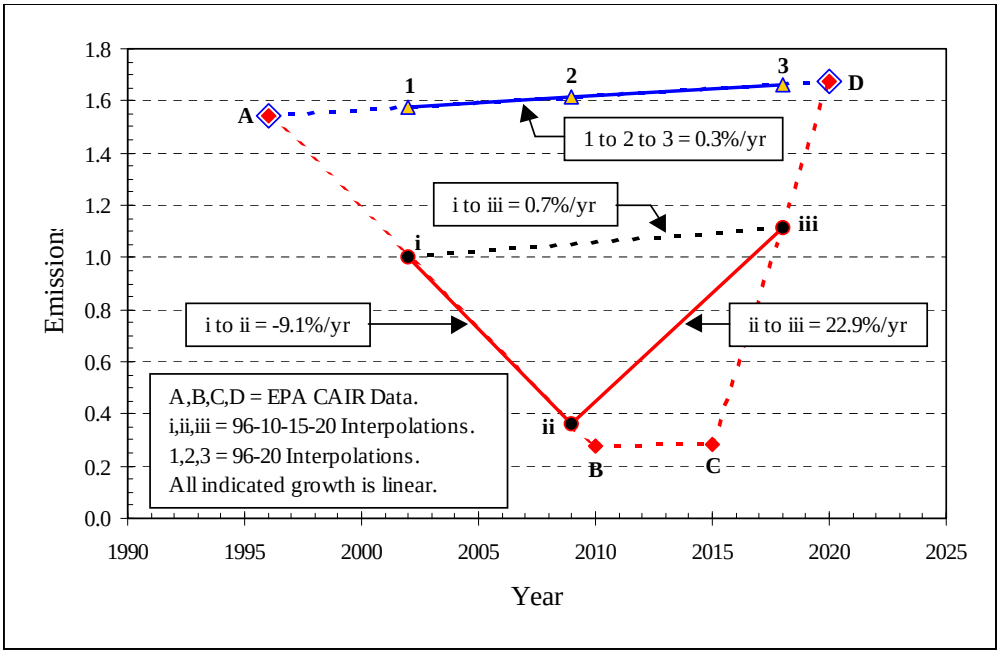
YEAR	TONS
1996:	15.3445
2010:	2.7271
2015:	2.8178
2020:	16.6232

Clearly, there is a major drop in emissions between 1996 and 2010, followed by a major increase in emissions between 2015 and 2020. Several observations regarding these changes are important. First, the CAIR data were reported to exclude the T4 rule, so that the drop in emissions should be related to something other than simply a change in diesel fuel sulfur content. Second, if the T4 rule impacts were "accidentally" included in the estimates, there should be a resultant 90 percent drop in diesel sulfur between 2010 and 2015; so such inclusion is unlikely. Third, the rate of growth between 2015 and 2020 (43 percent *per year* compound or 97 percent *per year* linear) is well beyond any reasonable expectations for rail service; and fuel sulfur content during this period is constant both with and without T4. In short, there appeared to be no rational explanation for the data, yet the same basic relations are observed for thousands of CAIR inventory records.

For the most part, the issue seems to be centered on SO_2 and PM records, which are those records primarily affected by the T4 rule. But, as noted above, there does not seem to be any pattern of consistency that would indicate that either inclusion or exclusion of T4 rule impacts is the underlying cause. Moreover, where they occur, the observed growth extremes generally affect both SO_2 and PM equally, while one would expect PM effects to be buffered if the T4 rule was the underlying cause, since changes in diesel fuel sulfur content will only affect a fraction of PM (i.e., sulfate), while directly reducing SO_2.

The data presented in Figure 2.3-1 illustrates what this meant to the VISTAS forecasting process. Figure 2.3-1 depicts the same data presented above for Autauga County, Alabama, but normalized so that the interpolated 2002 CAIR emissions estimate equals unity. The "raw" CAIR data is depicted by the markers labeled A, B, C, and D. Interpolated data for 2002 and 2009, based on 1996 and 2010 CAIR data, is depicted by the markers labeled "i" and "ii." Interpolated data for 2018, based on 2015 and 2020 CAIR data is depicted by the marker labeled "iii." The relationship between marker "iii" and marker "i" is exactly the relationship used to construct the preliminary (e.g., pre-Base F) 2018 VISTAS inventory (i.e., a linear growth rate equal to 0.7 percent per year). Thus, it is easy to see that although there is a major "dip and rise" between 2002 and 2018, it is essentially masked unless data for intervening years are examined. Since no intervening year was examined for the preliminary 2018 inventory, the "dip and rise" was not discovered. However, upon the development of the 2009 inventory forecast, the issue became obvious, as the marker labeled "ii" readily illustrates. In effect, the 2009 inventory reflected very low negative "growth rates" for some SCCs and pollutants relative to the 2002 inventory, while the 2018 inventory reflected very high and positive growth rates for those same SCCs and pollutants. In effect, the path between 2002 and 2018 that previously looked like the dotted line connecting markers "i" and "iii," now looks like the solid line connecting markers "i", "ii," and "iii." For reference purposes, this path is hereafter referred to as the 1996, 2010, 2015, and 2020 growth basis, since all interpolated data is based on CAIR data for those four years.

Figure 2.3-1 Impacts of the Apparent CAIR Inventory Discrepancy



In light of the apparent discrepancies inherent in the 1996, 2010, 2015, and 2020 growth basis data and the inconsistencies its use would impart into the 2009 and 2018 VISTAS inventories, a secondary forecasting method was developed. This second method relies on the apparent consistency between the 1996 and 2020 non-T4 CAIR inventories, interpolating equivalent 2002, 2009, and 2018 inventories solely from these two inventories. In effect, the CAIR inventories for 2010 and 2015 are ignored. In Figure 2.3-1, this secondary approach is depicted by the data points that lie along the lines connecting markers A and D. Markers A and D represent the 1996 and 2020 CAIR inventories, and the markers labeled 1, 2, and 3 represent the interpolated 2002, 2009, and 2018 CAIR equivalent inventories. The growth rate between 2009 and 2002 is then equal to the ratio of the 2009 and 2002 CAIR inventories, while that between 2018 and 2002 is equal to the ratio of the 2018 and 2002 CAIR inventories. For the example data, the resulting linear growth estimate is 0.3 percent per year. For reference purposes, this path is hereafter referred to as the 1996-2020 growth basis, since all interpolated data are based on CAIR data for only those two years.

It is perhaps worth noting that the only elements of Figure 2.3-1 that have any bearing on the VISTAS inventories are the growth rates. The absolute CAIR data are of importance only in determining those rates, as all VISTAS inventories were developed on the basis of the VISTAS 2002 base year inventory, not any of the CAIR inventories. So referring to Figure 2.3-1, the two growth options are summarized in Table 2.3-13.

Table 2.3-13 Growth Options based on CAIR Data

GROWTH BASIS	PERCENT PER YEAR
1996, 2010, 2015, 2020 Growth Basis:	-9.1% per year (linear) between 2002 and 2009
1996-2020 Growth Basis:	+0.3% per year (linear) between 2002 and 2009
1996, 2010, 2015, 2020 Growth Basis:	+22.9% per year (linear) between 2009 and 2018
1996-2020 Growth Basis:	+0.3% per year (linear) between 2009 and 2018
1996, 2010, 2015, 2020 Growth Basis:	+0.7% per year (linear) between 2002 and 2018
1996-2020 Growth Basis:	+0.3% per year (linear) between 2002 and 2018

Of course, these specific rates are applicable only to the example case (i.e., diesel rail SO_2 in Autauga County, Alabama), but there are thousands of additional CAIR records that are virtually identical from a growth viewpoint.

While forecast inventories for aircraft, locomotives, and CMV were developed for 2009 and 2018 using both growth methods, it was ultimately decided to utilize the 1996-2020 growth basis for Base F since it provided more reasonable growth rates for 2009. Tables 2.3-14 and 2.3-15 present a summary of each Base F inventory, while Tables 2.3-16 and 2.3-17 present the associated change in emissions for each Base F forecast inventory relative to the Base F 2002 base year VISTAS inventory. The larger reduction in CMV SO_2 emissions in 2009 and 2018

(relative to 2002) for Virginia and West Virginia is notable relative to the other VISTAS States, but this has been checked and is attributable to a high diesel contribution to total CMV SO_2 in the 2002 inventories for these two States.

Figures 2.3-2 through 2.3-13 graphically depict the relationships between the various Base F inventories and preliminary 2002 and 2018 projections prepared prior to Base F. There are two figures for each pollutant, the first of which presents a comparison of total VISTAS regional emission estimates for aircraft, locomotives, and CMV, and the second of which presents total VISTAS region emission estimates for locomotives only. This two figure approach is intended to provide a more robust illustration of the differences between the various inventories, as some of the differences are less distinct when viewed through overall aggregate emissions totals. All of the figures include the following emissions estimates:

- The 2002 Base F base year VISTAS emissions inventory (labeled as “2002”),
- The 2002 pre-Base F base year VISTAS emissions inventory (labeled as “2002 Prelim”),
- The Base F 2009 VISTAS emissions inventory developed using growth rates derived from 1996 and 2020 EPA CAIR data (labeled as “2009”),
- The Base F 2018 VISTAS emissions inventory developed using growth rates derived from 1996 and 2020 EPA CAIR data (labeled as “2018”), and
- The pre-Base F 2018 VISTAS emissions inventory estimates as developed using growth rates derived from 1996, 2010, 2015, and 2020 EPA CAIR data (labeled as “2018 Prelim”).

All 12 figures generally illustrate a reduction in emissions estimates between the 2002 pre-Base F emission estimates published in February 2004 (the initial 2002 VISTAS inventory) and the 2002 Base F emission estimates. This reduction generally results from emission updates reflected in the State 2002 CERR submittals used to develop the Base F 2002 base year inventory, although the major differences in aggregate PM emission estimates are driven to a greater extent by modifications in the methodology used to estimate aircraft PM in the Base F 2002 base year inventory (as documented under the base year inventory section of this report).

Table 2.3-14 Base F 2009 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons) -- Based on Growth Using 1996 and 2020 EPA Inventories

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	4,178	202	278	102	19	217
	FL	29,258	10,316	2,812	2,756	928	4,235
	GA	7,635	6,233	1,712	1,678	523	512
	KY	3,075	762	207	203	73	304
	MS	1,765	162	51	50	16	108
	NC	6,551	1,601	436	427	153	644
	SC	7,372	559	446	437	98	975
	TN	8,020	3,096	824	807	268	1,050
	VA	10,994	3,094	1,239	1,214	907	2,892
	WV	1,312	91	28	28	9	74
	Total	**80,159**	**26,116**	**8,033**	**7,704**	**2,993**	**11,011**
Commercial Marine (2280)	AL	1,280	8,888	872	802	2,753	768
	FL	6,236	43,198	1,838	1,691	5,864	1,467
	GA	1,097	7,599	317	291	974	256
	KY	7,087	48,039	2,158	1,985	8,350	1,649
	MS	6,074	41,437	1,821	1,676	6,587	1,415
	NC	634	4,386	184	169	584	148
	SC	1,133	7,796	326	300	1,012	264
	TN	3,887	26,333	1,168	1,074	4,512	904
	VA	1,042	2,662	312	286	61	506
	WV	1,638	11,073	455	419	89	381
	Total	**30,109**	**201,412**	**9,450**	**8,693**	**30,786**	**7,759**
Military Marine (2283)	VA	118	299	23	21	5	50
	Total	**118**	**299**	**23**	**21**	**5**	**50**
Locomotives (2285)	AL	3,648	23,529	452	406	242	1,279
	FL	1,052	8,905	189	170	101	382
	GA	2,769	24,398	507	456	271	1,003
	KY	2,264	19,597	415	374	221	819
	MS	2,406	20,785	441	397	239	849
	NC	1,712	14,741	313	282	167	618
	SC	1,213	10,443	222	200	119	437
	TN	2,745	23,924	483	435	240	984
	VA	1,236	11,134	1,167	1,050	608	467
	WV	1,369	12,177	251	226	135	489
	Total	**20,412**	**169,635**	**4,440**	**3,995**	**2,343**	**7,328**
Grand Total		**130,798**	**397,462**	**21,946**	**20,413**	**36,126**	**26,148**

Table 2.3-15 Base F 2018 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons) -- Based on Growth Using 1996 and 2020 EPA Inventories

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	4,681	236	345	122	23	245
	FL	34,178	12,147	3,312	3,246	1,093	4,976
	GA	8,939	7,340	2,016	1,976	616	601
	KY	3,602	898	244	239	86	357
	MS	1,986	190	60	58	18	122
	NC	6,728	1,454	400	392	139	615
	SC	8,487	616	493	484	112	1,119
	TN	9,009	3,519	939	921	309	1,187
	VA	12,578	3,528	1,370	1,342	1,063	3,358
	WV	1,484	106	33	33	10	85
	Total	**91,670**	**30,035**	**9,213**	**8,814**	**3,468**	**12,666**
Commercial Marine (2280)	AL	1,388	8,464	880	809	2,715	809
	FL	6,684	41,117	1,853	1,705	6,248	1,543
	GA	1,174	7,246	319	293	976	269
	KY	7,703	45,174	2,199	2,023	8,383	1,752
	MS	6,571	39,129	1,850	1,702	6,556	1,498
	NC	679	4,179	185	170	596	155
	SC	1,217	7,406	329	303	1,027	278
	TN	4,225	24,763	1,190	1,095	4,808	960
	VA	1,133	2,517	314	289	9	537
	WV	1,781	10,412	459	422	13	404
	Total	**32,554**	**190,407**	**9,578**	**8,811**	**31,330**	**8,205**
Military Marine (2283)	VA	128	282	23	21	1	53
	Total	**128**	**282**	**23**	**21**	**1**	**53**
Locomotives (2285)	AL	3,850	19,917	381	343	34	1,183
	FL	1,110	7,538	159	143	14	353
	GA	2,917	21,395	427	385	38	932
	KY	2,389	16,751	352	317	31	757
	MS	2,540	17,594	372	335	34	785
	NC	1,807	12,478	264	237	24	571
	SC	1,280	8,840	187	168	17	404
	TN	2,897	21,735	407	367	34	910
	VA	1,300	10,173	983	885	86	436
	WV	1,444	10,831	212	190	19	453
	Total	**21,534**	**147,252**	**3,744**	**3,368**	**333**	**6,785**
Grand Total		**145,885**	**367,975**	**22,557**	**21,015**	**35,132**	**27,709**

Table 2.3-16 Change in Emissions between 2009 and 2002 Base F Inventories (Based on Growth Using 1996 and 2020 EPA Inventories)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	+10%	+15%	+23%	+18%	+16%	+11%
	FL	+15%	+16%	+16%	+16%	+16%	+16%
	GA	+15%	+16%	+16%	+16%	+16%	+16%
	KY	+15%	+16%	+16%	+16%	+16%	+16%
	MS	+11%	+16%	+15%	+15%	+16%	+12%
	NC	+8%	+3%	+4%	+4%	+3%	+5%
	SC	+13%	+9%	+9%	+9%	+12%	+13%
	TN	+11%	+12%	+12%	+12%	+14%	+11%
	VA	+13%	+12%	+9%	+9%	+15%	+14%
	WV	+11%	+16%	+15%	+15%	+16%	+12%
	Total	**+13%**	**+14%**	**+14%**	**+13%**	**+15%**	**+14%**
Commercial Marine (2280)	AL	+7%	-4%	-5%	-5%	-18%	+4%
	FL	+6%	-4%	-5%	-5%	-12%	+4%
	GA	+6%	-3%	-5%	-5%	-17%	+4%
	KY	+7%	-4%	-4%	-4%	-13%	+5%
	MS	+7%	-4%	-4%	-4%	-15%	+5%
	NC	+6%	-4%	-5%	-5%	-15%	+4%
	SC	+6%	-4%	-5%	-5%	-16%	+4%
	TN	+7%	-4%	-4%	-4%	-9%	+5%
	VA	+7%	-4%	-7%	-7%	-83%	+5%
	WV	+7%	-4%	-7%	-7%	-83%	+5%
	Total	**+7%**	**-4%**	**-5%**	**-5%**	**-15%**	**+5%**
Military Marine (2283)	VA	+7%	-4%	-7%	-7%	-83%	+5%
	Total	**+7%**	**-4%**	**-7%**	**-7%**	**-83%**	**+5%**
Locomotives (2285)	AL	+5%	-11%	-24%	-24%	-83%	-6%
	FL	+5%	-11%	-24%	-24%	-83%	-6%
	GA	+4%	-9%	-24%	-24%	-83%	-5%
	KY	+5%	-10%	-23%	-23%	-83%	-6%
	MS	+5%	-11%	-24%	-24%	-83%	-6%
	NC	+5%	-11%	-24%	-24%	-83%	-6%
	SC	+5%	-11%	-24%	-24%	-83%	-6%
	TN	+5%	-7%	-24%	-24%	-83%	-6%
	VA	+4%	-6%	-24%	-24%	-83%	-5%
	WV	+4%	-8%	-24%	-24%	-83%	-5%
	Total	**+4%**	**-9%**	**-24%**	**-24%**	**-83%**	**-5%**
Grand Total		**+10%**	**-5%**	**-4%**	**-4%**	**-32%**	**+5%**

Table 2.3-17 Change in Emissions between 2018 and 2002 Base F Inventories (Based on Growth Using 1996 and 2020 EPA Inventories)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	+24%	+35%	+53%	+41%	+36%	+25%
	FL	+34%	+37%	+37%	+37%	+37%	+36%
	GA	+35%	+37%	+37%	+37%	+37%	+36%
	KY	+35%	+37%	+37%	+37%	+37%	+36%
	MS	+25%	+36%	+35%	+35%	+36%	+27%
	NC	+10%	-6%	-5%	-5%	-6%	0%
	SC	+30%	+20%	+21%	+21%	+27%	+30%
	TN	+24%	+27%	+28%	+28%	+31%	+26%
	VA	+29%	+28%	+20%	+20%	+35%	+33%
	WV	+26%	+36%	+35%	+35%	+36%	+28%
	Total	**+29%**	**+31%**	**+30%**	**+30%**	**+33%**	**+31%**
Commercial Marine (2280)	AL	+16%	-8%	-4%	-4%	-19%	+10%
	FL	+14%	-8%	-4%	-4%	-7%	+9%
	GA	+13%	-8%	-5%	-5%	-17%	+9%
	KY	+17%	-10%	-2%	-2%	-13%	+12%
	MS	+16%	-9%	-3%	-3%	-15%	+11%
	NC	+13%	-8%	-4%	-4%	-14%	+9%
	SC	+14%	-9%	-4%	-4%	-15%	+10%
	TN	+17%	-10%	-2%	-2%	-3%	+12%
	VA	+17%	-9%	-6%	-6%	-98%	+11%
	WV	+17%	-10%	-6%	-6%	-98%	+12%
	Total	**+15%**	**-9%**	**-3%**	**-3%**	**-14%**	**+11%**
Military Marine (2283)	VA	+17%	-10%	-6%	-6%	-98%	+12%
	Total	**+17%**	**-10%**	**-6%**	**-6%**	**-98%**	**+12%**
Locomotives (2285)	AL	+10%	-24%	-36%	-36%	-98%	-13%
	FL	+10%	-24%	-36%	-36%	-98%	-13%
	GA	+10%	-20%	-36%	-36%	-98%	-12%
	KY	+10%	-23%	-35%	-35%	-98%	-13%
	MS	+10%	-24%	-36%	-36%	-98%	-13%
	NC	+10%	-24%	-36%	-36%	-98%	-13%
	SC	+10%	-24%	-36%	-36%	-98%	-13%
	TN	+10%	-15%	-36%	-36%	-98%	-13%
	VA	+10%	-14%	-36%	-36%	-98%	-11%
	WV	+10%	-18%	-36%	-36%	-98%	-12%
	Total	**+10%**	**-21%**	**-36%**	**-36%**	**-98%**	**-12%**
Grand Total		**+23%**	**-12%**	**-1%**	**-1%**	**-34%**	**+11%**

Figure 2.3-2 Total Aircraft, Locomotive, and CMV CO Emissions (Base F)

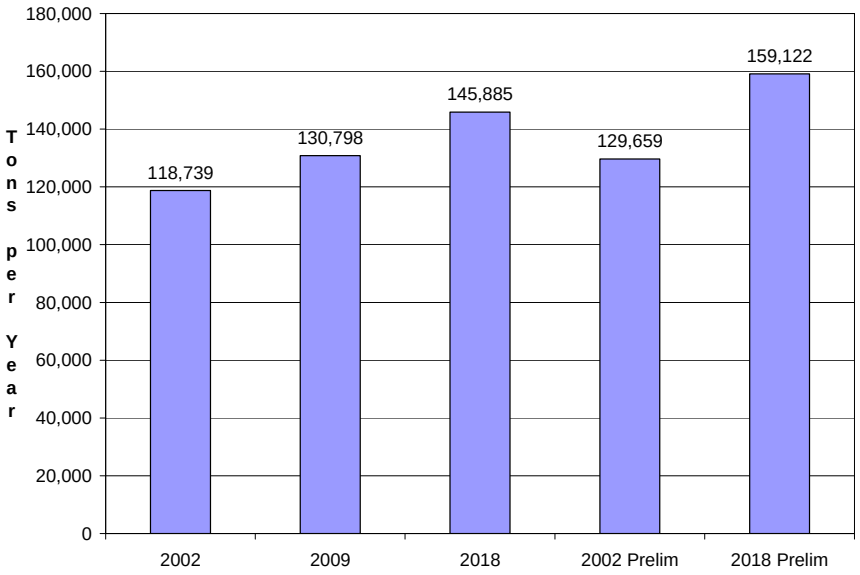


Figure 2.3-3 Locomotive CO Emissions (Base F)

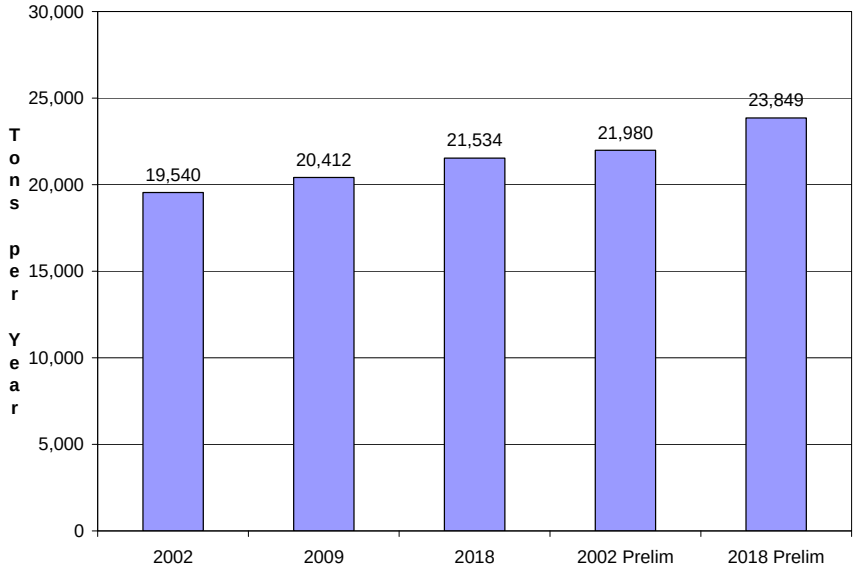


Figure 2.3-4 Total Aircraft, Locomotive, and CMV NO_x Emissions (Base F)

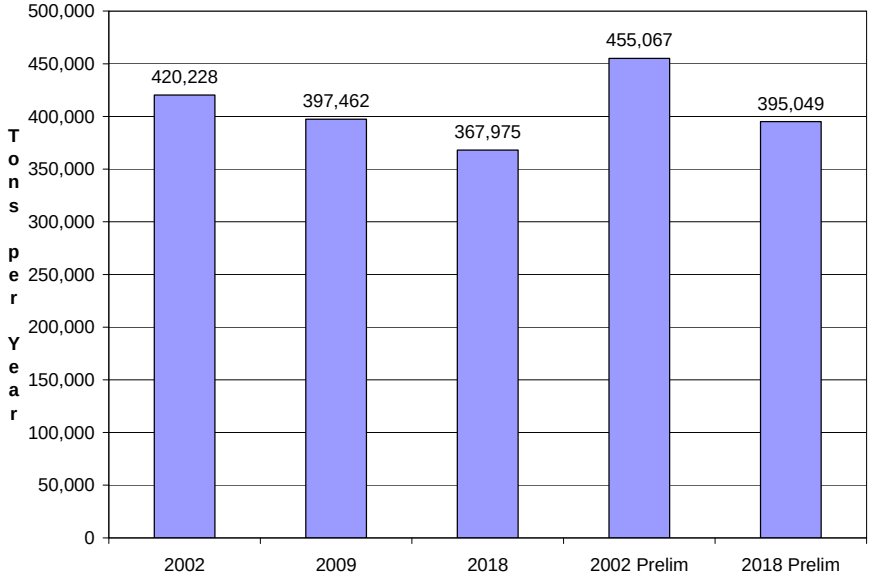


Figure 2.3-5 Locomotive NO_x Emissions (Base F)

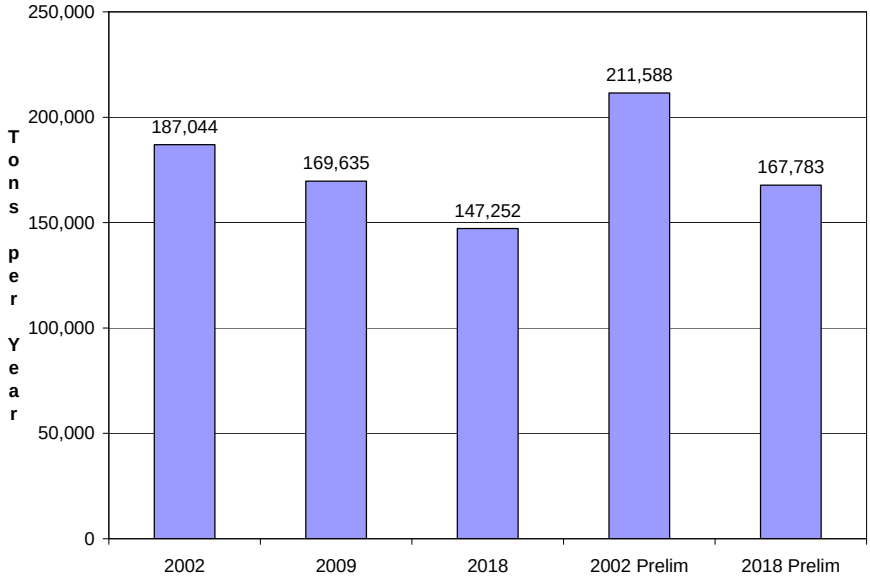


Figure 2.3-6 Total Aircraft, Locomotive, and CMV PM_{10} Emissions (Base F)

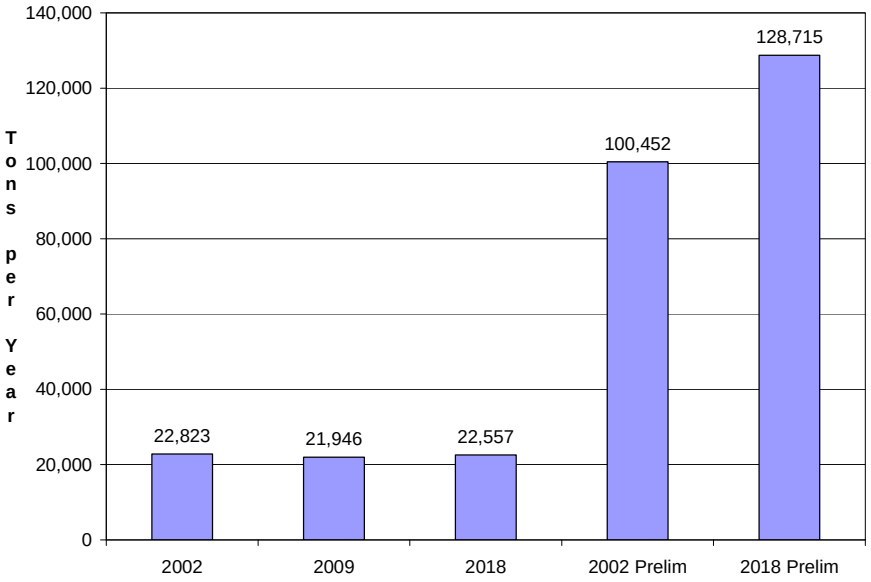


Figure 2.3-7 Locomotive PM_{10} Emissions (Base F)

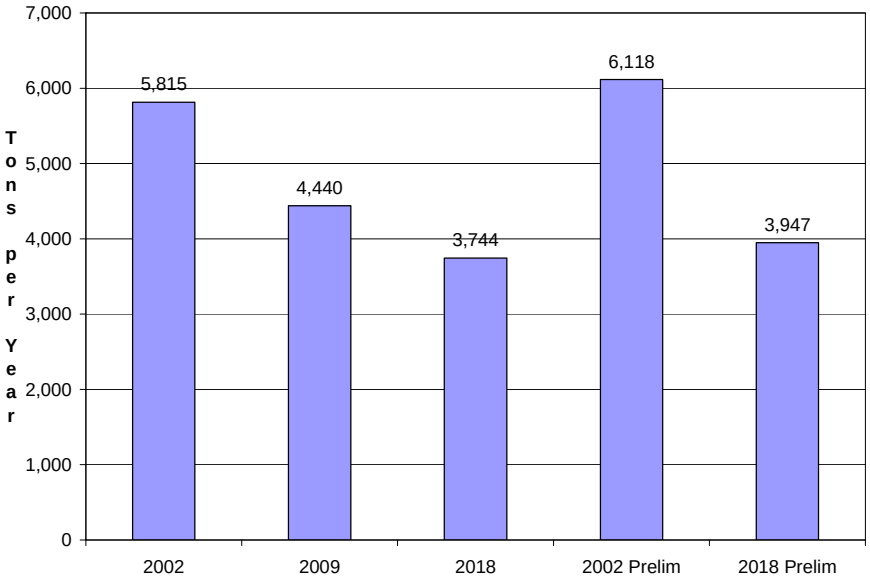


Figure 2.3-8 Total Aircraft, Locomotive, and CMV $PM_{2.5}$ Emissions (Base F)

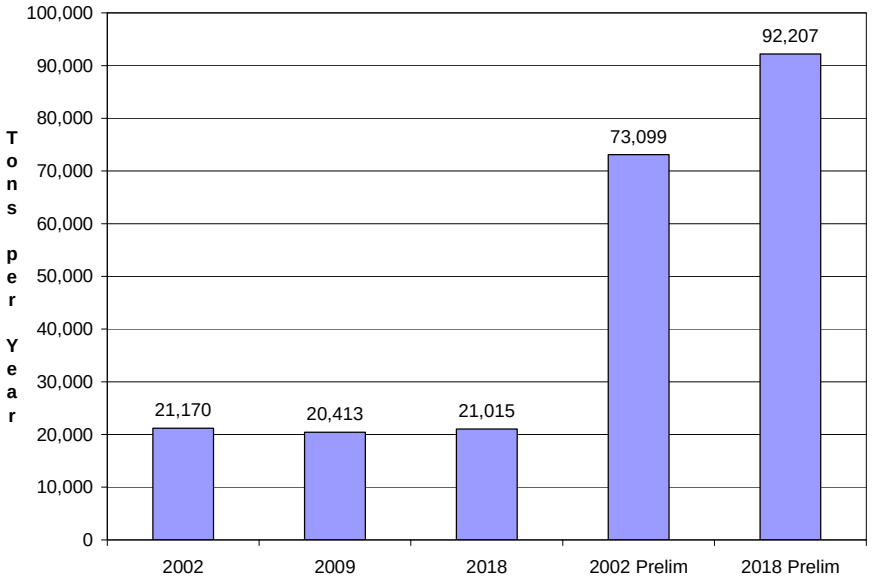


Figure 2.3-9 Locomotive $PM_{2.5}$ Emissions (Base F)

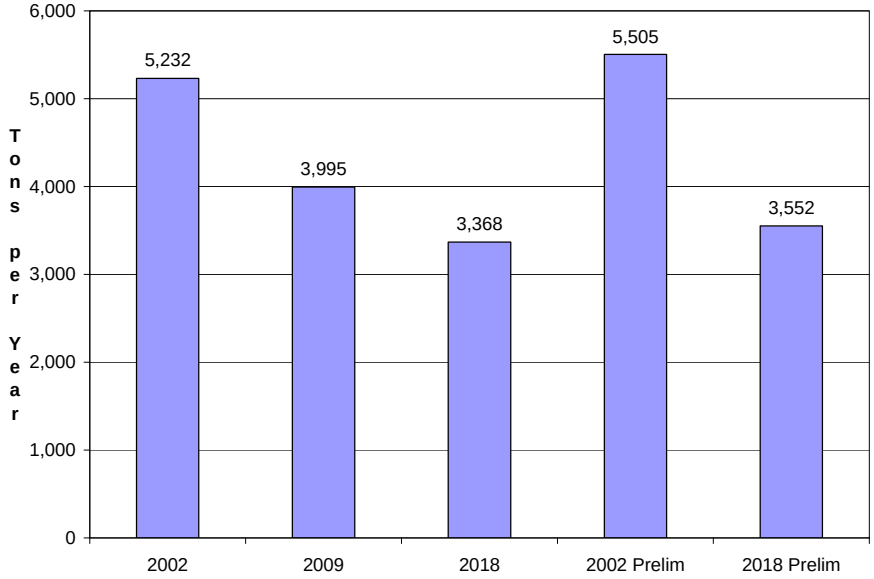


Figure 2.3-10 Total Aircraft, Locomotive, and CMV SO_2 Emissions (Base F)

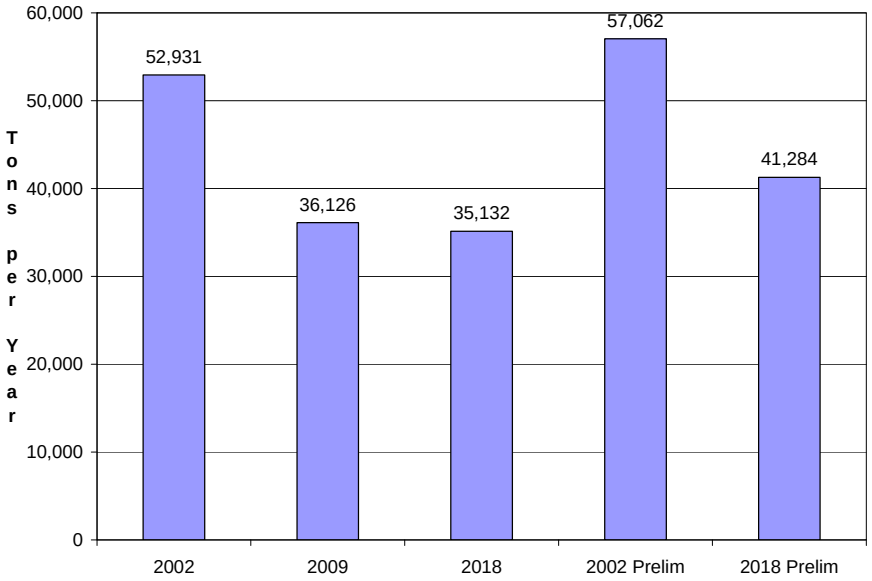


Figure 2.3-11 Locomotive SO_2 Emissions (Base F)

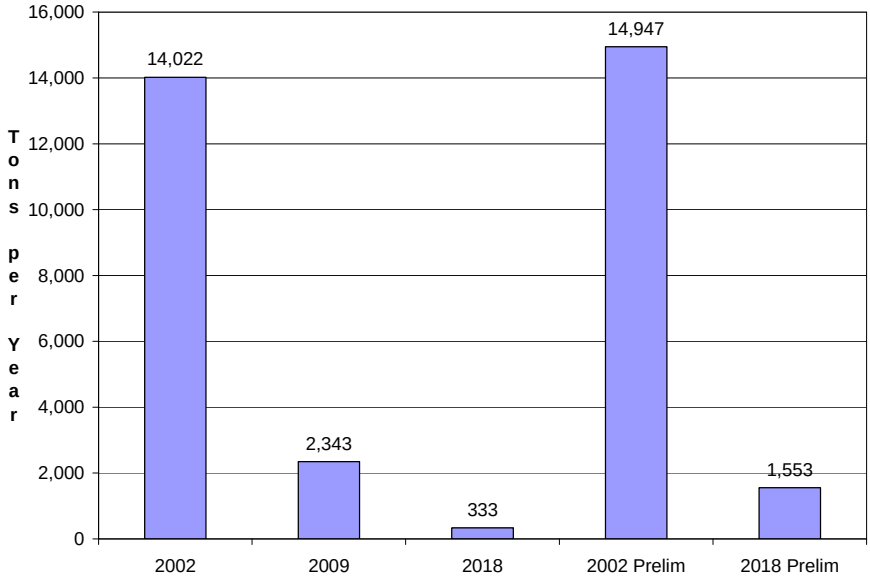


Figure 2.3-12 Total Aircraft, Locomotive, and CMV VOC Emissions (Base F)

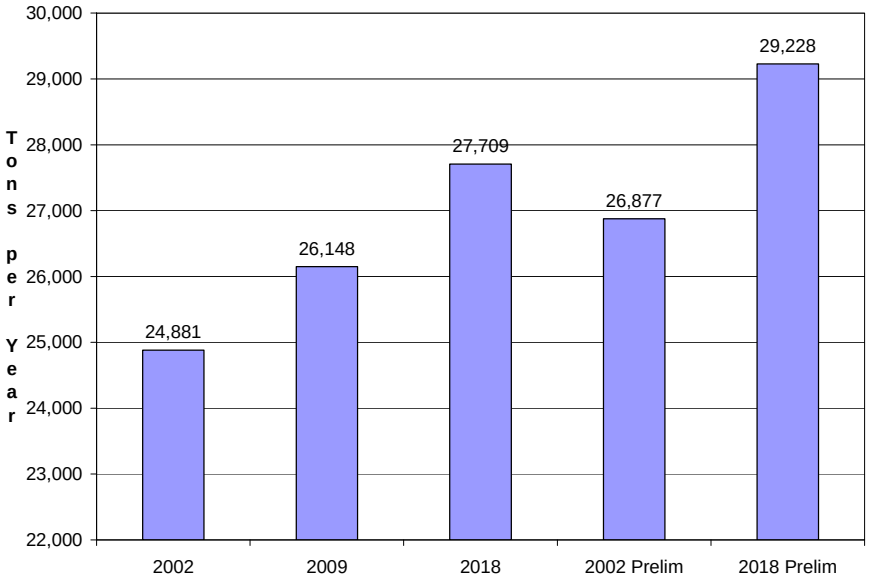
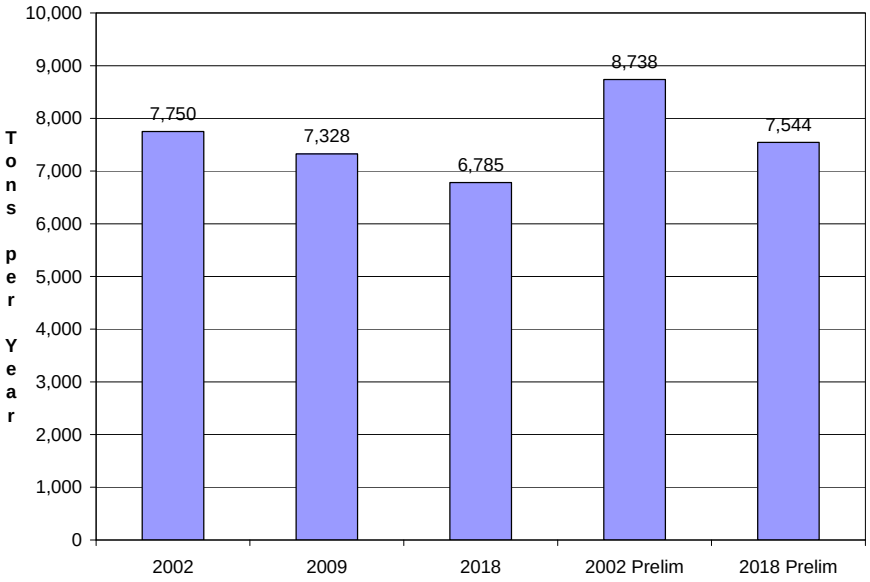


Figure 2.3-13 Locomotive VOC Emissions (Base F)



Base G Revisions:

Table 2.3-18 shows the Base G 2002 base year emissions for each State in the VISTAS region for aircraft, locomotives and CMV. Although some of these data are updated relative to those used as the basis of the Base F emissions forecasts, the methodology used to develop 2009 and 2018 emissions forecasts for aircraft, locomotives, and CMV for Base G is identical to that used for Base F (as documented above). The only exceptions are as follows:

(a) As indicated in the discussion of the Base F forecasts, the CAIR (growth rate) matching criteria were overridden for any record for which States provided local growth data. For Base F, only North Carolina provided such data. However, for Base G, Kentucky regulators provided growth data for aircraft emissions associated with Cincinnati/Northern Kentucky International Airport (located in Boone County, Kentucky). These data were applied to all pollutants and all aircraft types (i.e., military aircraft (SCC 2275001000), commercial aircraft (SCC 2275020000), general aviation aircraft (SCC 2275050000), and air taxi aircraft (SCC 2275060000)). Emissions forecasts for all aircraft operations in counties other than Boone continued to utilize the growth factors developed according to the CAIR matching criteria. Table 2.3-19 presents the locally generated growth factors applied in Kentucky. It should be recognized that although the locally provided growth factors presented in the table are significantly greater than those that would apply under the CAIR matching criteria, this is to be expected as local regulators noted a very significant decline in activity at the Cincinnati/Northern Kentucky International Airport in 2002 (relative to activity in preceding years). Moreover, this downward spike seems to have been alleviated since 2002, so that the provided growth factors represent not only “routine” growth expected between 2002 and the two forecast years, but growth required to offset the temporary decline observed in 2002.

Table 2.3-18 Base G 2002 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	5,595	185	238	99	18	276
	FL	25,431	8,891	2,424	2,375	800	3,658
	GA	6,620	5,372	1,475	1,446	451	443
	KY	5,577	925	251	246	88	397
	MS	1,593	140	44	43	13	96
	NC	6,088	1,548	419	411	148	613
	SC	6,505	515	409	401	88	863
	TN	7,251	2,766	734	719	235	943
	VA	11,873	3,885	2,010	1,970	272	2,825
	WV	1,178	78	25	24	8	66
	Total	**77,712**	**24,305**	**8,029**	**7,734**	**2,121**	**10,179**
Commercial Marine (2280)	AL	1,196	9,218	917	844	3,337	737
	FL	5,888	44,817	1,936	1,781	6,683	1,409
	GA	1,038	7,875	334	307	1,173	246
	KY	6,607	50,267	2,246	2,066	9,608	1,569
	MS	5,688	43,233	1,903	1,751	7,719	1,351
	NC	599	4,547	193	178	690	142
	SC	1,067	8,100	343	316	1,205	253
	TN	3,624	27,555	1,217	1,120	4,974	860
	VA	972	2,775	334	307	359	483
	WV	1,528	11,586	487	448	525	362
	Total	**28,207**	**209,972**	**9,911**	**9,118**	**36,275**	**7,413**
Military Marine (2283)	VA	110	313	25	23	27	48
	Total	**110**	**313**	**25**	**23**	**27**	**48**
Locomotives (2285)	AL	3,518	26,623	592	533	1,446	1,365
	FL	1,006	9,969	247	222	605	404
	GA	2,654	26,733	664	598	1,622	1,059
	KY	2,166	21,811	542	488	1,321	867
	MS	2,302	23,267	578	520	1,429	899
	NC	1,638	16,502	410	369	1,001	654
	SC	1,160	11,690	291	261	710	462
	TN	2,626	25,627	633	570	1,439	1,041
	VA	1,186	11,882	1,529	1,375	3,641	492
	WV	1,311	13,224	329	296	808	517
	Total	**19,568**	**187,328**	**5,815**	**5,232**	**14,022**	**7,761**
Grand Total		**125,597**	**421,918**	**23,780**	**22,107**	**52,444**	**25,401**

Table 2.3-19 Locally Generated Growth Factors for Kentucky

FIP	2009 Factor	2018 Factor
21015	1.31	1.81

Note:
Growth factor = Year Emissions/2002 Emissions.
Under CAIR approach, 2009 = 0.99 to 1.17.
Under CAIR approach, 2018 = 0.97 to 1.40.

(b) Because of the additional emissions records added in Alabama, as discussed in the Base G 2002 base year inventory section of this report, the total number of emissions records in the Base G 2009 and 2018 forecasts increased to 23,042 (as compared to 22,838 for Base F). The 23,042 data records for aircraft, locomotives, and CMV were assigned growth factors in accordance with the following breakdown:

72 records matched State-provided growth factors,
4,287 records matched using the CAIR-Primary criterion,
240 records matched using the CAIR-Secondary criterion,
7,511 records matched using the CAIR-Tertiary criterion,
720 records matched using the No T4-Primary criterion,
3,858 records matched using the No T4-Secondary criterion, and
6,354 records matched using the No T4-Tertiary criterion.

Tables 2.3-20 and 2.3-21 present a summary of the resulting Base G 2009 and 2018 inventories, while Tables 2.3-22 and 2.3-23 present the associated change in emissions for each forecast inventory relative to the Base G 2002 base year VISTAS. As was the case with Base F, the larger reduction in CMV SO_2 emissions in 2009 and 2018 (relative to 2002) for Virginia and West Virginia is notable relative to the other VISTAS States, but is attributable to a high diesel contribution to total CMV SO_2 in the 2002 inventories for these two States.

Figures 2.3-14 through 2.3-25 graphically depict the relationships between the various inventories, as revised through Base G. There are two figures for each pollutant, the first of which presents a comparison of total VISTAS regional emission estimates for aircraft, locomotives, and CMV, and the second of which presents total VISTAS region emission estimates for locomotives only. This two figure approach is intended to provide a more robust illustration of the differences between the various inventories, as some of the differences are less distinct when viewed through overall aggregate emissions totals. All of the figures include the following emissions estimates:

- The Base G 2002 base year VISTAS emissions inventory (labeled as “2002”),
- The pre-Base F 2002 base year VISTAS emissions inventory (labeled as “2002 Prelim”),
- The Base G 2009 VISTAS emissions inventory developed using growth rates derived from 1996 and 2020 EPA CAIR data (labeled as “2009”),
- The Base G 2018 VISTAS emissions inventory developed using growth rates derived from 1996 and 2020 EPA CAIR data (labeled as “2018”), and
- The pre-Base F 2018 VISTAS emissions inventory estimates developed using growth rates derived from 1996, 2010, 2015, and 2020 EPA CAIR data (labeled as “2018 Prelim”).

All 12 figures generally illustrate a reduction in emissions estimates between the pre-Base F 2002 emission estimates published in February 2004 and the Base G 2002 base year emission estimates. This reduction generally results from emission updates reflected in the Base F State CERR submittals, although the major differences in aggregate PM emission estimates are driven to a greater extent by modifications in the methodology used to estimate aircraft PM in the Base F revisions to the 2002 Base F base year inventory (as documented under the base year inventory section of this report).

Table 2.3-20 Base G 2009 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons) -- Based on Growth Using 1996 and 2020 EPA Inventories

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	6,265	213	292	116	21	309
	FL	29,258	10,316	2,812	2,756	928	4,235
	GA	7,635	6,233	1,712	1,678	523	512
	KY	6,959	1,135	307	301	108	487
	MS	1,765	162	51	50	16	108
	NC	6,991	1,795	486	477	171	709
	SC	7,372	559	446	437	98	975
	TN	8,020	3,096	824	807	268	1,050
	VA	13,141	4,244	2,124	2,082	306	3,153
	WV	1,312	91	28	28	9	74
	Total	**88,716**	**27,844**	**9,083**	**8,732**	**2,447**	**11,612**
Commercial Marine (2280)	AL	1,280	8,888	872	802	2,753	768
	FL	6,236	43,198	1,838	1,691	5,864	1,467
	GA	1,097	7,599	317	291	974	256
	KY	7,087	48,039	2,158	1,985	8,350	1,649
	MS	6,074	41,437	1,821	1,676	6,587	1,415
	NC	634	4,386	184	169	584	148
	SC	1,133	7,796	326	300	1,012	264
	TN	3,887	26,333	1,168	1,074	4,512	904
	VA	1,042	2,662	312	286	61	506
	WV	1,638	11,073	455	419	89	381
	Total	**30,108**	**201,412**	**9,450**	**8,693**	**30,786**	**7,759**
Military Marine (2283)	VA	118	299	23	21	5	50
	Total	**118**	**299**	**23**	**21**	**5**	**50**
Locomotives (2285)	AL	3,677	23,783	452	406	242	1,289
	FL	1,052	8,905	189	170	101	382
	GA	2,769	24,398	507	456	271	1,003
	KY	2,264	19,597	415	374	221	819
	MS	2,406	20,785	441	397	239	849
	NC	1,690	14,662	311	279	165	613
	SC	1,213	10,443	222	200	119	437
	TN	2,745	23,924	483	435	240	984
	VA	1,236	11,134	1,167	1,050	608	467
	WV	1,369	12,177	251	226	135	489
	Total	**20,420**	**169,808**	**4,437**	**3,993**	**2,341**	**7,333**
Grand Total		**139,362**	**399,364**	**22,994**	**21,440**	**35,578**	**26,754**

Table 2.3-21 Base G 2018 Aircraft, Locomotive, and Non-Recreational Marine Emissions (annual tons) -- Based on Growth Using 1996 and 2020 EPA Inventories

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	7,126	249	361	139	24	352
	FL	34,178	12,147	3,312	3,246	1,093	4,976
	GA	8,939	7,340	2,016	1,976	616	601
	KY	9,078	1,446	391	383	138	623
	MS	1,986	190	60	58	18	122
	NC	8,150	2,114	572	561	202	831
	SC	8,487	616	493	484	112	1,119
	TN	9,009	3,519	939	921	309	1,187
	VA	14,770	4,706	2,271	2,226	349	3,574
	WV	1,484	106	33	33	10	85
	Total	**103,206**	**32,435**	**10,450**	**10,027**	**2,871**	**13,472**
Commercial Marine (2280)	AL	1,388	8,464	880	809	2,715	809
	FL	6,684	41,117	1,853	1,705	6,248	1,543
	GA	1,174	7,246	319	293	976	269
	KY	7,703	45,174	2,199	2,023	8,383	1,752
	MS	6,571	39,129	1,850	1,702	6,556	1,498
	NC	678	4,179	185	170	596	155
	SC	1,217	7,406	329	303	1,027	278
	TN	4,225	24,763	1,190	1,095	4,808	960
	VA	1,133	2,517	314	289	9	537
	WV	1,781	10,412	459	422	13	404
	Total	**32,554**	**190,407**	**9,578**	**8,811**	**31,330**	**8,205**
Military Marine (2283)	VA	128	282	23	21	1	53
	Total	**128**	**282**	**23**	**21**	**1**	**53**
Locomotives (2285)	AL	3,881	20,131	381	343	34	1,192
	FL	1,110	7,538	159	143	14	353
	GA	2,917	21,395	427	385	38	932
	KY	2,389	16,751	352	317	31	757
	MS	2,540	17,594	372	335	34	785
	NC	1,782	12,539	263	237	23	570
	SC	1,280	8,840	187	168	17	404
	TN	2,897	21,735	407	367	34	910
	VA	1,300	10,173	983	885	86	436
	WV	1,444	10,831	212	190	19	453
	Total	**21,539**	**147,527**	**3,743**	**3,368**	**332**	**6,792**
Grand Total		**157,427**	**370,651**	**23,794**	**22,227**	**34,534**	**28,522**

Table 2.3-22 Change in Emissions between 2009 Base G and 2002 Base F Inventories (Based on Growth Using 1996 and 2020 EPA Inventories)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	+12%	+15%	+23%	+18%	+16%	+12%
	FL	+15%	+16%	+16%	+16%	+16%	+16%
	GA	+15%	+16%	+16%	+16%	+16%	+16%
	KY	+25%	+23%	+23%	+23%	+23%	+23%
	MS	+11%	+16%	+15%	+15%	+16%	+12%
	NC	+15%	+16%	+16%	+16%	+16%	+16%
	SC	+13%	+9%	+9%	+9%	+12%	+13%
	TN	+11%	+12%	+12%	+12%	+14%	+11%
	VA	+11%	+9%	+6%	+6%	+12%	+12%
	WV	+11%	+16%	+15%	+15%	+16%	+12%
	Total	**+14%**	**+15%**	**+13%**	**+13%**	**+15%**	**+14%**
Commercial Marine (2280)	AL	+7%	-4%	-5%	-5%	-18%	+4%
	FL	+6%	-4%	-5%	-5%	-12%	+4%
	GA	+6%	-3%	-5%	-5%	-17%	+4%
	KY	+7%	-4%	-4%	-4%	-13%	+5%
	MS	+7%	-4%	-4%	-4%	-15%	+5%
	NC	+6%	-4%	-5%	-5%	-15%	+4%
	SC	+6%	-4%	-5%	-5%	-16%	+4%
	TN	+7%	-4%	-4%	-4%	-9%	+5%
	VA	+7%	-4%	-7%	-7%	-83%	+5%
	WV	+7%	-4%	-7%	-7%	-83%	+5%
	Total	**+7%**	**-4%**	**-5%**	**-5%**	**-15%**	**+5%**
Military Marine (2283)	VA	+7%	-4%	-7%	-7%	-83%	+5%
	Total	**+7%**	**-4%**	**-7%**	**-7%**	**-83%**	**+5%**
Locomotives (2285)	AL	+5%	-11%	-24%	-24%	-83%	-6%
	FL	+5%	-11%	-24%	-24%	-83%	-6%
	GA	+4%	-9%	-24%	-24%	-83%	-5%
	KY	+5%	-10%	-23%	-23%	-83%	-6%
	MS	+5%	-11%	-24%	-24%	-83%	-6%
	NC	+3%	-11%	-24%	-24%	-83%	-6%
	SC	+5%	-11%	-24%	-24%	-83%	-6%
	TN	+5%	-7%	-24%	-24%	-83%	-6%
	VA	+4%	-6%	-24%	-24%	-83%	-5%
	WV	+4%	-8%	-24%	-24%	-83%	-5%
	Total	**+4%**	**-9%**	**-24%**	**-24%**	**-83%**	**-6%**
Grand Total		**+11%**	**-5%**	**-3%**	**-3%**	**-32%**	**+5%**

Table 2.3-23 Change in Emissions between 2018 Base G and 2002 Base F Inventories (Based on Growth Using 1996 and 2020 EPA Inventories)

Source	State	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Aircraft (2275)	AL	+27%	+35%	+52%	+41%	+36%	+28%
	FL	+34%	+37%	+37%	+37%	+37%	+36%
	GA	+35%	+37%	+37%	+37%	+37%	+36%
	KY	+63%	+56%	+56%	+56%	+56%	+57%
	MS	+25%	+36%	+35%	+35%	+36%	+27%
	NC	+34%	+37%	+36%	+36%	+37%	+36%
	SC	+30%	+20%	+21%	+21%	+27%	+30%
	TN	+24%	+27%	+28%	+28%	+31%	+26%
	VA	+24%	+21%	+13%	+13%	+28%	+27%
	WV	+26%	+36%	+35%	+35%	+36%	+28%
	Total	**+33%**	**+33%**	**+30%**	**+30%**	**+35%**	**+32%**
Commercial Marine (2280)	AL	+16%	-8%	-4%	-4%	-19%	+10%
	FL	+14%	-8%	-4%	-4%	-7%	+9%
	GA	+13%	-8%	-5%	-5%	-17%	+9%
	KY	+17%	-10%	-2%	-2%	-13%	+12%
	MS	+16%	-9%	-3%	-3%	-15%	+11%
	NC	+13%	-8%	-4%	-4%	-14%	+9%
	SC	+14%	-9%	-4%	-4%	-15%	+10%
	TN	+17%	-10%	-2%	-2%	-3%	+12%
	VA	+17%	-9%	-6%	-6%	-98%	+11%
	WV	+17%	-10%	-6%	-6%	-98%	+12%
	Total	**+15%**	**-9%**	**-3%**	**-3%**	**-14%**	**+11%**
Military Marine (2283)	VA	+17%	-10%	-6%	-6%	-98%	+12%
	Total	**+17%**	**-10%**	**-6%**	**-6%**	**-98%**	**+12%**
Locomotives (2285)	AL	+10%	-24%	-36%	-36%	-98%	-13%
	FL	+10%	-24%	-36%	-36%	-98%	-13%
	GA	+10%	-20%	-36%	-36%	-98%	-12%
	KY	+10%	-23%	-35%	-35%	-98%	-13%
	MS	+10%	-24%	-36%	-36%	-98%	-13%
	NC	+9%	-24%	-36%	-36%	-98%	-13%
	SC	+10%	-24%	-36%	-36%	-98%	-13%
	TN	+10%	-15%	-36%	-36%	-98%	-13%
	VA	+10%	-14%	-36%	-36%	-98%	-11%
	WV	+10%	-18%	-36%	-36%	-98%	-12%
	Total	**+10%**	**-21%**	**-36%**	**-36%**	**-98%**	**-12%**
Grand Total		**+25%**	**-12%**	**+0%**	**+1%**	**-34%**	**+12%**

Figure 2.3-14 Total Aircraft, Locomotive, and CMV CO Emissions (Base G)

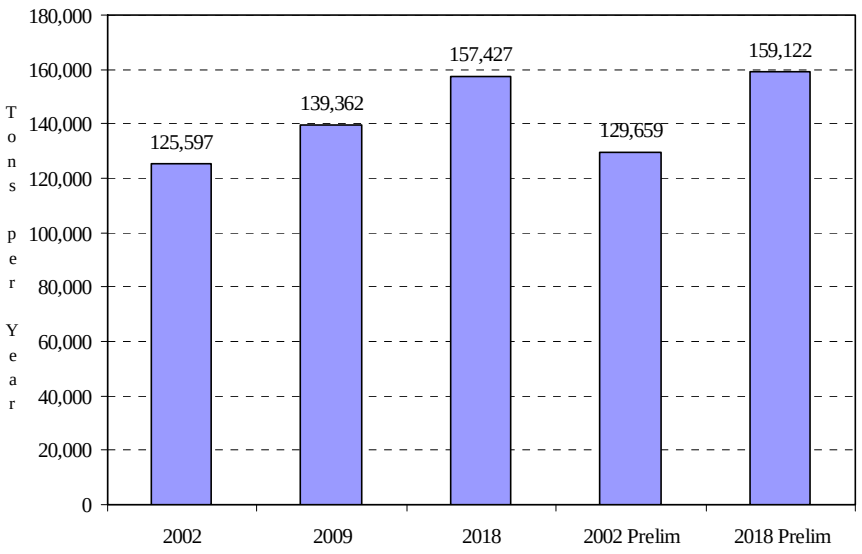


Figure 2.3-15 Locomotive CO Emissions (Base G)

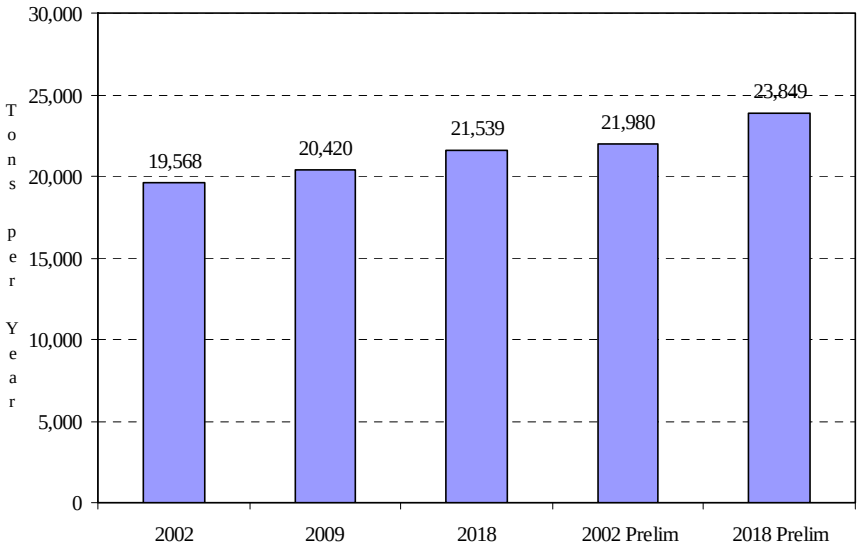


Figure 2.3-16 Total Aircraft, Locomotive, and CMV NO_x Emissions (Base G)

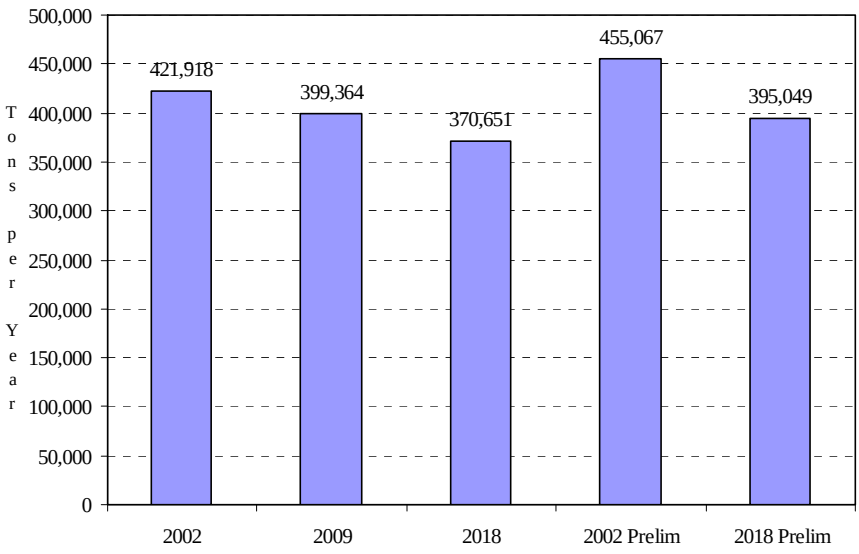


Figure 2.3-17 Locomotive NO_x Emissions (Base G)

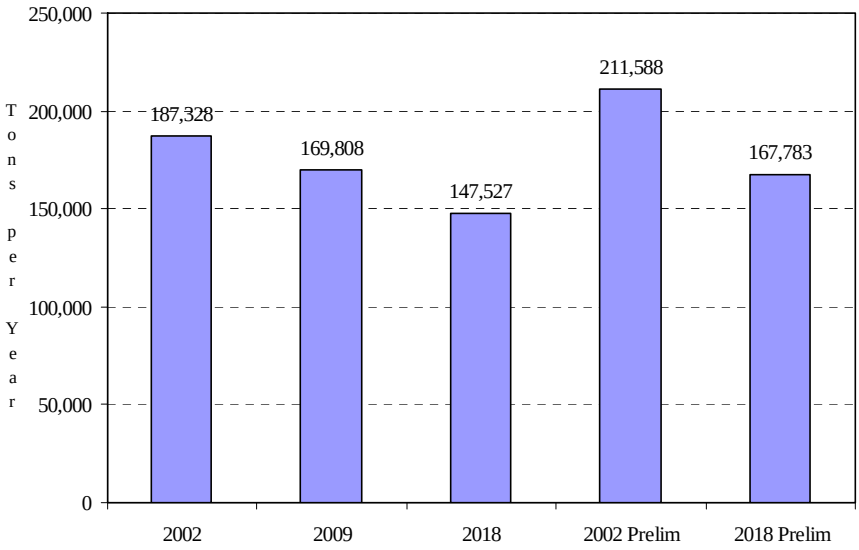


Figure 2.3-18 Total Aircraft, Locomotive, and CMV PM_{10} Emissions (Base G)

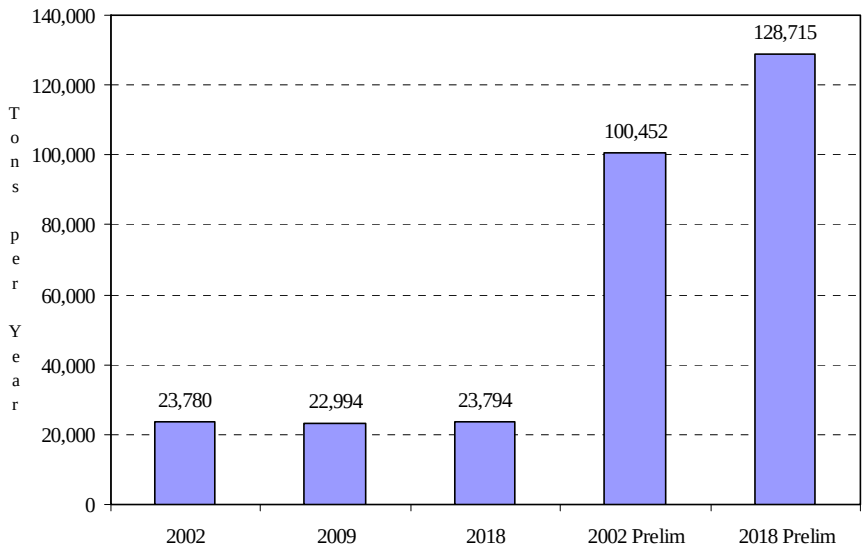


Figure 2.3-19 Locomotive PM_{10} Emissions (Base G)

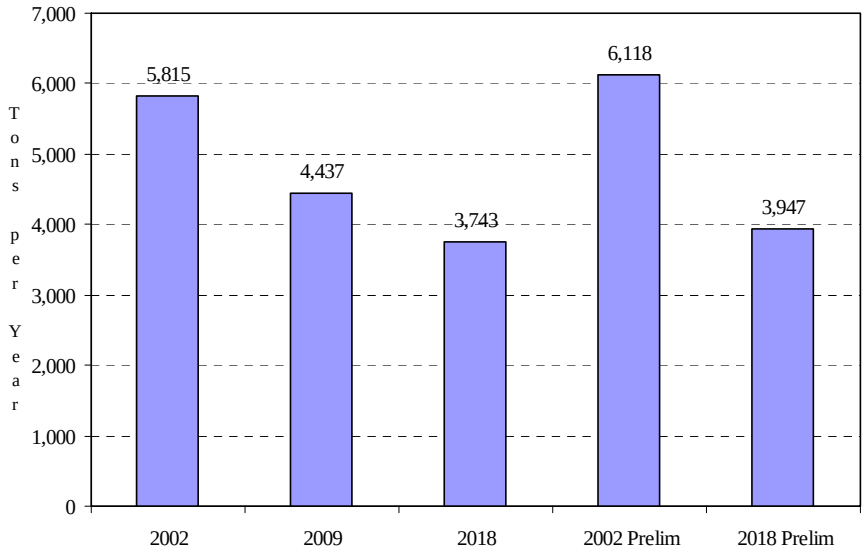


Figure 2.3-20 Total Aircraft, Locomotive, and CMV $PM_{2.5}$ Emissions (Base G)

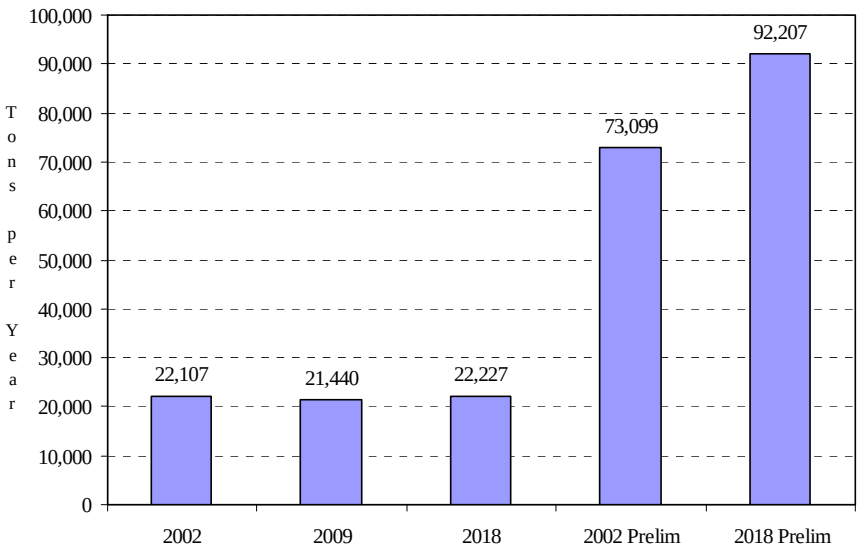


Figure 2.3-21 Locomotive $PM_{2.5}$ Emissions (Base G)

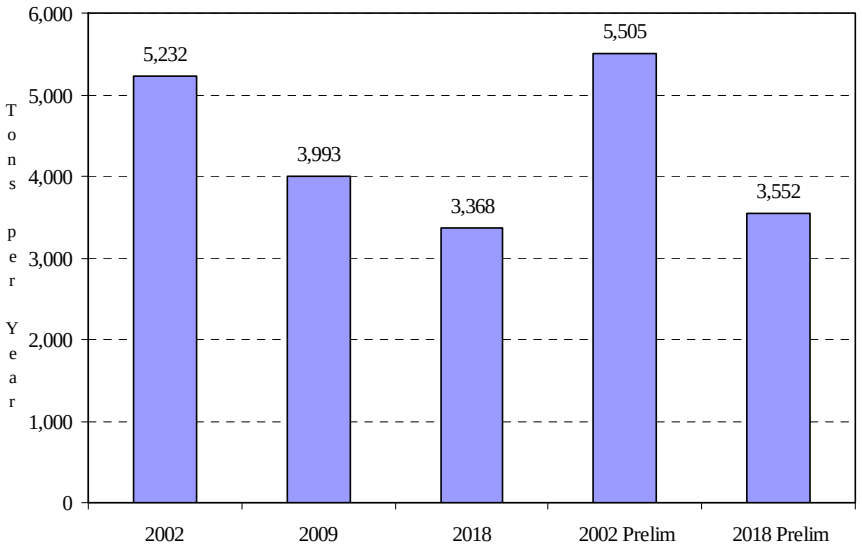


Figure 2.3-22 Total Aircraft, Locomotive, and CMV SO_2 Emissions (Base G)

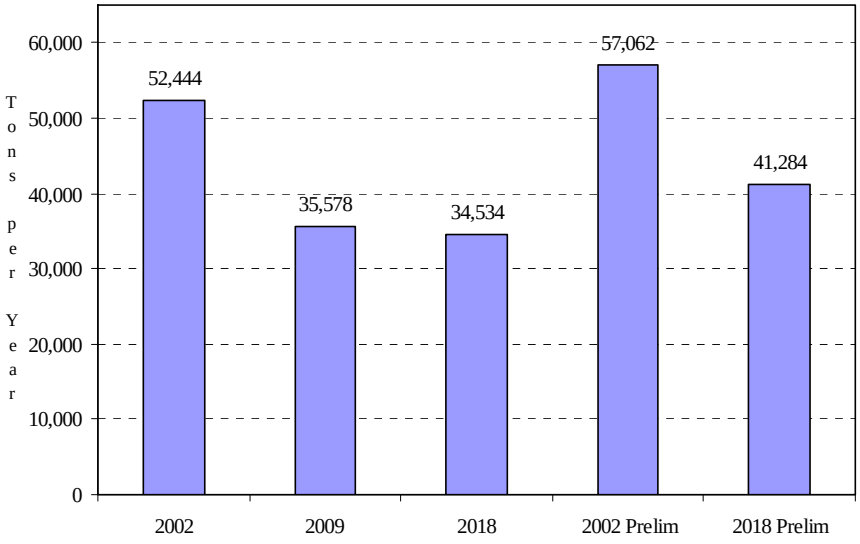


Figure 2.3-23 Locomotive SO_2 Emissions (Base G)

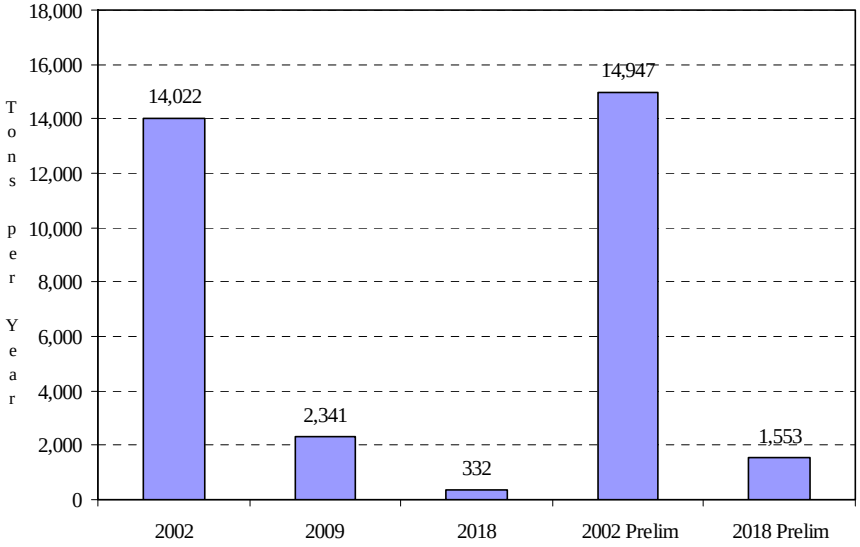


Figure 2.3-24 Total Aircraft, Locomotive, and CMV VOC Emissions (Base G)

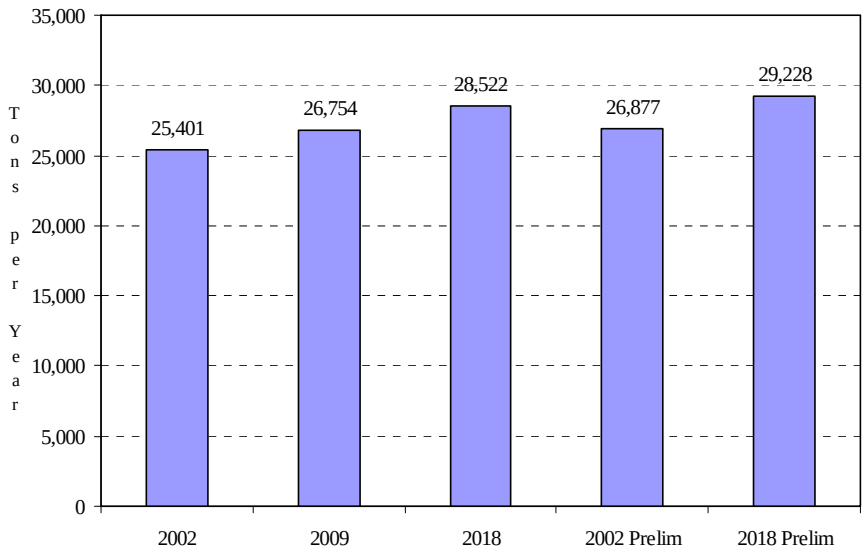
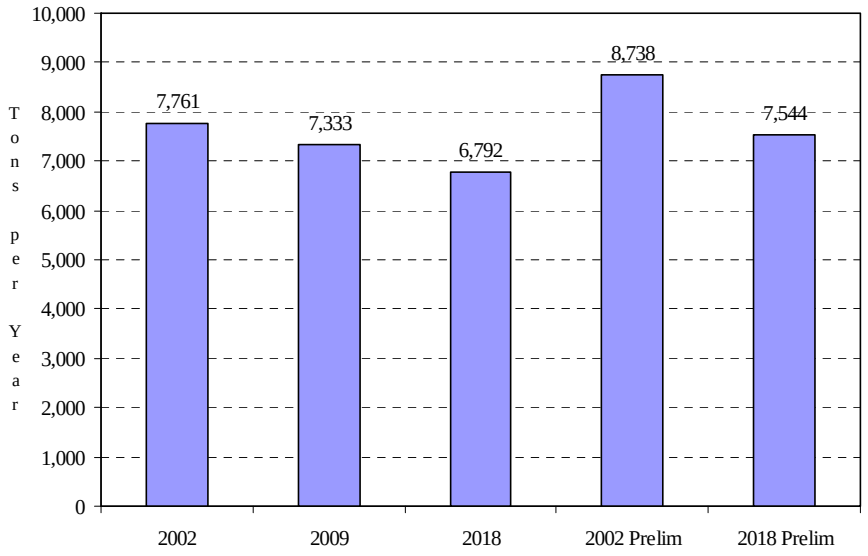


Figure 2.3-25 Locomotive VOC Emissions (Base G)



2.3.4.3 Emissions from NONROAD Model Sources in Illinois, Indiana, and Ohio

Base G projection inventories for 2009 and 2018 for NONROAD model sources in the states of Illinois, Indiana, and Ohio were produced using a methodology identical to that employed to develop a Base G 2002 base year inventory for the same states (as documented earlier in this report). This method consists of the extraction of a complete set of county-level input data applicable to each of the three states (in each of the two projection years) from the latest version of the EPA's NMIM model. This includes appropriate consideration of all non-default NMIM input files generated by the Midwest Regional Planning Organization as documented earlier in the discussion of the Base G 2002 base year inventory. These input data were then assembled into appropriate input files for the Final NONROAD2005 model and emission estimates were produced using the same procedure employed for the VISTAS region.

Changes noted between the base year (2002) and forecast year (2009 and 2018) input data extracted from NMIM include differences in gasoline vapor pressure, gasoline sulfur content, and diesel sulfur content in most counties. All temperature data (minimum, maximum, and average daily temperatures) was constant across years.

As described in the discussion of the Base G 2002 base year inventory, counties in the three states were grouped for modeling purposes using a temperature aggregation scheme that allowed for county-specific temperature variations of no more that 2 ºF from group average temperatures (for all temperature inputs). The same grouping scheme was applied to projection year modeling, so that Illinois emissions were modeled using 12 county groups, Indiana emissions were modeled using 9 county groups, and Ohio emissions were modeled using 10 county groups. Thus, 31 iterations of NONROAD2002 were required per season per projection year, as compared to the 53 iterations per season per projection year required for the VISTAS region.

As was also described in the discussion of the Base G 2002 base year inventory, several non-default equipment population, growth, activity, seasonal distribution, and county allocation files are assigned by NMIM model inputs for these counties. As was the case for the base year inventory development, these same non-default assignments were retained for both projection inventories.

2.3.4.4 Differences between 2009/2018

Methodologically, there was no difference in the way that 2009 and 2018 emissions were calculated for non-road mobile sources. The actual value of the growth factors were different for each type of mobile source considered, but the calculation methods were identical.

2.3.5 Quality Assurance steps

Throughout the inventory development process, quality assurance steps were performed to ensure that no double counting of emissions occurred, to ensure that a full and complete inventory was developed for VISTAS, and to make sure that projection calculations were working correctly. Quality assurance was an important component to the inventory development process and MACTEC performed the following QA steps on mobile source components of the 2009 and revised 2018 projection inventories:

1. All final files (NONROAD only) were run through EPA's Format and Content checking software. Input data files for MOBILE and VMT growth estimates were reviewed by the corresponding SIWG and by the VISTAS Emission Inventory Technical Advisor.

2. SCC level emission summaries were prepared and evaluated to ensure that emissions were consistent and that there were no missing sources (NONROAD only).

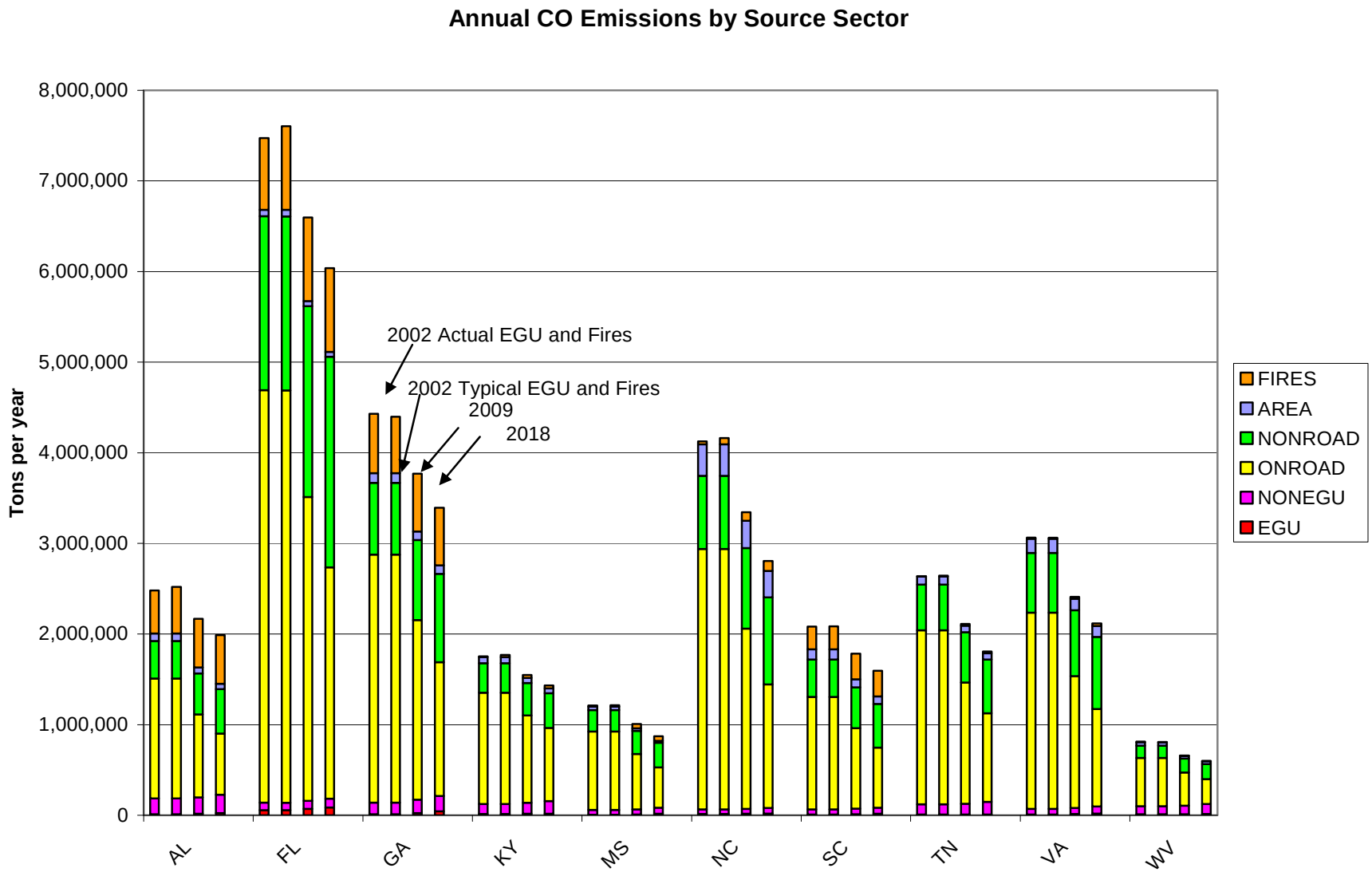
3. Tier comparisons (by pollutant) were developed between the 2002 base year inventory and the 2009 and 2018 projection inventories (NONROAD only). Total VISTAS level summaries by pollutant were developed for these sources to compare Base F and Base G emission levels.

4. Data product summaries were provided to both the VISTAS Emission Inventory Technical Advisor and to the SIWG representatives for review and comment. Changes based on these comments were implemented in the files.

5. Version numbering was used for all inventory files developed. The version numbering process used a decimal system to track major and minor changes. For example, a major change would result in a version going from 1.0 to 2.0. A minor change would cause a version number to go from 1.0 to 1.1. Minor changes resulting from largely editorial changes would result in a change from 1.00 to 1.01.

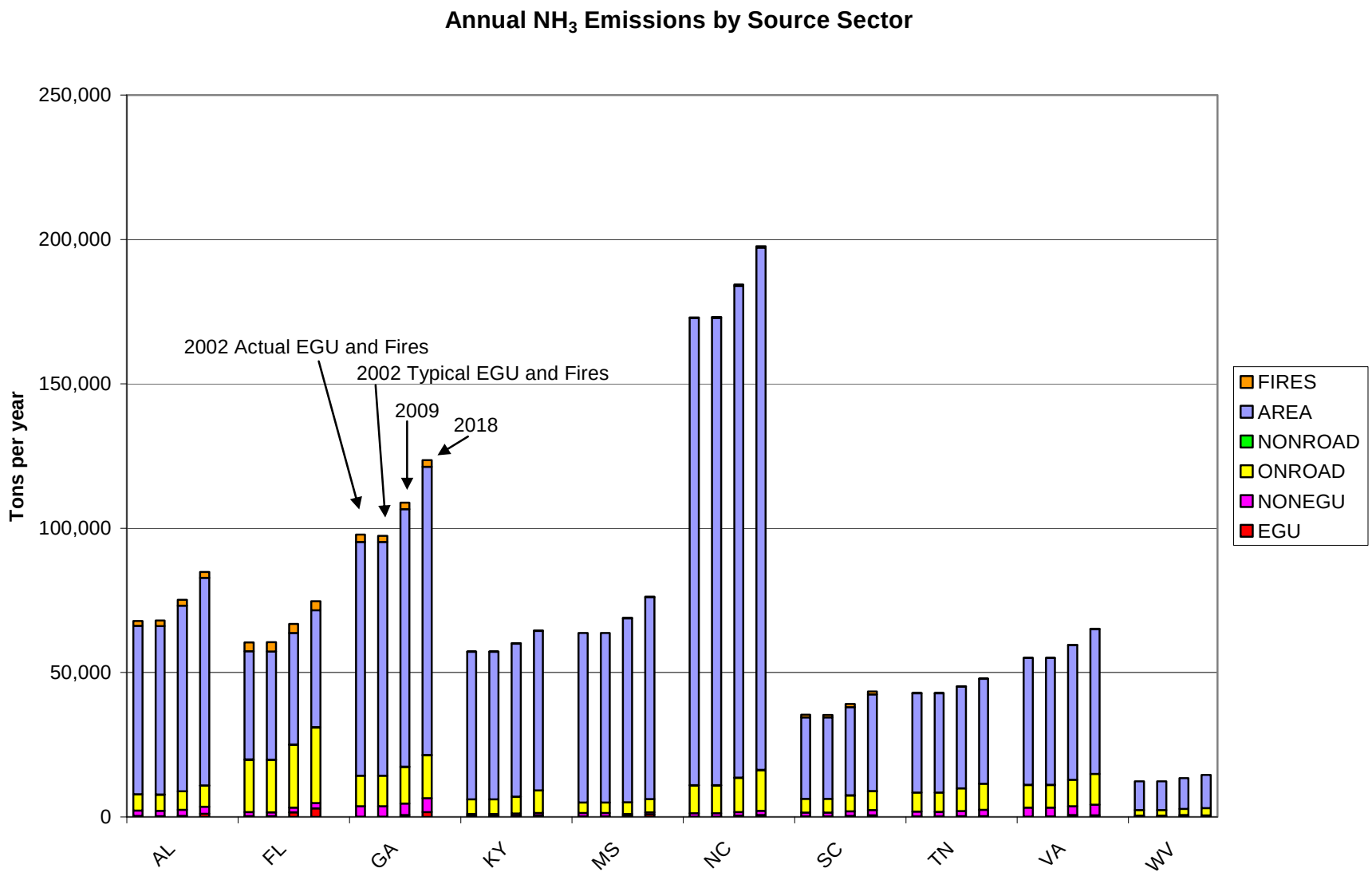
Appendix A:

STATE EMISSION TOTALS BY POLLUTANT AND SECTOR


Annual CO Emissions by Source Sector
Tons per year
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

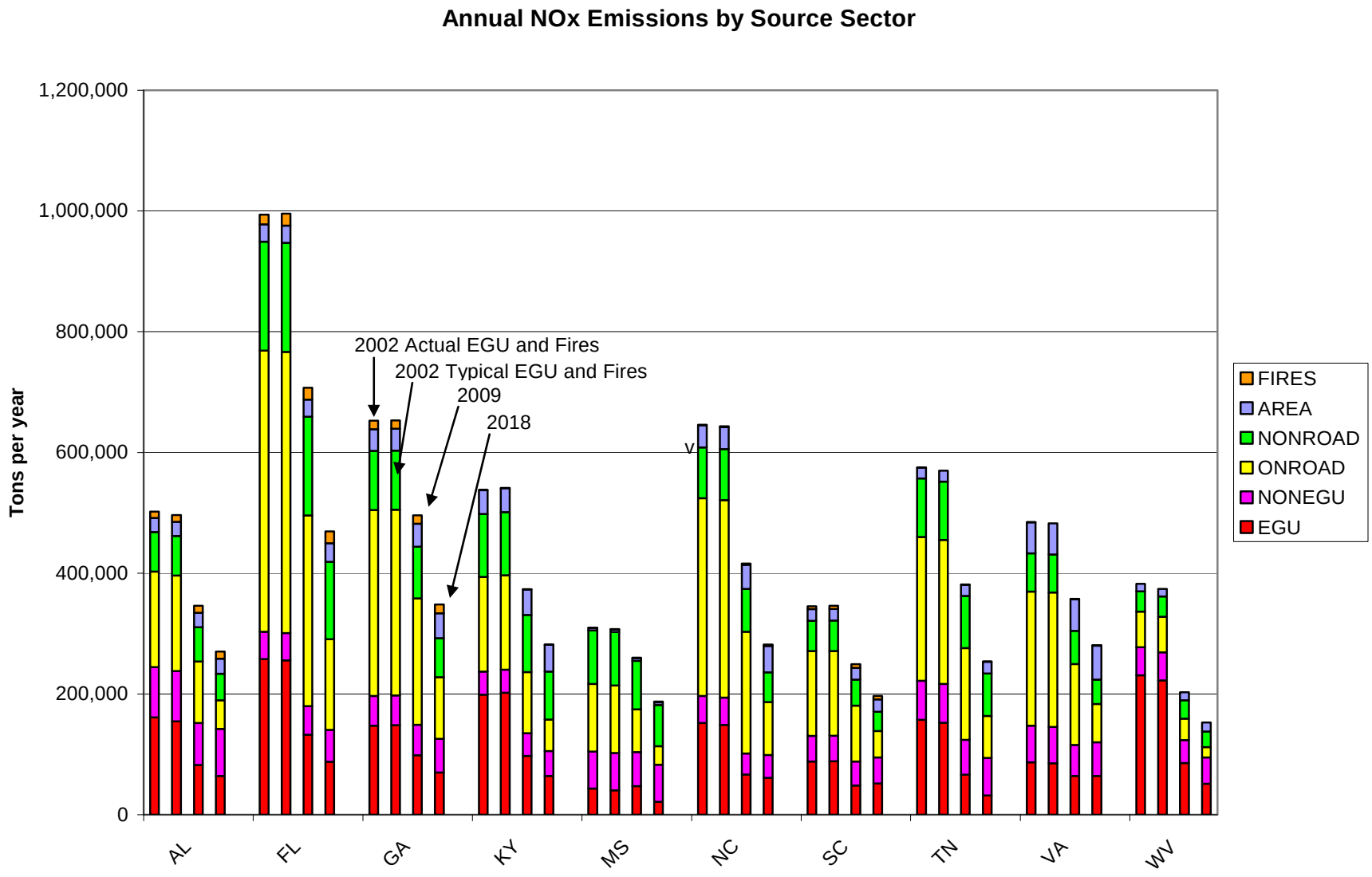
Annual CO Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	11,279	174,271	1,321,528	414,385	83,958	474,959	2002 Actual
	11,460	174,260	1,321,528	414,385	83,958	514,120	2002 Typical
	14,986	180,369	915,647	454,686	66,654	534,873	2009
	24,342	201,663	676,210	488,924	59,626	535,658	2018
FL	57,113	81,933	4,550,447	1,920,729	71,079	790,620	2002 Actual
	55,899	81,928	4,550,447	1,920,729	71,079	923,310	2002 Typical
	71,072	87,661	3,352,509	2,104,920	57,011	923,310	2009
	85,495	97,438	2,554,160	2,323,327	53,903	923,310	2018
GA	9,712	130,850	2,735,968	791,158	108,083	654,411	2002 Actual
	9,650	130,850	2,735,968	791,158	108,083	620,342	2002 Typical
	23,721	147,427	1,983,803	882,970	94,130	637,177	2009
	44,269	167,904	1,476,981	973,872	93,827	637,177	2018
KY	12,619	109,936	1,230,148	325,993	66,752	8,703	2002 Actual
	12,607	109,936	1,230,148	325,993	66,752	24,900	2002 Typical
	15,812	122,024	963,762	357,800	57,887	31,810	2009
	17,144	139,437	807,536	381,215	54,865	33,296	2018
MS	5,303	54,568	864,290	236,752	37,905	13,209	2002 Actual
	5,219	54,568	864,290	236,752	37,905	14,353	2002 Typical
	7,116	57,749	609,972	257,453	27,184	48,160	2009
	17,348	65,884	445,493	270,726	22,099	50,037	2018
NC	13,885	50,576	2,873,992	808,231	345,315	34,515	2002 Actual
	14,074	50,576	2,873,992	808,231	345,315	71,970	2002 Typical
	14,942	53,744	1,991,708	887,605	301,163	96,258	2009
	19,870	62,197	1,362,214	960,709	290,809	111,266	2018
SC	6,990	56,315	1,241,359	413,964	113,714	248,341	2002 Actual
	6,969	56,315	1,241,359	413,964	113,714	253,005	2002 Typical
	11,643	59,934	889,957	448,625	90,390	282,307	2009
	14,975	68,415	663,493	481,332	83,167	282,307	2018
TN	7,084	115,264	1,917,842	505,163	89,828	4,302	2002 Actual
	6,787	115,264	1,917,842	505,163	89,828	10,124	2002 Typical
	7,214	119,216	1,338,016	554,121	74,189	17,372	2009
	7,723	140,556	976,634	593,100	68,809	18,860	2018
VA	6,892	63,796	2,163,259	660,105	155,873	15,625	2002 Actual
	6,797	63,784	2,163,259	660,105	155,873	12,611	2002 Typical
	12,535	68,326	1,453,946	726,815	128,132	21,130	2009
	18,850	76,846	1,075,104	797,683	121,690	26,923	2018
WV	10,341	89,879	533,471	133,113	39,546	6,738	2002 Actual
	10,117	89,878	533,471	133,113	39,546	2,652	2002 Typical
	11,493	93,839	365,549	152,862	31,640	3,949	2009
	12,397	111,302	274,804	167,424	28,773	5,013	2018


Annual NH3 Emissions by Source Sector
Tons per year
250,000
200,000
150,000
100,000
50,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

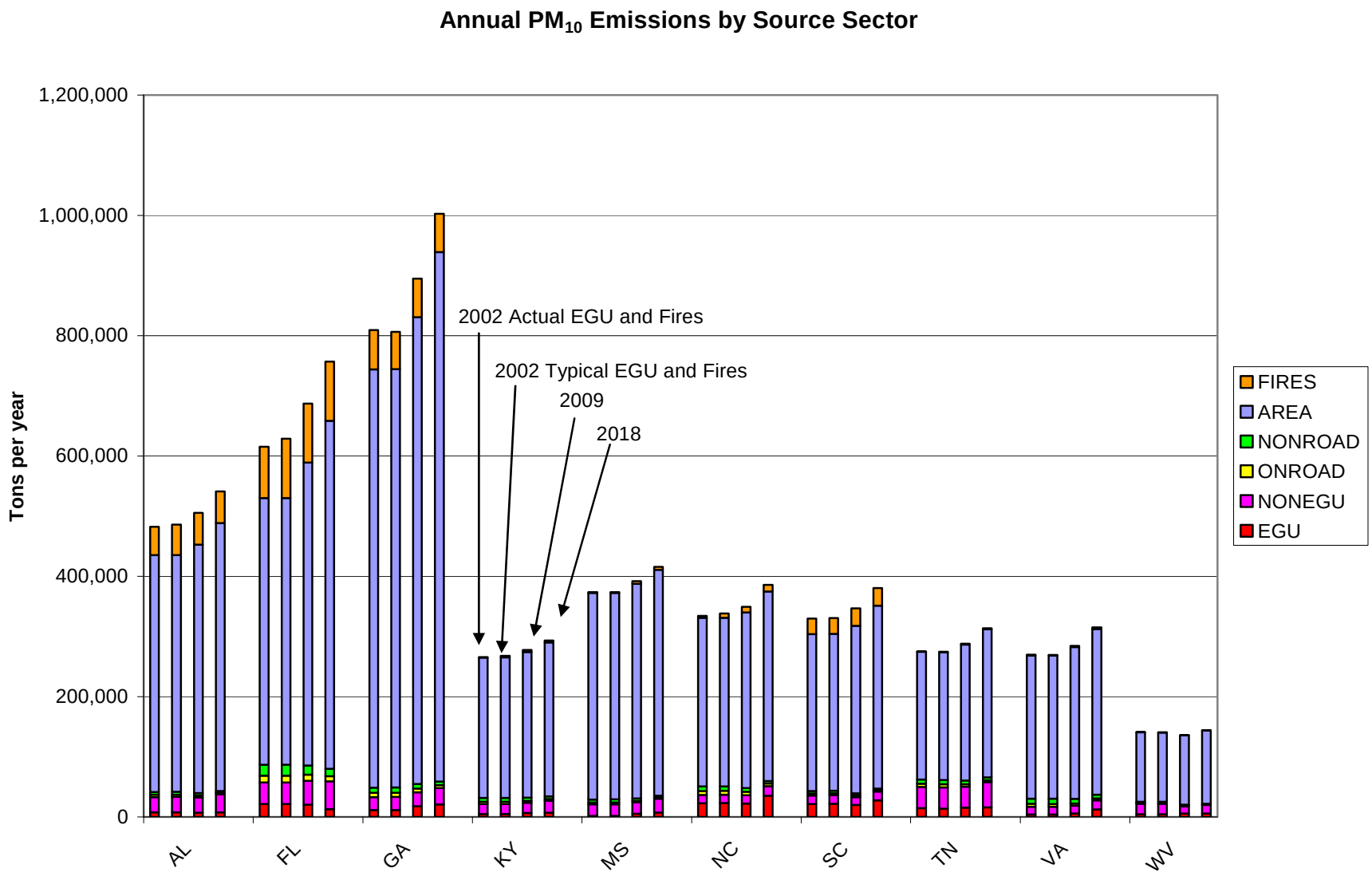
Annual NH_3 Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	317	1,883	5,588	33	58,318	1,689	2002 Actual
	239	1,883	5,588	33	58,318	1,957	2002 Typical
	359	2,132	6,364	36	64,268	2,050	2009
	1,072	2,464	7,298	42	71,915	2,054	2018
FL	234	1,423	18,114	134	37,446	3,102	2002 Actual
	222	1,423	18,114	134	37,446	3,157	2002 Typical
	1,629	1,544	21,781	148	38,616	3,157	2009
	2,976	1,829	26,163	171	40,432	3,157	2018
GA	83	3,613	10,546	60	80,913	2,578	2002 Actual
	86	3,613	10,546	60	80,913	2,153	2002 Typical
	686	3,963	12,687	68	89,212	2,229	2009
	1,677	4,797	14,873	79	99,885	2,229	2018
KY	326	674	5,055	31	51,135	39	2002 Actual
	321	674	5,055	31	51,135	112	2002 Typical
	400	760	5,796	34	53,005	143	2009
	476	901	7,811	40	55,211	150	2018
MS	190	1,169	3,585	23	58,721	59	2002 Actual
	198	1,169	3,585	23	58,721	65	2002 Typical
	334	668	4,035	25	63,708	217	2009
	827	764	4,566	29	69,910	225	2018
NC	54	1,179	9,702	65	161,860	155	2002 Actual
	55	1,179	9,702	65	161,860	324	2002 Typical
	445	1,285	11,825	72	170,314	433	2009
	663	1,465	14,065	83	180,866	501	2018
SC	142	1,411	4,694	33	28,166	980	2002 Actual
	141	1,411	4,694	33	28,166	908	2002 Typical
	370	1,578	5,523	36	30,555	1,039	2009
	625	1,779	6,473	41	33,496	1,039	2018
TN	204	1,613	6,625	43	34,393	19	2002 Actual
	197	1,613	6,625	43	34,393	46	2002 Typical
	227	1,840	7,782	48	35,253	78	2009
	241	2,213	9,021	55	36,291	85	2018
VA	127	3,104	7,852	48	43,905	70	2002 Actual
	130	3,104	7,852	48	43,905	57	2002 Typical
	694	3,045	9,086	53	46,639	95	2009
	606	3,604	10,624	61	50,175	121	2018
WV	121	332	1,908	9	9,963	30	2002 Actual
	121	332	1,908	9	9,963	12	2002 Typical
	330	314	2,148	11	10,625	18	2009
	143	378	2,497	13	11,504	23	2018


Annual NOx Emissions by Source Sector
Tons per year
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

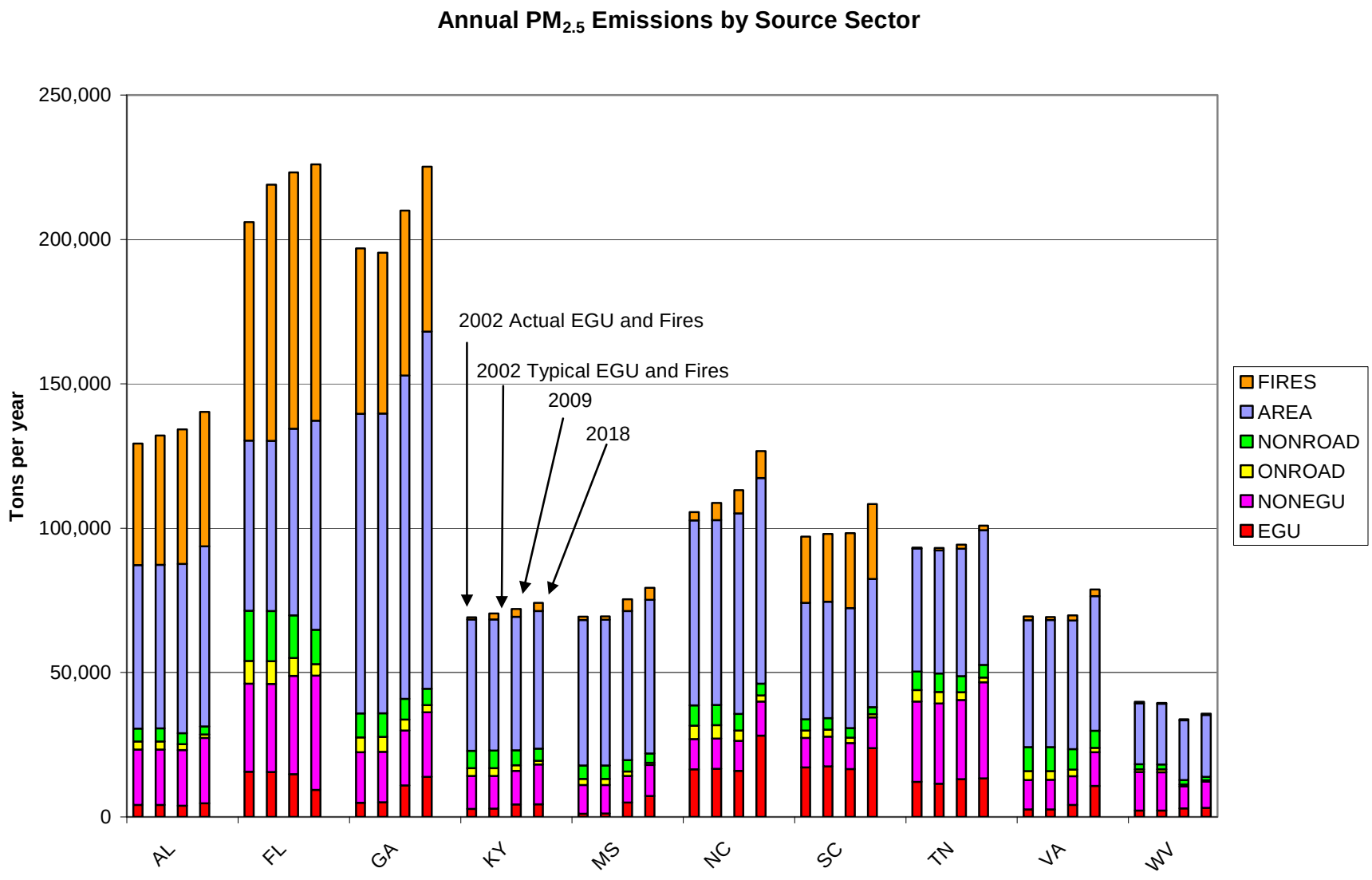
Annual NO_x Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	161,038	83,310	158,212	65,366	23,444	10,728	2002 Actual
	154,704	83,302	158,212	65,366	23,444	11,456	2002 Typical
	82,305	69,409	101,831	56,862	23,930	11,901	2009
	64,358	77,960	47,298	43,799	25,028	11,918	2018
FL	257,677	45,156	465,640	180,627	28,872	15,942	2002 Actual
	255,678	45,150	465,640	180,627	28,872	19,791	2002 Typical
	132,535	47,125	315,840	163,794	28,187	19,791	2009
	87,645	52,959	150,180	127,885	30,708	19,791	2018
GA	147,517	49,251	307,732	97,961	36,142	14,203	2002 Actual
	148,126	49,251	307,732	97,961	36,142	13,882	2002 Typical
	98,497	50,353	209,349	85,733	37,729	14,243	2009
	69,856	55,824	102,179	64,579	41,332	14,243	2018
KY	198,817	38,392	156,417	104,571	39,507	187	2002 Actual
	201,928	38,434	156,417	104,571	39,507	534	2002 Typical
	97,263	37,758	101,182	94,752	42,088	682	2009
	64,378	41,034	52,263	79,392	44,346	714	2018
MS	43,135	61,526	111,914	88,787	4,200	283	2002 Actual
	40,433	61,553	111,914	88,787	4,200	308	2002 Typical
	47,276	56,398	70,743	80,567	4,249	1,033	2009
	21,535	61,252	30,619	68,252	4,483	1,073	2018
NC	151,850	44,929	327,329	84,284	36,550	740	2002 Actual
	148,812	44,929	327,329	84,284	36,550	1,544	2002 Typical
	66,521	34,768	201,609	70,997	39,954	2,065	2009
	61,110	37,802	87,791	49,046	43,865	2,387	2018
SC	88,241	42,153	140,489	50,249	19,332	4,932	2002 Actual
	88,528	42,153	140,489	50,249	19,332	5,270	2002 Typical
	48,668	39,368	92,499	43,235	19,360	5,899	2009
	51,751	43,331	43,490	31,758	20,592	5,899	2018
TN	157,307	64,344	238,577	96,827	17,844	92	2002 Actual
	152,137	64,344	238,577	96,827	17,844	217	2002 Typical
	66,405	57,514	151,912	86,641	18,499	373	2009
	31,715	62,519	69,385	70,226	19,597	405	2018
VA	86,886	60,415	222,374	63,219	51,418	335	2002 Actual
	85,081	60,390	222,374	63,219	51,418	271	2002 Typical
	64,358	51,001	134,232	54,993	52,618	453	2009
	64,344	55,734	63,342	40,393	56,158	578	2018
WV	230,977	46,612	58,999	33,239	12,687	145	2002 Actual
	222,437	46,618	58,999	33,239	12,687	57	2002 Typical
	85,476	38,023	35,635	30,133	13,439	85	2009
	51,474	43,280	17,247	25,710	14,828	108	2018


Annual PM10 Emissions by Source Sector
Tons per year
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV

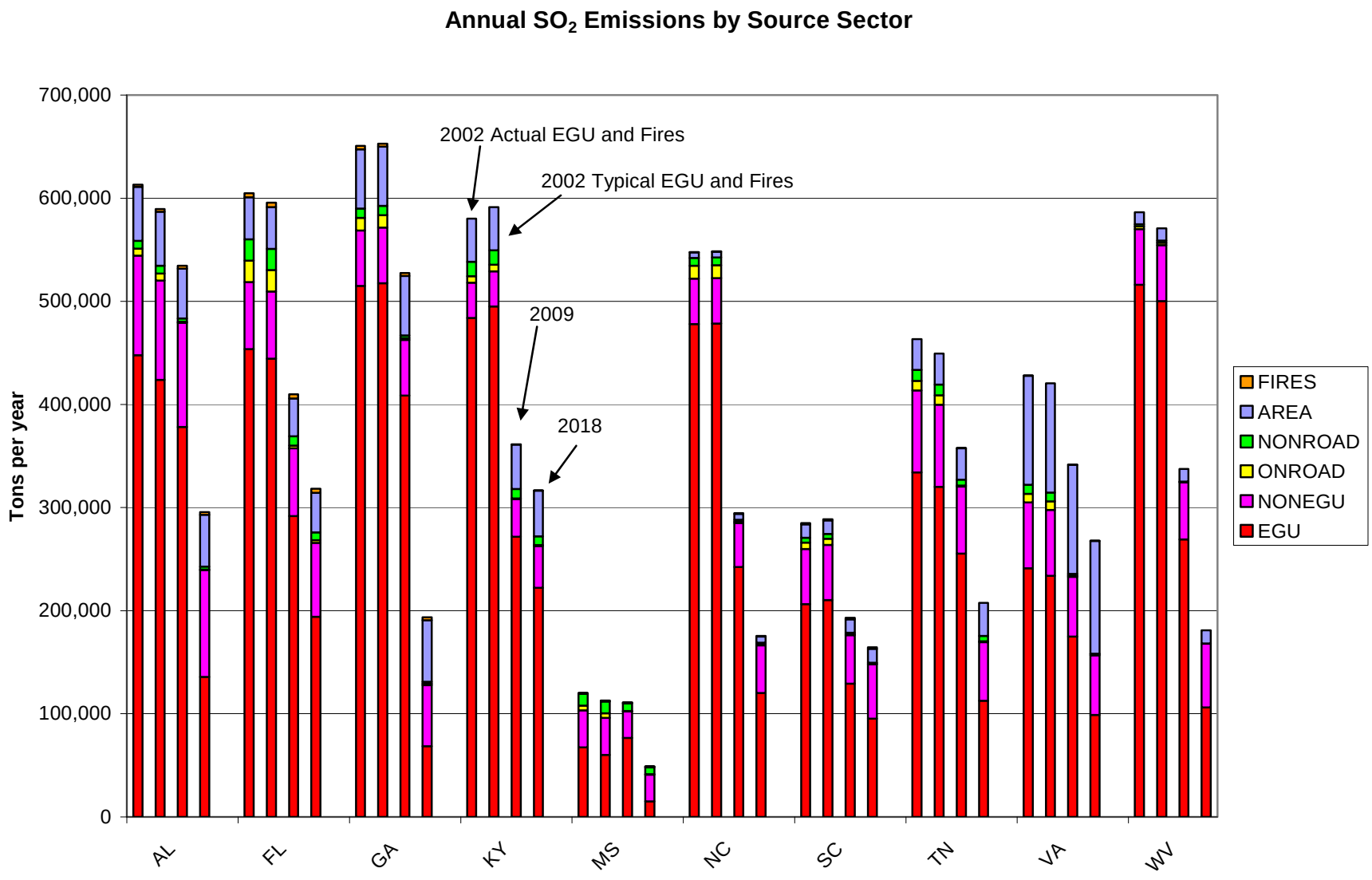
Annual PM_{10} Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	7,646	25,240	3,903	4,787	393,588	47,237	2002 Actual
	7,845	25,239	3,903	4,787	393,588	50,833	2002 Typical
	6,969	25,421	3,171	4,027	413,020	52,851	2009
	7,822	29,889	2,410	3,041	445,256	52,927	2018
FL	21,387	35,857	11,275	18,281	443,346	85,263	2002 Actual
	21,391	35,856	11,275	18,281	443,346	98,470	2002 Typical
	20,182	39,947	9,911	15,613	503,230	98,470	2009
	12,791	46,492	8,268	12,497	578,516	98,470	2018
GA	11,224	21,610	7,246	8,618	695,414	65,227	2002 Actual
	11,467	21,610	7,246	8,618	695,414	62,336	2002 Typical
	17,891	23,103	6,072	7,521	776,411	63,973	2009
	20,732	27,273	4,844	6,015	880,199	63,973	2018
KY	4,701	16,626	3,723	6,425	233,559	846	2002 Actual
	4,795	16,626	3,723	6,425	233,559	2,421	2002 Typical
	6,463	17,174	2,976	5,544	242,177	3,093	2009
	6,694	20,153	2,580	4,556	256,052	3,237	2018
MS	1,633	19,472	2,859	5,010	343,377	1,284	2002 Actual
	1,706	19,469	2,859	5,010	343,377	1,396	2002 Typical
	5,182	19,245	2,275	4,270	356,324	4,683	2009
	7,412	22,837	1,624	3,452	375,495	4,865	2018
NC	22,754	13,838	6,579	7,348	280,379	3,356	2002 Actual
	22,994	13,838	6,579	7,348	280,379	6,998	2002 Typical
	22,152	13,910	5,572	6,055	292,443	9,359	2009
	35,275	15,737	4,392	4,298	315,294	10,819	2018
SC	21,400	14,142	3,452	4,152	260,858	25,968	2002 Actual
	21,827	14,142	3,452	4,152	260,858	26,304	2002 Typical
	20,041	12,959	2,862	3,471	278,299	29,153	2009
	27,640	14,674	2,184	2,617	304,251	29,153	2018
TN	14,640	35,174	5,371	6,819	212,554	418	2002 Actual
	13,866	35,174	5,371	6,819	212,554	984	2002 Typical
	15,608	34,581	4,206	5,877	226,098	1,689	2009
	15,941	41,999	3,092	4,672	246,252	1,834	2018
VA	3,960	13,252	4,549	8,728	237,577	1,519	2002 Actual
	3,892	13,252	4,549	8,728	237,577	1,226	2002 Typical
	5,606	13,046	3,747	7,510	252,488	2,054	2009
	12,551	15,111	3,212	6,208	275,351	2,618	2018
WV	4,573	17,503	1,381	1,850	115,346	655	2002 Actual
	4,472	17,503	1,381	1,850	115,346	258	2002 Typical
	5,657	11,882	1,068	1,640	115,089	384	2009
	5,784	14,202	819	1,292	121,549	487	2018


Annual PM2.5 Emissions by Source Sector
Tons per year
250,000
200,000
150,000
100,000
50,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

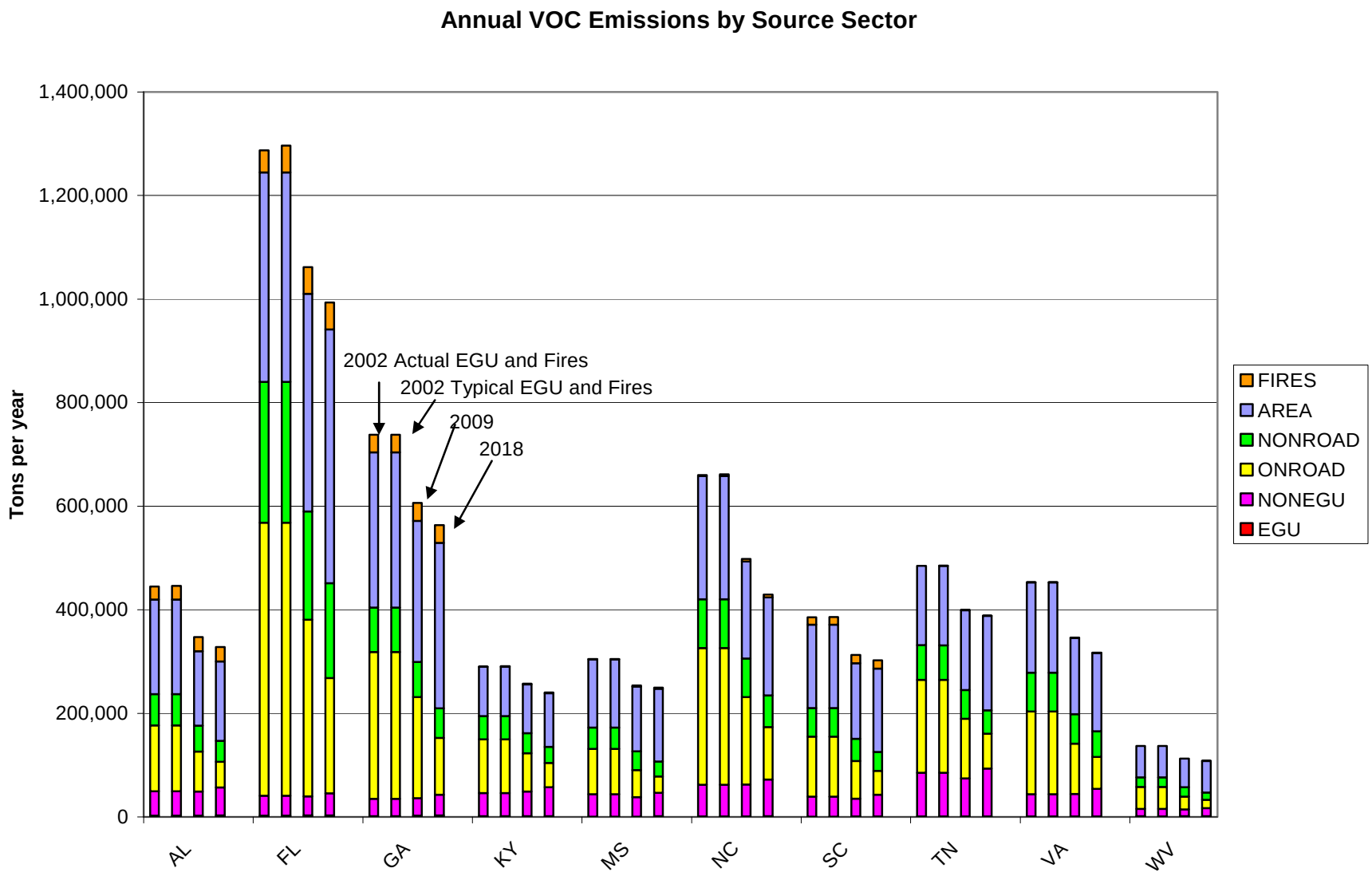
Annual $PM_{2.5}$ Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	4,113	19,178	2,799	4,502	56,654	42,041	2002 Actual
	4,176	19,177	2,799	4,502	56,654	44,812	2002 Typical
	3,921	19,230	2,032	3,776	58,699	46,543	2009
	4,768	22,584	1,192	2,835	62,323	46,608	2018
FL	15,643	30,504	7,868	17,415	58,878	75,717	2002 Actual
	15,575	30,504	7,868	17,415	58,878	88,756	2002 Typical
	14,790	34,019	6,173	14,866	64,589	88,756	2009
	9,417	39,486	4,038	11,868	72,454	88,756	2018
GA	4,939	17,462	5,168	8,226	103,794	57,293	2002 Actual
	5,070	17,462	5,168	8,226	103,794	55,712	2002 Typical
	10,907	18,982	3,840	7,175	112,001	57,116	2009
	13,881	22,416	2,380	5,730	123,704	57,116	2018
KY	2,802	11,372	2,697	6,046	45,453	726	2002 Actual
	2,847	11,372	2,697	6,046	45,453	2,076	2002 Typical
	4,279	11,686	1,920	5,203	46,243	2,653	2009
	4,434	13,739	1,272	4,256	47,645	2,777	2018
MS	1,138	9,906	2,112	4,690	50,401	1,102	2002 Actual
	1,147	9,902	2,112	4,690	50,401	1,197	2002 Typical
	4,996	9,199	1,508	3,985	51,661	4,016	2009
	7,252	10,719	819	3,203	53,222	4,173	2018
NC	16,498	10,500	4,623	7,005	64,052	2,878	2002 Actual
	16,623	10,500	4,623	7,005	64,052	6,002	2002 Typical
	15,949	10,458	3,493	5,760	69,457	8,027	2009
	28,137	11,825	2,123	4,069	71,262	9,279	2018
SC	17,154	10,245	2,501	3,945	40,291	22,953	2002 Actual
	17,521	10,245	2,501	3,945	40,291	23,511	2002 Typical
	16,548	9,048	1,855	3,294	41,613	25,955	2009
	23,794	10,699	1,087	2,474	44,319	25,955	2018
TN	12,166	27,807	3,949	6,458	42,566	359	2002 Actual
	11,491	27,807	3,949	6,458	42,566	844	2002 Typical
	13,092	27,367	2,751	5,557	44,124	1,449	2009
	13,387	33,293	1,544	4,403	46,692	1,573	2018
VA	2,606	10,165	3,102	8,288	43,989	1,303	2002 Actual
	2,650	10,165	3,102	8,288	43,989	1,052	2002 Typical
	4,165	9,988	2,241	7,136	44,514	1,762	'2009
	10,773	11,605	1,543	5,891	46,697	2,245	2018
WV	2,210	13,313	995	1,728	21,049	562	2002 Actual
	2,163	13,313	995	1,728	21,049	221	2002 Typical
	2,940	7,638	684	1,528	20,664	329	2009
	3,116	9,124	405	1,198	21,490	418	2018


Annual SO2 Emissions by Source Sector
Tons per year
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

Annual SO_2 Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	447,828	96,481	6,900	7,584	52,253	2,208	2002 Actual
	423,736	96,481	6,900	7,584	52,253	2,559	2002 Typical
	378,052	101,246	810	3,471	48,228	2,681	2009
	135,851	103,303	720	2,818	50,264	2,686	2018
FL	453,631	65,090	20,915	20,614	40,491	4,057	2002 Actual
	444,383	65,090	20,915	20,614	40,491	4,129	2002 Typical
	291,831	65,651	2,612	8,967	36,699	4,129	2009
	194,028	71,810	2,533	7,536	38,317	4,129	2018
GA	514,952	53,774	12,184	9,005	57,559	3,372	2002 Actual
	517,633	53,778	12,184	9,005	57,559	2,815	2002 Typical
	408,679	53,983	1,585	2,725	57,696	2,914	2009
	68,515	59,343	1,457	1,709	59,729	2,914	2018
KY	484,057	34,029	6,308	14,043	41,805	51	2002 Actual
	495,153	34,029	6,308	14,043	41,805	146	2002 Typical
	271,669	36,418	759	9,180	43,087	187	2009
	222,102	40,682	763	8,592	44,186	196	2018
MS	67,429	35,960	4,614	11,315	771	78	2002 Actual
	60,086	35,954	4,614	11,315	771	84	2002 Typical
	76,646	25,564	537	7,191	753	283	2009
	15,213	25,674	440	6,638	746	294	2018
NC	477,990	44,123	12,420	7,693	5,412	203	2002 Actual
	478,488	44,123	12,420	7,693	5,412	423	2002 Typical
	242,286	42,536	1,503	1,892	5,751	566	2009
	120,165	46,314	1,481	905	6,085	655	2018
SC	206,399	53,518	5,972	4,866	12,900	1,281	2002 Actual
	210,272	53,518	5,972	4,866	12,900	1,187	2002 Typical
	129,122	47,193	721	1,701	13,051	1,359	2009
	95,377	52,410	643	1,198	13,457	1,359	2018
TN	334,151	79,604	9,226	10,441	29,917	25	2002 Actual
	320,146	79,604	9,226	10,441	29,917	60	2002 Typical
	255,410	64,964	1,076	5,651	30,577	102	2009
	112,672	56,682	948	5,207	31,962	111	2018
VA	241,204	63,903	8,294	8,663	105,890	92	2002 Actual
	233,691	63,900	8,294	8,663	105,890	74	2002 Typical
	174,777	58,039	1,079	1,707	105,984	124	2009
	98,988	57,790	1,043	507	109,380	158	2018
WV	516,084	54,070	2,464	2,112	11,667	40	2002 Actual
	500,381	54,077	2,464	2,112	11,667	16	2002 Typical
	268,952	55,598	279	359	12,284	23	2009
	106,199	61,702	253	56	12,849	29	2018


Annual VOC Emissions by Source Sector
Tons per year
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2002 Actual EGU and Fires
2002 Typical EGU and Fires
2009
2018
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
FIRES
AREA
NONROAD
ONROAD
NONEGU
EGU

Annual VOC Emissions by Source Sector

Name	EGU	NONEGU	ONROAD	NONROAD	AREA	FIRES	YEAR
AL	2,295	47,037	127,295	60,487	182,674	25,278	2002 Actual
	2,288	47,035	127,295	60,487	182,674	26,526	2002 Typical
	2,473	46,644	76,990	50,249	143,454	27,502	2009
	2,952	54,291	49,175	40,407	153,577	27,539	2018
FL	2,524	38,471	527,209	272,072	404,302	42,724	2002 Actual
	2,531	38,471	527,209	272,072	404,302	51,527	2002 Typical
	2,730	36,882	340,947	209,543	420,172	51,527	2009
	3,047	42,813	222,303	183,452	489,975	51,527	2018
GA	1,244	33,709	283,421	85,965	299,679	33,979	2002 Actual
	1,256	33,709	283,421	85,965	299,679	33,918	2002 Typical
	2,314	34,116	195,125	67,686	272,315	34,710	2009
	2,816	40,282	109,763	56,761	319,328	34,710	2018
KY	1,487	44,834	103,503	44,805	95,375	410	2002 Actual
	1,481	44,834	103,503	44,805	95,375	1,172	2002 Typical
	1,369	47,786	73,942	38,558	94,042	1,497	2009
	1,426	55,861	47,066	30,920	103,490	1,567	2018
MS	648	43,204	87,672	41,081	131,808	622	2002 Actual
	629	43,203	87,672	41,081	131,808	675	2002 Typical
	564	37,747	52,107	36,197	124,977	2,266	2009
	1,274	45,335	31,616	28,842	140,134	2,355	2018
NC	988	61,182	263,766	94,480	237,926	1,624	2002 Actual
	986	61,182	263,766	94,480	237,926	3,387	2002 Typical
	954	61,925	168,676	74,056	187,769	4,530	2009
	1,302	70,875	101,099	61,327	189,591	5,236	2018
SC	470	38,458	116,163	55,016	161,000	14,202	2002 Actual
	470	38,458	116,163	55,016	161,000	14,666	2002 Typical
	723	34,403	72,603	43,061	146,107	16,045	2009
	931	41,987	46,301	36,131	161,228	16,045	2018
TN	926	84,328	179,807	66,450	153,307	202	2002 Actual
	890	84,328	179,807	66,450	153,307	476	2002 Typical
	932	73,498	115,181	55,358	154,377	817	2009
	976	92,456	67,324	45,084	182,222	888	2018
VA	754	43,152	159,790	74,866	174,116	735	2002 Actual
	747	43,152	159,790	74,866	174,116	593	2002 Typical
	788	43,726	96,770	57,009	147,034	994	2009
	980	53,186	61,964	49,052	150,919	1,267	2018
WV	1,180	14,595	42,174	18,566	60,443	317	2002 Actual
	1,140	14,595	42,174	18,566	60,443	125	2002 Typical
	1,361	13,043	24,843	18,069	55,288	186	2009
	1,387	15,582	16,121	14,086	60,747	236	2018

APPENDIX B:

STATE VMT TOTALS

State VMT Totals

Million Miles Per Year

2002	LDGV	LDGT1	LDGT2	HDDV	LDDV	LDDT	HDDV	MC	TOTAL
AL	31,982	12,728	4,347	1,630	63	69	4,709	196	55,723
FL	105,340	40,835	13,945	5,079	206	220	12,465	591	178,681
GA	61,660	24,394	8,331	3,103	121	132	8,673	371	106,785
KY	28,751	12,189	3,366	1,606	55	55	4,827	171	51,020
MS	23,933	6,724	439	1,025	330	125	3,610	92	36,278
NC	51,189	30,339	10,787	4,119	230	230	9,440	461	106,795
SC	26,672	10,750	3,671	1,395	52	58	4,306	171	47,074
TN	30,809	20,272	6,922	2,943	52	111	6,810	397	68,316
VA	36,336	24,784	8,667	2,148	61	139	4,969	369	77,472
WV	9,010	5,931	2,028	732	25	37	1,664	117	19,544

2009	LDGV	LDGT1	LDGT2	HDDV	LDDV	LDDT	HDDV	MC	TOTAL
AL	30,638	18,598	5,511	2,069	65	72	5,976	249	63,178
FL	107,641	62,449	18,697	6,820	215	230	16,743	794	213,590
GA	61,569	36,641	10,933	4,077	126	137	11,374	487	125,343
KY	28,006	16,984	4,428	1,983	58	57	5,983	231	57,729
MS	23,641	10,131	573	1,341	356	135	4,719	120	41,017
NC	48,495	43,484	15,122	4,576	40	224	10,928	527	123,396
SC	26,451	16,119	4,796	1,824	55	61	5,617	223	55,147
TN	28,775	28,650	8,521	3,627	52	111	8,391	490	78,615
VA	33,663	34,814	10,597	2,624	61	137	6,073	451	88,419
WV	8,128	8,205	2,427	878	25	37	1,995	140	21,835

2018	LDGV	LDGT1	LDGT2	HDDV	LDDV	LDDT	HDDV	MC	TOTAL
AL	31,706	23,562	6,990	2,634	67	84	7,607	317	72,966
FL	116,576	83,385	24,996	9,156	221	301	22,491	1,066	258,191
GA	65,214	47,687	14,245	5,332	129	171	14,853	637	148,269
KY	29,353	21,058	5,558	2,463	60	66	7,454	288	66,300
MS	24,787	12,984	736	1,727	372	159	6,076	155	46,996
NC	42,247	51,568	18,260	4,985	279	279	11,396	553	129,566
SC	27,930	20,880	6,220	2,375	57	75	7,306	290	65,133
TN	29,253	35,702	10,629	4,538	52	130	10,500	613	91,417
VA	35,030	44,438	13,543	3,358	62	164	7,770	578	104,944
WV	8,130	10,025	2,969	1,078	25	41	2,451	172	24,891

APPENDIX C:

STATE TIER 1 EMISSION TOTALS

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
AL	2002	01	FUEL COMB. ELEC. UTIL.	11,279	317	161,038	7,646	4,113	447,828	2,295
AL	2002	02	FUEL COMB. INDUSTRIAL	67,132	234	51,535	6,730	3,792	40,918	2,239
AL	2002	03	FUEL COMB. OTHER	70,498	169	19,237	6,411	5,528	39,606	56,120
AL	2002	04	CHEMICAL & ALLIED PRODUCT MFG	5,721	35	2,032	1,220	888	12,770	7,273
AL	2002	05	METALS PROCESSING	38,247	376	6,011	9,107	7,803	14,039	3,299
AL	2002	06	PETROLEUM & RELATED INDUSTRIES	13,606	0	878	194	155	22,991	4,024
AL	2002	07	OTHER INDUSTRIAL PROCESSES	47,676	1,468	25,252	22,689	9,516	17,904	25,304
AL	2002	08	SOLVENT UTILIZATION	216	0	226	149	126	3	108,437
AL	2002	09	STORAGE & TRANSPORT	174	0	230	1,086	636	13	16,522
AL	2002	10	WASTE DISPOSAL & RECYCLING	104,914	10	4,016	15,832	14,946	489	12,612
AL	2002	11	HIGHWAY VEHICLES	1,321,528	5,588	158,212	3,903	2,799	6,900	127,295
AL	2002	12	OFF-HIGHWAY	414,385	33	65,366	4,787	4,502	7,584	60,487
AL	2002	14	MISCELLANEOUS	385,005	59,596	8,065	402,646	74,483	2,208	19,161
	2002 Total			**2,480,381**	**67,827**	**502,098**	**482,402**	**129,287**	**613,255**	**445,065**
AL	2009	01	FUEL COMB. ELEC. UTIL.	14,986	359	82,305	6,969	3,921	378,052	2,473
AL	2009	02	FUEL COMB. INDUSTRIAL	68,146	274	36,301	6,140	3,438	40,651	2,191
AL	2009	03	FUEL COMB. OTHER	52,256	158	19,514	5,904	5,104	36,048	31,403
AL	2009	04	CHEMICAL & ALLIED PRODUCT MFG	6,118	38	2,273	1,257	912	13,660	6,613
AL	2009	05	METALS PROCESSING	38,969	500	6,021	9,062	7,756	16,629	3,305
AL	2009	06	PETROLEUM & RELATED INDUSTRIES	13,241	0	858	221	177	22,495	3,336
AL	2009	07	OTHER INDUSTRIAL PROCESSES	52,004	1,571	26,340	24,196	10,197	19,383	26,519
AL	2009	08	SOLVENT UTILIZATION	247	0	257	165	139	4	92,631
AL	2009	09	STORAGE & TRANSPORT	192	0	253	1,146	584	14	17,738
AL	2009	10	WASTE DISPOSAL & RECYCLING	87,225	11	3,634	14,504	13,485	590	11,207
AL	2009	11	HIGHWAY VEHICLES	915,647	6,364	101,831	3,171	2,032	810	76,990
AL	2009	12	OFF-HIGHWAY	454,686	36	56,862	4,027	3,776	3,471	50,249
AL	2009	14	MISCELLANEOUS	463,498	65,899	9,788	428,698	82,679	2,681	22,657
	2009 Total			**2,167,216**	**75,209**	**346,238**	**505,457**	**134,201**	**534,489**	**347,312**
AL	2018	01	FUEL COMB. ELEC. UTIL.	24,342	1,072	64,358	7,822	4,768	135,851	2,952
AL	2018	02	FUEL COMB. INDUSTRIAL	69,068	275	38,424	6,427	3,599	40,126	2,293
AL	2018	03	FUEL COMB. OTHER	43,744	164	20,185	5,641	4,818	37,162	21,215
AL	2018	04	CHEMICAL & ALLIED PRODUCT MFG	7,384	46	2,804	1,523	1,106	16,509	8,040
AL	2018	05	METALS PROCESSING	49,770	674	7,519	11,036	9,423	21,824	4,234
AL	2018	06	PETROLEUM & RELATED INDUSTRIES	13,002	0	848	258	207	15,364	3,421
AL	2018	07	OTHER INDUSTRIAL PROCESSES	60,452	1,732	30,831	27,727	11,812	21,843	30,267
AL	2018	08	SOLVENT UTILIZATION	301	0	317	200	169	4	112,412
AL	2018	09	STORAGE & TRANSPORT	234	0	307	1,366	699	17	18,900
AL	2018	10	WASTE DISPOSAL & RECYCLING	88,758	13	3,867	15,343	14,143	718	11,938
AL	2018	11	HIGHWAY VEHICLES	676,210	7,298	47,298	2,410	1,192	720	49,175
AL	2018	12	OFF-HIGHWAY	488,924	42	43,799	3,041	2,835	2,818	40,407
AL	2018	14	MISCELLANEOUS	464,235	73,529	9,803	458,551	85,538	2,686	22,686
	2018 Total			**1,986,424**	**84,845**	**270,362**	**541,346**	**140,310**	**295,642**	**327,940**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
FL	2002	01	FUEL COMB. ELEC. UTIL.	57,113	234	257,677	21,387	15,643	453,631	2,524
FL	2002	02	FUEL COMB. INDUSTRIAL	64,798	131	45,157	20,442	18,547	42,524	4,219
FL	2002	03	FUEL COMB. OTHER	49,230	99	11,597	8,464	8,074	20,031	16,123
FL	2002	04	CHEMICAL & ALLIED PRODUCT MFG	745	1,101	2,221	1,868	1,488	34,462	3,542
FL	2002	05	METALS PROCESSING	1,404	1	194	449	334	882	82
FL	2002	06	PETROLEUM & RELATED INDUSTRIES	1,070	0	560	259	129	470	724
FL	2002	07	OTHER INDUSTRIAL PROCESSES	18,586	19	12,325	23,419	11,844	6,515	27,024
FL	2002	08	SOLVENT UTILIZATION	0	0	1	128	110	0	304,582
FL	2002	09	STORAGE & TRANSPORT	161	0	561	1,645	720	38	79,281
FL	2002	10	WASTE DISPOSAL & RECYCLING	54,721	351	2,535	9,943	9,405	659	9,125
FL	2002	11	HIGHWAY VEHICLES	4,550,447	18,114	465,640	11,275	7,868	20,915	527,209
FL	2002	12	OFF-HIGHWAY	1,920,729	134	180,627	18,281	17,415	20,614	272,072
FL	2002	14	MISCELLANEOUS	752,915	40,269	14,821	497,846	114,447	4,057	40,795
	2002 Total			**7,471,920**	**60,454**	**993,915**	**615,407**	**206,025**	**604,797**	**1,287,301**
FL	2009	01	FUEL COMB. ELEC. UTIL.	35,928	1,631	86,165	9,007	5,910	186,055	1,910
FL	2009	02	FUEL COMB. INDUSTRIAL	69,972	146	44,480	16,265	14,827	38,225	4,473
FL	2009	03	FUEL COMB. OTHER	33,014	100	10,800	7,555	7,174	19,882	10,907
FL	2009	04	CHEMICAL & ALLIED PRODUCT MFG	901	1,231	2,461	1,908	1,526	34,961	3,821
FL	2009	05	METALS PROCESSING	1,545	1	176	361	251	993	82
FL	2009	06	PETROLEUM & RELATED INDUSTRIES	1,190	0	612	304	156	519	748
FL	2009	07	OTHER INDUSTRIAL PROCESSES	18,593	26	13,521	33,084	19,357	6,881	26,413
FL	2009	08	SOLVENT UTILIZATION	0	0	1	132	113	0	319,723
FL	2009	09	STORAGE & TRANSPORT	187	0	621	1,661	727	50	83,880
FL	2009	10	WASTE DISPOSAL & RECYCLING	177,953	342	6,251	22,971	22,364	698	17,241
FL	2009	11	HIGHWAY VEHICLES	3,308,863	21,549	312,321	9,801	6,104	2,584	336,707
FL	2009	12	OFF-HIGHWAY	2,104,920	148	163,794	15,613	14,866	8,967	209,543
FL	2009	14	MISCELLANEOUS	764,004	41,471	15,075	557,331	120,796	4,129	41,290
	2009 Total			**6,596,484**	**66,874**	**707,273**	**687,353**	**223,192**	**406,888**	**1,061,801**
FL	2018	01	FUEL COMB. ELEC. UTIL.	85,495	2,976	87,645	12,791	9,417	194,028	3,047
FL	2018	02	FUEL COMB. INDUSTRIAL	77,465	156	48,879	17,876	16,324	37,205	4,894
FL	2018	03	FUEL COMB. OTHER	27,094	110	12,356	7,255	6,853	20,975	8,879
FL	2018	04	CHEMICAL & ALLIED PRODUCT MFG	1,200	1,448	3,119	2,367	1,907	41,395	4,739
FL	2018	05	METALS PROCESSING	1,973	2	225	466	323	1,325	106
FL	2018	06	PETROLEUM & RELATED INDUSTRIES	1,513	0	778	387	198	659	918
FL	2018	07	OTHER INDUSTRIAL PROCESSES	20,748	35	15,855	39,842	23,289	7,741	29,716
FL	2018	08	SOLVENT UTILIZATION	0	0	1	158	135	0	387,657
FL	2018	09	STORAGE & TRANSPORT	226	0	690	2,004	877	58	87,732
FL	2018	10	WASTE DISPOSAL & RECYCLING	180,730	418	6,486	24,140	23,427	769	18,335
FL	2018	11	HIGHWAY VEHICLES	2,554,160	26,163	150,180	8,268	4,038	2,533	222,303
FL	2018	12	OFF-HIGHWAY	2,323,327	171	127,885	12,497	11,868	7,536	183,452
FL	2018	14	MISCELLANEOUS	763,701	43,251	15,068	628,984	127,364	4,129	41,338
	2018 Total			**6,037,633**	**74,728**	**469,168**	**757,033**	**226,019**	**318,353**	**993,116**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
GA	2002	01	FUEL COMB. ELEC. UTIL.	9,712	83	147,517	11,224	4,939	514,952	1,244
GA	2002	02	FUEL COMB. INDUSTRIAL	59,492	27	53,039	12,037	7,886	88,791	3,956
GA	2002	03	FUEL COMB. OTHER	63,314	17	14,465	10,142	10,057	10,740	27,226
GA	2002	04	CHEMICAL & ALLIED PRODUCT MFG	5,387	920	2,277	391	305	2,721	2,668
GA	2002	05	METALS PROCESSING	330	0	60	147	94	0	70
GA	2002	06	PETROLEUM & RELATED INDUSTRIES	41	0	3	69	44	68	175
GA	2002	07	OTHER INDUSTRIAL PROCESSES	27,960	2,666	12,215	39,630	13,073	8,701	26,999
GA	2002	08	SOLVENT UTILIZATION	4	0	22	13	13	0	234,744
GA	2002	09	STORAGE & TRANSPORT	39	0	6	583	360	0	26,334
GA	2002	10	WASTE DISPOSAL & RECYCLING	146,183	16	5,164	23,422	22,506	312	15,003
GA	2002	11	HIGHWAY VEHICLES	2,735,968	10,546	307,732	7,246	5,168	12,184	283,421
GA	2002	12	OFF-HIGHWAY	791,158	60	97,961	8,618	8,226	9,005	85,965
GA	2002	14	MISCELLANEOUS	590,400	83,458	12,308	695,723	124,142	3,372	29,640
	2002 Total			**4,429,989**	**97,795**	**652,769**	**809,244**	**196,815**	**650,846**	**737,444**
GA	2009	01	FUEL COMB. ELEC. UTIL.	23,721	686	98,497	17,891	10,907	408,679	2,314
GA	2009	02	FUEL COMB. INDUSTRIAL	63,067	28	53,726	11,206	7,390	89,850	4,163
GA	2009	03	FUEL COMB. OTHER	45,184	17	15,347	8,496	8,400	10,981	15,683
GA	2009	04	CHEMICAL & ALLIED PRODUCT MFG	6,044	1,032	2,531	436	341	2,743	2,814
GA	2009	05	METALS PROCESSING	363	0	61	159	100	0	47
GA	2009	06	PETROLEUM & RELATED INDUSTRIES	50	0	4	83	54	82	154
GA	2009	07	OTHER INDUSTRIAL PROCESSES	29,976	2,902	12,528	45,339	14,758	7,662	28,441
GA	2009	08	SOLVENT UTILIZATION	4	0	25	14	14	0	216,248
GA	2009	09	STORAGE & TRANSPORT	45	0	7	649	401	0	27,821
GA	2009	10	WASTE DISPOSAL & RECYCLING	218,460	18	7,419	31,955	30,900	360	18,711
GA	2009	11	HIGHWAY VEHICLES	1,983,803	12,687	209,349	6,072	3,840	1,585	195,125
GA	2009	12	OFF-HIGHWAY	882,970	68	85,733	7,521	7,175	2,725	67,686
GA	2009	14	MISCELLANEOUS	515,329	91,406	10,637	765,043	125,665	2,914	26,388
	2009 Total			**3,769,016**	**108,844**	**495,864**	**894,865**	**209,944**	**527,582**	**605,595**
GA	2018	01	FUEL COMB. ELEC. UTIL.	44,269	1,677	69,856	20,732	13,881	68,515	2,816
GA	2018	02	FUEL COMB. INDUSTRIAL	67,067	30	57,232	11,755	7,769	94,403	4,424
GA	2018	03	FUEL COMB. OTHER	39,440	17	17,801	7,722	7,622	11,958	11,482
GA	2018	04	CHEMICAL & ALLIED PRODUCT MFG	7,076	1,208	2,982	517	405	3,436	3,524
GA	2018	05	METALS PROCESSING	421	0	76	185	118	0	55
GA	2018	06	PETROLEUM & RELATED INDUSTRIES	63	0	5	105	68	104	191
GA	2018	07	OTHER INDUSTRIAL PROCESSES	33,611	3,559	14,460	55,130	17,899	8,748	33,333
GA	2018	08	SOLVENT UTILIZATION	5	0	30	22	22	0	264,326
GA	2018	09	STORAGE & TRANSPORT	54	0	9	764	470	0	29,409
GA	2018	10	WASTE DISPOSAL & RECYCLING	235,690	22	8,120	35,280	34,038	423	20,411
GA	2018	11	HIGHWAY VEHICLES	1,476,981	14,873	102,179	4,844	2,380	1,457	109,763
GA	2018	12	OFF-HIGHWAY	973,872	79	64,579	6,015	5,730	1,709	56,761
GA	2018	14	MISCELLANEOUS	515,220	102,075	10,635	859,835	134,730	2,914	26,368
	2018 Total			**3,393,769**	**123,540**	**347,964**	**1,002,907**	**225,133**	**193,668**	**562,862**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
KY	2002	01	FUEL COMB. ELEC. UTIL.	12,619	326	198,817	4,701	2,802	484,057	1,487
KY	2002	02	FUEL COMB. INDUSTRIAL	14,110	182	60,674	2,155	1,463	41,825	1,565
KY	2002	03	FUEL COMB. OTHER	40,806	55	4,997	7,679	7,352	9,647	12,711
KY	2002	04	CHEMICAL & ALLIED PRODUCT MFG	176	214	296	774	581	2,345	3,462
KY	2002	05	METALS PROCESSING	89,197	6	1,082	3,396	2,720	12,328	1,508
KY	2002	06	PETROLEUM & RELATED INDUSTRIES	4,304	335	2,519	308	205	5,747	2,895
KY	2002	07	OTHER INDUSTRIAL PROCESSES	6,493	78	6,518	31,429	10,394	3,333	25,388
KY	2002	08	SOLVENT UTILIZATION	0	10	9	317	241	1	61,834
KY	2002	09	STORAGE & TRANSPORT	33	8	15	1,920	1,177	3	18,853
KY	2002	10	WASTE DISPOSAL & RECYCLING	20,622	8	1,768	7,229	6,476	606	7,927
KY	2002	11	HIGHWAY VEHICLES	1,230,148	5,055	156,417	3,723	2,697	6,308	103,503
KY	2002	12	OFF-HIGHWAY	325,993	31	104,571	6,425	6,046	14,043	44,805
KY	2002	14	MISCELLANEOUS	9,651	50,953	209	195,827	26,941	51	4,476
	2002 Total			**1,754,151**	**57,261**	**537,890**	**265,880**	**69,094**	**580,293**	**290,414**
KY	2009	01	FUEL COMB. ELEC. UTIL.	15,812	400	97,263	6,463	4,279	271,669	1,369
KY	2009	02	FUEL COMB. INDUSTRIAL	14,986	195	61,683	2,105	1,456	42,433	1,476
KY	2009	03	FUEL COMB. OTHER	30,045	54	5,178	7,035	6,725	10,123	9,148
KY	2009	04	CHEMICAL & ALLIED PRODUCT MFG	179	249	300	851	633	2,384	3,635
KY	2009	05	METALS PROCESSING	99,428	7	1,156	3,246	2,550	13,735	1,772
KY	2009	06	PETROLEUM & RELATED INDUSTRIES	4,818	377	2,828	344	230	6,460	3,052
KY	2009	07	OTHER INDUSTRIAL PROCESSES	7,212	84	6,674	32,194	10,912	3,634	27,548
KY	2009	08	SOLVENT UTILIZATION	0	10	11	371	283	1	62,595
KY	2009	09	STORAGE & TRANSPORT	38	9	18	2,064	1,268	3	20,038
KY	2009	10	WASTE DISPOSAL & RECYCLING	22,388	9	1,979	7,770	6,925	733	7,725
KY	2009	11	HIGHWAY VEHICLES	963,762	5,796	101,182	2,976	1,920	759	73,942
KY	2009	12	OFF-HIGHWAY	357,800	34	94,752	5,544	5,203	9,180	38,558
KY	2009	14	MISCELLANEOUS	32,627	52,915	702	206,463	29,601	187	6,335
	2009 Total			**1,549,096**	**60,139**	**373,725**	**277,427**	**71,984**	**361,300**	**257,193**
KY	2018	01	FUEL COMB. ELEC. UTIL.	17,144	476	64,378	6,694	4,434	222,102	1,426
KY	2018	02	FUEL COMB. INDUSTRIAL	15,692	205	64,533	2,203	1,528	43,772	1,555
KY	2018	03	FUEL COMB. OTHER	24,764	53	5,550	6,469	6,169	9,947	7,479
KY	2018	04	CHEMICAL & ALLIED PRODUCT MFG	219	317	367	1,054	781	2,884	4,384
KY	2018	05	METALS PROCESSING	114,470	9	1,508	3,898	3,065	15,800	2,343
KY	2018	06	PETROLEUM & RELATED INDUSTRIES	5,495	434	3,244	392	262	7,426	3,394
KY	2018	07	OTHER INDUSTRIAL PROCESSES	8,303	93	7,872	35,349	12,377	4,141	31,394
KY	2018	08	SOLVENT UTILIZATION	0	12	14	464	352	1	73,525
KY	2018	09	STORAGE & TRANSPORT	44	10	21	2,408	1,481	4	21,196
KY	2018	10	WASTE DISPOSAL & RECYCLING	24,677	11	2,256	8,481	7,518	894	8,392
KY	2018	11	HIGHWAY VEHICLES	807,536	7,811	52,263	2,580	1,272	763	47,066
KY	2018	12	OFF-HIGHWAY	381,215	40	79,392	4,556	4,256	8,592	30,920
KY	2018	14	MISCELLANEOUS	33,931	55,118	729	218,725	30,626	196	7,254
	2018 Total			**1,433,491**	**64,588**	**282,127**	**293,273**	**74,122**	**316,520**	**240,329**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
MS	2002	01	FUEL COMB. ELEC. UTIL.	5,303	190	43,135	1,633	1,138	67,429	648
MS	2002	02	FUEL COMB. INDUSTRIAL	22,711	28	48,699	5,011	3,638	9,746	8,024
MS	2002	03	FUEL COMB. OTHER	36,752	34	4,502	5,445	5,414	789	22,923
MS	2002	04	CHEMICAL & ALLIED PRODUCT MFG	15,410	361	1,725	849	440	1,663	2,375
MS	2002	05	METALS PROCESSING	1,031	0	115	122	58	36	371
MS	2002	06	PETROLEUM & RELATED INDUSTRIES	975	20	1,187	790	335	15,560	20,788
MS	2002	07	OTHER INDUSTRIAL PROCESSES	13,884	747	9,219	27,617	8,051	8,866	15,525
MS	2002	08	SOLVENT UTILIZATION	45	7	105	219	178	1	80,760
MS	2002	09	STORAGE & TRANSPORT	74	0	80	124	38	40	23,327
MS	2002	10	WASTE DISPOSAL & RECYCLING	1,414	9	89	447	324	31	886
MS	2002	11	HIGHWAY VEHICLES	864,290	3,585	111,914	2,859	2,112	4,614	87,672
MS	2002	12	OFF-HIGHWAY	236,752	23	88,787	5,010	4,690	11,315	41,081
MS	2002	14	MISCELLANEOUS	13,386	58,741	288	323,511	42,932	78	654
	2002 Total			**1,212,028**	**63,748**	**309,845**	**373,637**	**69,348**	**120,166**	**305,035**
MS	2009	01	FUEL COMB. ELEC. UTIL.	7,116	334	47,276	5,182	4,996	76,646	564
MS	2009	02	FUEL COMB. INDUSTRIAL	24,607	30	44,095	3,728	2,787	7,388	8,007
MS	2009	03	FUEL COMB. OTHER	26,024	33	4,514	5,278	5,245	751	17,445
MS	2009	04	CHEMICAL & ALLIED PRODUCT MFG	16,141	405	1,955	941	488	1,880	2,614
MS	2009	05	METALS PROCESSING	1,098	0	128	129	62	37	402
MS	2009	06	PETROLEUM & RELATED INDUSTRIES	1,101	23	1,262	894	379	7,926	13,317
MS	2009	07	OTHER INDUSTRIAL PROCESSES	14,181	197	8,376	31,380	8,628	8,254	16,282
MS	2009	08	SOLVENT UTILIZATION	50	8	118	239	194	1	80,393
MS	2009	09	STORAGE & TRANSPORT	92	0	100	172	59	49	23,494
MS	2009	10	WASTE DISPOSAL & RECYCLING	1,486	10	95	473	339	32	743
MS	2009	11	HIGHWAY VEHICLES	609,972	4,035	70,743	2,275	1,508	537	52,107
MS	2009	12	OFF-HIGHWAY	257,453	25	80,567	4,270	3,985	7,191	36,197
MS	2009	14	MISCELLANEOUS	48,314	63,886	1,037	337,018	46,695	283	2,295
	2009 Total			**1,007,634**	**68,987**	**260,266**	**391,978**	**75,365**	**110,975**	**253,858**
MS	2018	01	FUEL COMB. ELEC. UTIL.	17,348	827	21,535	7,412	7,252	15,213	1,274
MS	2018	02	FUEL COMB. INDUSTRIAL	26,082	33	46,792	4,073	3,039	5,167	8,556
MS	2018	03	FUEL COMB. OTHER	20,900	32	4,768	4,964	4,928	726	14,670
MS	2018	04	CHEMICAL & ALLIED PRODUCT MFG	20,175	475	2,337	1,132	588	2,242	3,290
MS	2018	05	METALS PROCESSING	1,357	0	167	160	79	48	461
MS	2018	06	PETROLEUM & RELATED INDUSTRIES	1,267	26	1,294	1,010	430	8,484	14,407
MS	2018	07	OTHER INDUSTRIAL PROCESSES	16,267	216	9,996	38,492	10,492	9,657	20,301
MS	2018	08	SOLVENT UTILIZATION	60	9	141	301	244	1	98,354
MS	2018	09	STORAGE & TRANSPORT	115	0	124	210	73	62	24,537
MS	2018	10	WASTE DISPOSAL & RECYCLING	1,638	12	114	533	372	34	870
MS	2018	11	HIGHWAY VEHICLES	445,493	4,566	30,619	1,624	819	440	31,616
MS	2018	12	OFF-HIGHWAY	270,726	29	68,252	3,452	3,203	6,638	28,842
MS	2018	14	MISCELLANEOUS	50,160	70,096	1,076	352,321	47,869	294	2,377
	2018 Total			**871,587**	**76,321**	**187,215**	**415,685**	**79,388**	**49,006**	**249,556**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
NC	2002	01	FUEL COMB. ELEC. UTIL.	13,885	54	151,850	22,754	16,498	477,990	988
NC	2002	02	FUEL COMB. INDUSTRIAL	23,578	301	48,590	5,596	4,334	33,395	2,540
NC	2002	03	FUEL COMB. OTHER	217,008	2,318	16,460	31,777	26,746	3,971	87,985
NC	2002	04	CHEMICAL & ALLIED PRODUCT MFG	13,952	535	859	866	538	5,736	4,313
NC	2002	05	METALS PROCESSING	5,876	60	201	564	467	1,010	2,512
NC	2002	06	PETROLEUM & RELATED INDUSTRIES	461	0	174	104	52	283	140
NC	2002	07	OTHER INDUSTRIAL PROCESSES	8,552	480	7,380	25,328	8,924	3,426	18,025
NC	2002	08	SOLVENT UTILIZATION	130	307	229	524	484	26	151,383
NC	2002	09	STORAGE & TRANSPORT	66	46	53	639	354	1	16,120
NC	2002	10	WASTE DISPOSAL & RECYCLING	125,528	247	7,482	2,239	2,218	1,666	15,568
NC	2002	11	HIGHWAY VEHICLES	2,873,992	9,702	327,329	6,579	4,623	12,420	263,766
NC	2002	12	OFF-HIGHWAY	808,231	65	84,284	7,348	7,005	7,693	94,480
NC	2002	14	MISCELLANEOUS	35,218	158,900	757	229,909	33,291	203	1,765
	2002 Total			**4,126,478**	**173,014**	**645,648**	**334,226**	**105,533**	**547,821**	**659,585**
NC	2009	01	FUEL COMB. ELEC. UTIL.	14,942	445	66,516	22,152	15,949	242,286	954
NC	2009	02	FUEL COMB. INDUSTRIAL	24,871	312	38,161	5,159	3,871	30,788	2,510
NC	2009	03	FUEL COMB. OTHER	158,837	2,723	18,441	25,334	19,467	4,060	49,819
NC	2009	04	CHEMICAL & ALLIED PRODUCT MFG	14,732	599	933	981	607	6,286	4,925
NC	2009	05	METALS PROCESSING	6,358	67	207	627	528	1,130	2,790
NC	2009	06	PETROLEUM & RELATED INDUSTRIES	556	0	212	127	64	349	162
NC	2009	07	OTHER INDUSTRIAL PROCESSES	9,211	507	8,061	28,524	9,788	3,712	18,144
NC	2009	08	SOLVENT UTILIZATION	142	335	246	549	506	28	136,114
NC	2009	09	STORAGE & TRANSPORT	75	51	55	696	380	1	17,367
NC	2009	10	WASTE DISPOSAL & RECYCLING	139,518	307	8,354	2,774	2,750	1,913	17,331
NC	2009	11	HIGHWAY VEHICLES	1,991,708	11,825	201,609	5,572	3,493	1,503	168,676
NC	2009	12	OFF-HIGHWAY	887,605	72	70,997	6,055	5,760	1,892	74,056
NC	2009	14	MISCELLANEOUS	96,825	167,131	2,080	250,912	49,956	566	4,648
	2009 Total			**3,345,380**	**184,373**	**415,874**	**349,461**	**113,118**	**294,514**	**497,496**
NC	2018	01	FUEL COMB. ELEC. UTIL.	19,870	663	61,103	35,275	28,137	120,165	1,302
NC	2018	02	FUEL COMB. INDUSTRIAL	26,873	341	40,898	5,594	4,222	32,507	2,702
NC	2018	03	FUEL COMB. OTHER	131,365	2,857	20,027	21,847	16,231	4,050	34,104
NC	2018	04	CHEMICAL & ALLIED PRODUCT MFG	18,463	702	1,105	1,175	726	7,414	6,113
NC	2018	05	METALS PROCESSING	7,576	76	255	771	657	1,335	3,516
NC	2018	06	PETROLEUM & RELATED INDUSTRIES	712	0	272	162	82	448	207
NC	2018	07	OTHER INDUSTRIAL PROCESSES	10,675	559	9,259	34,339	11,601	4,357	20,978
NC	2018	08	SOLVENT UTILIZATION	169	375	277	588	540	31	152,979
NC	2018	09	STORAGE & TRANSPORT	91	59	67	808	430	2	19,511
NC	2018	10	WASTE DISPOSAL & RECYCLING	156,599	387	9,456	3,502	3,474	2,234	19,789
NC	2018	11	HIGHWAY VEHICLES	1,362,214	14,065	87,791	4,392	2,123	1,481	101,099
NC	2018	12	OFF-HIGHWAY	960,709	83	49,046	4,298	4,069	905	61,327
NC	2018	14	MISCELLANEOUS	111,705	177,474	2,399	273,030	54,376	655	5,333
	2018 Total			**2,807,022**	**197,643**	**281,955**	**385,780**	**126,667**	**175,583**	**428,960**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
SC	2002	01	FUEL COMB. ELEC. UTIL.	6,990	142	88,241	21,400	17,154	206,399	470
SC	2002	02	FUEL COMB. INDUSTRIAL	31,771	97	38,081	5,308	3,641	44,958	1,338
SC	2002	03	FUEL COMB. OTHER	75,800	65	4,367	6,261	6,166	4,318	49,171
SC	2002	04	CHEMICAL & ALLIED PRODUCT MFG	2,526	173	25	501	318	59	8,784
SC	2002	05	METALS PROCESSING	13,833	0	450	639	408	4,160	660
SC	2002	06	PETROLEUM & RELATED INDUSTRIES	248	0	283	120	71	170	114
SC	2002	07	OTHER INDUSTRIAL PROCESSES	9,502	1,237	15,145	15,224	6,981	12,128	16,342
SC	2002	08	SOLVENT UTILIZATION	0	1	1	78	60	0	88,878
SC	2002	09	STORAGE & TRANSPORT	10	0	4	1,025	626	0	21,009
SC	2002	10	WASTE DISPOSAL & RECYCLING	44,844	10	3,380	6,852	6,321	625	13,708
SC	2002	11	HIGHWAY VEHICLES	1,241,359	4,694	140,489	3,452	2,501	5,972	116,163
SC	2002	12	OFF-HIGHWAY	413,964	33	50,249	4,152	3,945	4,866	55,016
SC	2002	14	MISCELLANEOUS	239,836	28,975	4,678	264,959	48,898	1,281	13,655
	2002 Total			**2,080,683**	**35,426**	**345,395**	**329,971**	**97,090**	**284,936**	**385,308**
SC	2009	01	FUEL COMB. ELEC. UTIL.	11,643	370	48,668	20,041	16,548	129,122	723
SC	2009	02	FUEL COMB. INDUSTRIAL	32,661	105	35,011	2,978	2,087	36,660	1,374
SC	2009	03	FUEL COMB. OTHER	49,914	63	4,551	5,264	5,183	4,359	25,073
SC	2009	04	CHEMICAL & ALLIED PRODUCT MFG	2,798	173	26	543	345	60	7,409
SC	2009	05	METALS PROCESSING	15,632	0	448	631	378	4,856	663
SC	2009	06	PETROLEUM & RELATED INDUSTRIES	302	0	340	145	86	200	131
SC	2009	07	OTHER INDUSTRIAL PROCESSES	10,241	1,403	15,069	18,201	7,997	13,443	15,425
SC	2009	08	SOLVENT UTILIZATION	1	1	1	75	58	0	94,590
SC	2009	09	STORAGE & TRANSPORT	13	0	5	569	352	0	21,987
SC	2009	10	WASTE DISPOSAL & RECYCLING	70,379	11	4,215	9,526	8,977	666	15,998
SC	2009	11	HIGHWAY VEHICLES	889,957	5,523	92,499	2,862	1,855	721	72,603
SC	2009	12	OFF-HIGHWAY	448,625	36	43,235	3,471	3,294	1,701	43,061
SC	2009	14	MISCELLANEOUS	250,690	31,416	4,962	282,480	51,151	1,359	13,906
	2009 Total			**1,782,856**	**39,101**	**249,028**	**346,786**	**98,312**	**193,147**	**312,943**
SC	2018	01	FUEL COMB. ELEC. UTIL.	14,975	625	51,751	27,640	23,794	95,377	931
SC	2018	02	FUEL COMB. INDUSTRIAL	35,532	113	36,645	3,683	2,548	38,548	1,482
SC	2018	03	FUEL COMB. OTHER	39,627	65	5,135	4,791	4,711	4,469	16,391
SC	2018	04	CHEMICAL & ALLIED PRODUCT MFG	3,296	212	32	664	423	74	9,107
SC	2018	05	METALS PROCESSING	18,853	0	585	773	476	5,920	867
SC	2018	06	PETROLEUM & RELATED INDUSTRIES	389	0	438	186	110	258	166
SC	2018	07	OTHER INDUSTRIAL PROCESSES	12,136	1,566	17,507	20,128	8,981	15,863	18,290
SC	2018	08	SOLVENT UTILIZATION	1	1	1	93	72	0	119,154
SC	2018	09	STORAGE & TRANSPORT	16	0	6	1,380	842	0	22,739
SC	2018	10	WASTE DISPOSAL & RECYCLING	73,403	13	4,512	10,038	9,443	735	17,167
SC	2018	11	HIGHWAY VEHICLES	663,493	6,473	43,490	2,184	1,087	643	46,301
SC	2018	12	OFF-HIGHWAY	481,332	41	31,758	2,617	2,474	1,198	36,131
SC	2018	14	MISCELLANEOUS	250,637	34,345	4,961	306,342	53,367	1,359	13,896
	2018 Total			**1,593,690**	**43,455**	**196,820**	**380,519**	**108,327**	**164,444**	**302,623**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
TN	2002	01	FUEL COMB. ELEC. UTIL.	7,084	204	157,307	14,640	12,166	334,151	926
TN	2002	02	FUEL COMB. INDUSTRIAL	15,257	6	44,510	8,015	6,649	74,146	2,021
TN	2002	03	FUEL COMB. OTHER	77,857	25	15,568	7,967	7,549	16,253	18,346
TN	2002	04	CHEMICAL & ALLIED PRODUCT MFG	36,920	1,518	1,772	3,246	2,201	6,516	24,047
TN	2002	05	METALS PROCESSING	41,371	14	1,182	7,620	7,030	5,818	6,898
TN	2002	06	PETROLEUM & RELATED INDUSTRIES	543	0	331	314	243	383	1,850
TN	2002	07	OTHER INDUSTRIAL PROCESSES	9,420	44	11,794	30,484	12,867	5,845	27,336
TN	2002	08	SOLVENT UTILIZATION	275	1	5,066	2,103	1,818	58	110,872
TN	2002	09	STORAGE & TRANSPORT	22	24	105	1,249	736	134	21,962
TN	2002	10	WASTE DISPOSAL & RECYCLING	22,143	31	1,839	7,068	6,469	349	15,505
TN	2002	11	HIGHWAY VEHICLES	1,917,842	6,625	238,577	5,371	3,949	9,226	179,807
TN	2002	12	OFF-HIGHWAY	505,163	43	96,827	6,819	6,458	10,441	66,450
TN	2002	14	MISCELLANEOUS	5,003	34,292	100	179,440	24,708	25	1,978
	2002 Total			**2,638,901**	**42,825**	**574,980**	**274,337**	**92,841**	**463,345**	**477,997**
TN	2009	01	FUEL COMB. ELEC. UTIL.	7,214	227	66,405	15,608	13,092	255,410	932
TN	2009	02	FUEL COMB. INDUSTRIAL	15,536	6	37,046	7,157	5,973	63,076	1,773
TN	2009	03	FUEL COMB. OTHER	61,442	27	14,792	7,134	6,786	16,955	12,781
TN	2009	04	CHEMICAL & ALLIED PRODUCT MFG	35,440	1,719	1,958	3,369	2,271	1,949	15,492
TN	2009	05	METALS PROCESSING	45,183	15	1,245	7,337	6,823	6,537	7,671
TN	2009	06	PETROLEUM & RELATED INDUSTRIES	572	0	328	355	276	263	1,401
TN	2009	07	OTHER INDUSTRIAL PROCESSES	9,911	62	12,635	32,599	13,687	6,240	28,338
TN	2009	08	SOLVENT UTILIZATION	309	1	5,983	2,431	2,095	65	112,264
TN	2009	09	STORAGE & TRANSPORT	26	31	12	1,218	733	42	23,686
TN	2009	10	WASTE DISPOSAL & RECYCLING	23,810	35	1,993	7,618	6,968	393	14,922
TN	2009	11	HIGHWAY VEHICLES	1,338,016	7,782	151,912	4,206	2,751	1,076	115,181
TN	2009	12	OFF-HIGHWAY	554,121	48	86,641	5,877	5,557	5,651	55,358
TN	2009	14	MISCELLANEOUS	17,921	35,200	379	192,464	26,830	102	2,814
	2009 Total			**2,109,500**	**45,152**	**381,331**	**287,371**	**93,842**	**357,760**	**392,612**
TN	2018	01	FUEL COMB. ELEC. UTIL.	7,723	241	31,715	15,941	13,387	112,672	976
TN	2018	02	FUEL COMB. INDUSTRIAL	16,702	7	38,028	7,648	6,408	47,982	1,905
TN	2018	03	FUEL COMB. OTHER	54,486	30	15,502	6,757	6,412	18,091	10,269
TN	2018	04	CHEMICAL & ALLIED PRODUCT MFG	45,455	2,053	2,424	4,263	2,888	6,563	19,950
TN	2018	05	METALS PROCESSING	52,834	17	1,589	9,579	8,953	7,790	9,950
TN	2018	06	PETROLEUM & RELATED INDUSTRIES	665	0	378	414	324	309	1,598
TN	2018	07	OTHER INDUSTRIAL PROCESSES	10,946	88	14,157	38,196	16,242	7,286	35,126
TN	2018	08	SOLVENT UTILIZATION	380	1	7,675	3,154	2,717	79	140,760
TN	2018	09	STORAGE & TRANSPORT	33	41	14	1,571	939	49	25,491
TN	2018	10	WASTE DISPOSAL & RECYCLING	26,712	42	2,326	8,562	7,828	468	17,530
TN	2018	11	HIGHWAY VEHICLES	976,634	9,021	69,385	3,092	1,544	948	67,324
TN	2018	12	OFF-HIGHWAY	593,100	55	70,226	4,672	4,403	5,207	45,084
TN	2018	14	MISCELLANEOUS	19,210	36,213	408	209,058	28,209	111	3,293
	2018 Total			**1,804,879**	**47,809**	**253,828**	**312,906**	**100,255**	**207,555**	**379,257**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
VA	2002	01	FUEL COMB. ELEC. UTIL.	6,892	127	86,886	3,960	2,606	241,204	754
VA	2002	02	FUEL COMB. INDUSTRIAL	64,398	100	75,831	18,480	8,453	137,451	5,332
VA	2002	03	FUEL COMB. OTHER	98,788	13	15,648	11,572	11,236	5,508	54,496
VA	2002	04	CHEMICAL & ALLIED PRODUCT MFG	321	2,158	8,062	449	393	2,126	1,530
VA	2002	05	METALS PROCESSING	3,580	0	937	1,575	1,349	5,251	513
VA	2002	06	PETROLEUM & RELATED INDUSTRIES	23,384	0	182	255	153	170	501
VA	2002	07	OTHER INDUSTRIAL PROCESSES	12,002	726	9,279	33,409	9,795	17,702	13,086
VA	2002	08	SOLVENT UTILIZATION	0	4	0	225	210	2	111,511
VA	2002	09	STORAGE & TRANSPORT	16	7	11	745	505	0	26,121
VA	2002	10	WASTE DISPOSAL & RECYCLING	16,566	109	1,866	3,152	1,277	1,581	4,065
VA	2002	11	HIGHWAY VEHICLES	2,163,259	7,852	222,374	4,549	3,102	8,294	159,790
VA	2002	12	OFF-HIGHWAY	660,105	48	63,219	8,728	8,288	8,663	74,866
VA	2002	14	MISCELLANEOUS	16,238	43,961	350	182,486	22,086	92	848
	2002 Total			**3,065,551**	**55,105**	**484,646**	**269,585**	**69,453**	**428,046**	**453,413**
VA	2009	01	FUEL COMB. ELEC. UTIL.	12,535	694	64,358	5,606	4,165	174,777	788
VA	2009	02	FUEL COMB. INDUSTRIAL	67,422	105	67,263	18,346	8,345	131,459	5,483
VA	2009	03	FUEL COMB. OTHER	66,016	10	15,920	10,059	9,741	5,118	28,062
VA	2009	04	CHEMICAL & ALLIED PRODUCT MFG	286	2,082	7,790	477	413	1,996	1,419
VA	2009	05	METALS PROCESSING	3,397	0	827	1,563	1,332	4,813	390
VA	2009	06	PETROLEUM & RELATED INDUSTRIES	26,288	0	197	275	169	187	557
VA	2009	07	OTHER INDUSTRIAL PROCESSES	12,471	733	9,425	33,961	9,984	18,643	13,394
VA	2009	08	SOLVENT UTILIZATION	0	5	0	248	231	3	110,127
VA	2009	09	STORAGE & TRANSPORT	17	7	12	797	544	0	26,456
VA	2009	10	WASTE DISPOSAL & RECYCLING	20,109	119	2,174	3,823	1,515	1,805	4,789
VA	2009	11	HIGHWAY VEHICLES	1,453,946	9,086	134,232	3,747	2,241	1,079	96,770
VA	2009	12	OFF-HIGHWAY	726,815	53	54,993	7,510	7,136	1,707	57,009
VA	2009	14	MISCELLANEOUS	21,582	46,719	464	198,040	23,990	124	1,077
	2009 Total			**2,410,884**	**59,612**	**357,655**	**284,451**	**69,806**	**341,710**	**346,321**
VA	2018	01	FUEL COMB. ELEC. UTIL.	18,850	606	64,344	12,551	10,773	98,988	980
VA	2018	02	FUEL COMB. INDUSTRIAL	72,065	114	70,132	19,247	8,904	134,790	5,861
VA	2018	03	FUEL COMB. OTHER	53,171	14	17,852	9,427	9,086	5,230	18,603
VA	2018	04	CHEMICAL & ALLIED PRODUCT MFG	338	2,462	9,211	579	502	1,297	1,708
VA	2018	05	METALS PROCESSING	4,034	0	1,017	1,861	1,592	5,374	469
VA	2018	06	PETROLEUM & RELATED INDUSTRIES	30,284	0	228	315	194	217	642
VA	2018	07	OTHER INDUSTRIAL PROCESSES	14,029	877	10,836	37,553	11,276	18,088	15,636
VA	2018	08	SOLVENT UTILIZATION	0	6	0	314	293	3	127,953
VA	2018	09	STORAGE & TRANSPORT	21	8	15	949	648	0	27,357
VA	2018	10	WASTE DISPOSAL & RECYCLING	24,293	141	2,595	4,694	1,828	2,170	5,821
VA	2018	11	HIGHWAY VEHICLES	1,075,104	10,624	63,342	3,212	1,543	1,043	61,964
VA	2018	12	OFF-HIGHWAY	797,683	61	40,393	6,208	5,891	507	49,052
VA	2018	14	MISCELLANEOUS	27,223	50,279	584	218,141	26,225	158	1,322
	2018 Total			**2,117,096**	**65,192**	**280,549**	**315,051**	**78,754**	**267,867**	**317,368**

State Tier 1 Emission Totals

State	Year	TIER1	TIER 1 NAME	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
WV	2002	01	FUEL COMB. ELEC. UTIL.	10,341	121	230,977	4,573	2,210	516,084	1,180
WV	2002	02	FUEL COMB. INDUSTRIAL	8,685	97	33,825	1,583	1,332	37,111	1,097
WV	2002	03	FUEL COMB. OTHER	29,480	13	15,220	3,814	3,683	3,990	9,275
WV	2002	04	CHEMICAL & ALLIED PRODUCT MFG	50,835	80	1,627	950	831	9,052	5,755
WV	2002	05	METALS PROCESSING	28,837	143	1,570	8,749	7,515	5,619	1,393
WV	2002	06	PETROLEUM & RELATED INDUSTRIES	1	0	1,086	475	475	7,550	2,163
WV	2002	07	OTHER INDUSTRIAL PROCESSES	2,003	56	5,347	18,751	5,567	2,316	1,803
WV	2002	08	SOLVENT UTILIZATION	15	0	18	49	44	0	35,989
WV	2002	09	STORAGE & TRANSPORT	15	0	3	1,952	947	0	12,432
WV	2002	10	WASTE DISPOSAL & RECYCLING	9,395	8	599	4,153	3,731	100	5,098
WV	2002	11	HIGHWAY VEHICLES	533,471	1,908	58,999	1,381	995	2,464	42,174
WV	2002	12	OFF-HIGHWAY	133,113	9	33,239	1,850	1,728	2,112	18,566
WV	2002	14	MISCELLANEOUS	6,897	9,928	149	93,030	10,799	40	349
	2002 Total			**813,089**	**12,364**	**382,659**	**141,310**	**39,857**	**586,436**	**137,275**
WV	2009	01	FUEL COMB. ELEC. UTIL.	11,493	330	85,476	5,657	2,940	268,952	1,361
WV	2009	02	FUEL COMB. INDUSTRIAL	9,529	104	27,109	1,432	1,243	36,964	979
WV	2009	03	FUEL COMB. OTHER	21,558	13	14,229	3,351	3,216	4,047	6,824
WV	2009	04	CHEMICAL & ALLIED PRODUCT MFG	58,271	82	1,804	981	858	10,102	5,426
WV	2009	05	METALS PROCESSING	24,501	116	1,494	2,016	1,507	5,608	831
WV	2009	06	PETROLEUM & RELATED INDUSTRIES	1	0	1,221	535	535	8,495	2,172
WV	2009	07	OTHER INDUSTRIAL PROCESSES	2,288	59	4,995	19,240	5,910	2,570	2,064
WV	2009	08	SOLVENT UTILIZATION	17	0	20	52	47	0	32,199
WV	2009	09	STORAGE & TRANSPORT	17	0	3	1,756	695	0	12,997
WV	2009	10	WASTE DISPOSAL & RECYCLING	9,131	8	583	4,036	3,618	97	4,806
WV	2009	11	HIGHWAY VEHICLES	365,549	2,148	35,635	1,068	684	279	24,843
WV	2009	12	OFF-HIGHWAY	152,862	11	30,133	1,640	1,528	359	18,069
WV	2009	14	MISCELLANEOUS	4,116	10,574	89	93,957	11,002	23	219
	2009 Total			**659,332**	**13,446**	**202,791**	**135,720**	**33,782**	**337,495**	**112,790**
WV	2018	01	FUEL COMB. ELEC. UTIL.	12,397	143	51,474	5,784	3,116	106,199	1,387
WV	2018	02	FUEL COMB. INDUSTRIAL	10,174	111	28,764	1,505	1,308	38,571	1,048
WV	2018	03	FUEL COMB. OTHER	18,891	16	17,254	3,160	3,024	4,065	6,270
WV	2018	04	CHEMICAL & ALLIED PRODUCT MFG	70,252	99	2,183	1,181	1,034	12,196	6,560
WV	2018	05	METALS PROCESSING	28,563	148	1,929	2,491	1,887	6,735	1,087
WV	2018	06	PETROLEUM & RELATED INDUSTRIES	1	0	1,407	616	616	9,786	2,338
WV	2018	07	OTHER INDUSTRIAL PROCESSES	2,756	68	5,949	21,363	6,809	3,101	2,561
WV	2018	08	SOLVENT UTILIZATION	20	0	24	61	55	0	37,886
WV	2018	09	STORAGE & TRANSPORT	19	0	4	2,080	824	0	13,394
WV	2018	10	WASTE DISPOSAL & RECYCLING	9,237	10	592	4,116	3,674	98	5,153
WV	2018	11	HIGHWAY VEHICLES	274,804	2,497	17,247	819	405	253	16,121
WV	2018	12	OFF-HIGHWAY	167,424	13	25,710	1,292	1,198	56	14,086
WV	2018	14	MISCELLANEOUS	5,175	11,453	112	99,667	11,803	29	268
	2018 Total			**599,712**	**14,557**	**152,647**	**144,134**	**35,752**	**181,088**	**108,159**

State Tier 1 Emission Totals

	CO	NH3	NOX	PM10	PM2.5	SO2	VOC
VISTAS 2002 Total	**30,073,168**	**665,818**	**5,429,845**	**3,895,998**	**1,075,343**	**4,879,941**	**5,178,836**
VISTAS 2009 Total	**25,397,398**	**721,736**	**3,790,044**	**4,160,870**	**1,123,548**	**3,465,859**	**4,187,921**
VISTAS 2018 Total	**22,645,302**	**792,678**	**2,722,636**	**4,548,634**	**1,194,728**	**2,169,725**	**3,910,170**

APPENDIX D:

VISTAS TIER 1 EMISSION TOTALS

VISTAS Tier 1 Emission Totals

Year	TIER1	TIER1NAME	CO	NH3	NOX	PM10-PRI	PM25-PRI	SO2	VOC
2002	01	FUEL COMB. ELEC. UTIL.	141,217	1,799	1,523,445	113,917	79,269	3,743,723	12,515
2002	02	FUEL COMB. INDUSTRIAL	371,932	1,204	499,943	85,357	59,735	550,866	32,333
2002	03	FUEL COMB. OTHER	759,534	2,810	122,062	99,532	91,805	114,852	354,375
2002	04	CHEMICAL & ALLIED PRODUCT MFG	131,993	7,093	20,896	11,114	7,982	77,450	63,748
2002	05	METALS PROCESSING	223,705	601	11,801	32,367	27,778	49,143	17,306
2002	06	PETROLEUM & RELATED INDUSTRIES	44,633	355	7,204	2,887	1,863	53,392	33,374
2002	07	OTHER INDUSTRIAL PROCESSES	156,077	7,520	114,474	267,980	97,013	86,736	196,831
2002	08	SOLVENT UTILIZATION	687	331	5,677	3,805	3,284	90	1,288,990
2002	09	STORAGE & TRANSPORT	610	85	1,069	10,968	6,100	230	261,959
2002	10	WASTE DISPOSAL & RECYCLING	546,331	801	28,738	80,336	73,673	6,418	99,497
2002	11	HIGHWAY VEHICLES	19,432,305	73,670	2,187,683	50,338	35,813	89,296	1,890,798
2002	12	OFF-HIGHWAY	6,209,596	477	865,130	72,019	68,302	96,336	813,788
2002	14	MISCELLANEOUS	2,054,548	569,073	41,724	3,065,377	522,726	11,407	113,321
2002 Total			**30,073,168**	**665,818**	**5,429,845**	**3,895,998**	**1,075,343**	**4,879,941**	**5,178,836**
2009	01	FUEL COMB. ELEC. UTIL.	190,535	5,474	789,299	125,750	91,587	2,497,423	14,208
2009	02	FUEL COMB. INDUSTRIAL	391,422	1,305	445,967	74,588	51,491	514,636	32,431
2009	03	FUEL COMB. OTHER	544,289	3,198	123,297	85,410	77,042	112,323	207,146
2009	04	CHEMICAL & ALLIED PRODUCT MFG	140,910	7,611	22,031	11,742	8,394	76,021	54,168
2009	05	METALS PROCESSING	236,473	705	11,763	25,130	21,288	54,337	17,954
2009	06	PETROLEUM & RELATED INDUSTRIES	48,118	399	7,863	3,282	2,124	46,975	25,028
2009	07	OTHER INDUSTRIAL PROCESSES	166,088	7,545	117,625	298,719	111,218	90,420	202,567
2009	08	SOLVENT UTILIZATION	771	360	6,662	4,274	3,679	100	1,256,884
2009	09	STORAGE & TRANSPORT	702	98	1,087	10,729	5,743	160	275,462
2009	10	WASTE DISPOSAL & RECYCLING	770,459	869	36,697	105,449	97,841	7,287	113,473
2009	11	HIGHWAY VEHICLES	13,864,869	87,027	1,414,834	41,861	26,498	10,962	1,217,185
2009	12	OFF-HIGHWAY	6,827,857	530	767,707	61,528	58,279	42,845	649,786
2009	14	MISCELLANEOUS	2,214,906	606,617	45,212	3,312,407	568,364	12,370	121,629
2009 Total			**25,397,398**	**721,736**	**3,790,044**	**4,160,870**	**1,123,548**	**3,465,859**	**4,187,921**
2018	01	FUEL COMB. ELEC. UTIL.	262,414	9,306	568,158	152,642	118,959	1,169,110	17,090
2018	02	FUEL COMB. INDUSTRIAL	416,721	1,383	470,326	80,011	55,648	513,072	34,720
2018	03	FUEL COMB. OTHER	453,482	3,358	136,431	78,032	69,854	116,672	149,363
2018	04	CHEMICAL & ALLIED PRODUCT MFG	173,857	9,023	26,564	14,454	10,360	94,010	67,414
2018	05	METALS PROCESSING	279,850	926	14,871	31,221	26,572	66,150	23,089
2018	06	PETROLEUM & RELATED INDUSTRIES	53,392	460	8,891	3,845	2,490	43,055	27,283
2018	07	OTHER INDUSTRIAL PROCESSES	189,922	8,793	136,722	348,119	130,778	100,824	237,601
2018	08	SOLVENT UTILIZATION	936	404	8,480	5,354	4,601	119	1,515,005
2018	09	STORAGE & TRANSPORT	855	119	1,258	13,540	7,283	192	290,267
2018	10	WASTE DISPOSAL & RECYCLING	821,737	1,068	40,324	114,690	105,745	8,544	125,406
2018	11	HIGHWAY VEHICLES	10,312,627	103,394	663,796	33,426	16,403	10,281	752,732
2018	12	OFF-HIGHWAY	7,438,312	612	601,040	48,648	45,927	35,166	546,062
2018	14	MISCELLANEOUS	2,241,196	653,831	45,776	3,624,653	600,107	12,532	124,137
2018 Total			**22,645,302**	**792,678**	**2,722,636**	**4,548,634**	**1,194,728**	**2,169,725**	**3,910,170**

APPENDIX E:

AIRCRAFT PM EXCERPT FROM 2001 TUCSON REPORT

Final Report

EMISSIONS INVENTORIES FOR THE TUCSON AIR PLANNING AREA

VOLUME I. STUDY DESCRIPTION AND RESULTS

Prepared for

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ABBREVIATIONS AND ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADWM	Arizona Department of Weights and Measures
ALD2	High Molecular Weight Aldehydes (RCHO, R≠H)
AML	Arc Macro Language
AQM	Air Quality Model
APU	Aircraft Power Unit
ARB	California Air Resources Board
ASC	Area Source Category Code
AT	Air Taxi
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CSF	Chemical Speciation Factor
DM	Davis-Monthan Air Force Base
DOT	Department of Transportation
EDMS	Emissions Dispersion Modeling System
EEA	Energy & Environmental Analysis, Inc.
EIPP	Emission Inventory Preparation Plan
EPA	The U.S. Environmental Protection Agency
ETH	Ethene ($CH_2{=}CH_2$)
FAA	Federal Aviation Administration
FAEED	FAA Aircraft Engine Emission Database
FIPS	Federal Information Processing System
FIRE	EPA's Factor Information REtrieval Data System
FORM	Formaldehyde ($CH_2{=}O$)
GA	General Aviation
GIS	Geographical Information System
GSE	Ground Support Equipment
ICAO	International Civil Aviation Organization

ABBREVIATIONS AND ACRONYMS

ISOP	Isoprene
LPG	Liquid Petroleum Gas
LTO	Landing and TakeOff
NAD27	North American Datum - 1927
NCDC	National Climatic Data Center
NEI	US EPA National Emission Inventory
NEVES	Nonroad Engine and Vehicle Emission Study
NG	Natural Gas
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Oxides of Nitrogen
OLE	Olefinic Carbon Bond (C═C)
ORNL	Oak Ridge National Laboratory
PAG	Pima Association of Governments
PAR	Paraffinic Carbon Bond (C—C)
PDEQ	Pima County Department of Environmental Quality
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PM_{10}	Particulate Matter less than 10 microns
RASP	Regional Aviation System Plan
RVP	Reid Vapor Pressure
SAF	Spatial Allocation Factor
SCC	Source Category Code
SCF	Standard Cubic Foot
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_X	Oxides of Sulfur
TAF	Temporal Allocation Factor

ABBREVIATIONS AND ACRONYMS

TAPA	Tucson Air Planning Area
TAZ	Transportation Analysis Zone
THC	Total Hydrocarbon
TIA	Tucson International Airport
TIM	Time-In-Mode
TOL	Tolulene (C_6H_5—CH_3)
TTN	EPA Technology Transfer Network
UAM	Urban Airshed Model
UP	Union Pacific Railroad
VOC	Volatile Organic Compounds as defined by the 1990 Clean Air Act Amendments
XYL	Xylene (C_6H_6—$(CH_3)_2$)

(Prior material unrelated to VISTAS modeling is intentionally omitted)

While emission rates for HC, CO, and NO_x are routinely measured from (new) commercial air carrier engines under the emissions certification component of International Civil Aviation Organization (ICAO) regulations, measurement of PM emissions is not required. As a result, almost all aircraft engine PM emission rate data have been collected under special studies. Currently, such data exists for only about 20 aircraft engines, with a considerable portion of these data collected by the U.S. Air Force for military aircraft engines. While emission factors for these engines are included in the AP-42 database upon which the FAEED and EDMS emission inventory models were developed, they have not been included in either model due to their limited applicability. To date, it has been standard EPA practice not to estimate PM emissions for aircraft engines. However, since the emissions models maintain a placekeeper for PM emission rates and include PM emission estimates for GSE, it can appear to the uninformed user that aircraft PM emission rates are zero. As a result, aircraft are often incorrectly considered to be insignificant PM sources even though those engines tested for PM have demonstrated significant emission rates. This policy of exclusion by omission is not appropriate in developing an accurate modeling inventory, even in the absence of a large emissions database. While a precise emissions estimate cannot be made with available data, it is clear that a zero emission rate is far from accurate.

As an alternative for this study, measured emissions data for aircraft engines that have been tested for PM were statistically analyzed to determine whether or not a relationship to other measured emissions parameters could be established. Intuitively, it was hoped that an inverse relationship with NO_x might be demonstrated, as such a relationship is theoretically attractive. While the level of sophistication of the statistical analysis is constrained by the quantity of data available, simple direct and indirect linear relationships can be examined. Because data are not available for each test engine in each of the four LTO cycle modes and because relationships might be expected to vary by operating mode (due to significant changes in engine and combustion efficiency), all statistical analysis was performed for each operating mode individually.

Statistically significant relationships were found for the direct linear analysis for three of the four LTO cycle modes. Significant in this context means that coefficient t-statistics for one or more of the other measured pollutants (HC, CO, or NO_x) indicated a direct relationship with measured PM (at a confidence level exceeding 95 percent). In all cases, correlation coefficients were poor (as expected), suggesting a high level of variability and poor predictability of PM emissions for any given engine. Nevertheless, statistics were unbiased and should provide an accurate mechanism to initially assess PM emissions on a aggregate basis (i.e., over a range of aircraft engine models such as those associated with an analysis for an entire set of airport operations). Only at idle was no significant relation found, which is not surprising given relative engine inefficiency in this mode.

The indirect linear analysis revealed a consistent and significant inverse relationship between PM and NO_x based on calculated t-statistics. Correlation coefficients continue to be poor, but t-statistics are generally improved over those of the direct linear analysis (all developed inverse relations, including idle, were significant at the 99 percent confidence level). In selecting the most appropriate relationship for estimation of PM emission rates for non-tested aircraft engines, the statistical analysis that produced the best combination of a significant t-statistic, a relatively low root mean square error, and an intuitive engineering basis was identified. This was the inverse NO_x relationship for the takeoff (i.e., full throttle) mode of operation. Figure 4-1 illustrates the selected statistical relationship.

With this relationship established, PM emission rate data for the other aircraft operating modes (i.e., the approach, taxi, and climbout modes) was statistically analyzed against observed PM emission rate data for the takeoff mode. Statistically significant relations were developed for all three modes. Table 4-23 presents the coefficients developed for these PM-to-PM regressions as well as the statistics for the PM-to-NO_x regression developed for the takeoff mode. These four relations were used to develop a set of fleetwide PM emission factors based on measured takeoff NO_x emission rates. These emission factors were then input into the EEA aircraft emissions model and used to generate PM emission estimates for TIA aircraft operations.

FIGURE 4-1. Relationship Used to Estimate Aircraft PM Emission Rates

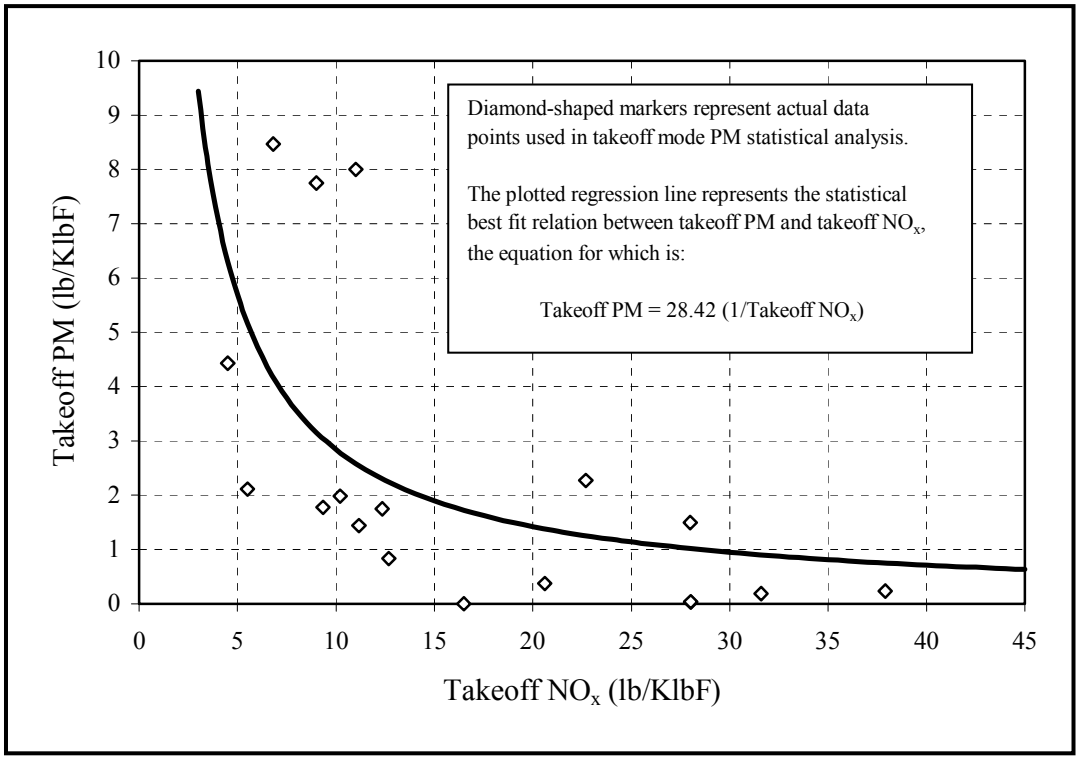


TABLE 4-23. Statistics for Aircraft and APU PM Relations

Statistical Parameter	Takeoff PM	Climbout PM	Approach PM	Taxi PM
Predictive Parameter	1/Takeoff NO_x	Takeoff PM	Takeoff PM	Takeoff PM
Coefficient	28.42	1.42	1.53	3.10
Coefficient t-statistic	5.1	11.8	14.9	5.7
Correlation Coefficient	0.30	0.84	0.91	0.56
F-statistic	7.4	86.1	135.7	21.9
Number of Observations	18	17	15	18

(Subsequent material unrelated to VISTAS modeling is intentionally omitted)

APPENDIX F:

COMPARISON OF BASE F AND BASE G ON-ROAD MOBILE EMISSIONS

Base G Onroad Mobile Emissions (Annual Tons)

	VOC			NOx			CO			SO2			PM-10			PM-2.5			NH3		
FIPSST	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**
AL	125,768	76,065	44,503	156,460	100,693	42,622	1,303,508	902,469	594,725	6,827	802	654	3,861	3,136	2,193	2,768	2,010	1,085	5,530	6,298	6,630
FL	520,757	336,707	199,050	460,503	312,321	136,040	4,493,820	3,308,863	2,263,190	20,687	2,584	2,302	11,148	9,801	7,516	7,779	6,104	3,671	17,922	21,549	23,778
GA	279,975	192,773	99,464	304,309	207,024	92,113	2,699,650	1,956,263	1,303,529	12,043	1,568	1,325	7,165	6,005	4,406	5,110	3,797	2,166	10,436	12,554	13,511
KY	102,362	73,142	42,810	154,634	100,025	46,993	1,214,191	950,912	711,211	6,238	751	694	3,682	2,944	2,348	2,667	1,899	1,158	5,003	5,737	7,095
MS	86,811	51,600	28,699	110,672	69,952	27,620	853,774	602,257	394,247	4,566	532	401	2,828	2,250	1,479	2,089	1,491	746	3,549	3,995	4,147
NC	260,895	166,844	91,720	323,606	199,281	79,433	2,839,283	1,966,195	1,207,391	12,286	1,487	1,346	6,505	5,510	3,994	4,571	3,453	1,931	9,601	11,702	12,776
SC	114,861	71,781	41,866	138,940	91,471	39,348	1,226,555	878,825	588,536	5,909	713	584	3,414	2,831	1,986	2,473	1,834	988	4,646	5,466	5,878
TN	177,943	114,032	61,339	235,869	150,179	62,446	1,893,704	1,320,562	863,682	9,127	1,065	862	5,312	4,160	2,813	3,904	2,720	1,405	6,556	7,702	8,196
VA	157,989	95,694	55,992	219,835	132,699	57,192	2,136,288	1,435,359	954,463	8,196	1,067	949	4,499	3,706	2,922	3,067	2,216	1,404	7,770	8,990	9,653
WV	41,703	24,570	14,652	58,340	35,234	15,530	526,841	360,865	243,683	2,438	276	231	1,366	1,057	747	984	676	369	1,889	2,126	2,268
VISTAS	**1,869,063**	**1,203,208**	**680,096**	**2,163,168**	**1,398,879**	**599,336**	**19,187,613**	**13,682,570**	**9,124,656**	**88,316**	**10,844**	**9,348**	**49,780**	**41,400**	**30,403**	**35,411**	**26,200**	**14,922**	**72,902**	**86,118**	**93,932**

Base F Onroad Mobile (Annual Tons)

	VOC			NOx			CO			SO2			PM-10			PM-2.5			NH3		
FIPSST	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**
AL	118,978	73,137	47,151	157,626	101,299	46,598	1,300,754	934,442	675,902	6,898	637	720	3,905	3,195	2,488	2,799	2,053	1,262	5,586	6,362	7,296
FL	438,761	293,423	192,096	402,099	284,737	134,465	4,022,000	3,090,443	2,306,759	18,802	1,911	2,289	10,185	9,027	7,691	7,126	5,653	3,848	16,183	19,553	23,595
GA	265,972	187,102	104,678	306,998	208,568	100,707	2,712,473	2,044,169	1,474,029	12,182	1,256	1,458	7,252	6,116	4,995	5,169	3,877	2,517	10,545	12,685	14,870
KY	96,202	63,210	38,814	154,093	97,731	43,014	1,195,656	932,296	669,891	5,988	587	651	3,728	3,008	2,283	2,699	1,946	1,160	5,055	5,807	6,584
MS	81,701	49,986	30,337	110,242	69,949	29,829	849,049	624,575	445,150	4,614	398	441	2,863	2,296	1,688	2,114	1,525	876	3,585	4,035	4,565
NC	272,594	167,894	87,718	290,873	207,670	83,399	2,677,118	2,192,253	1,238,802	12,482	1,314	1,323	6,733	5,874	4,299	4,754	3,651	2,158	9,711	12,663	13,077
SC	107,236	69,026	44,121	139,403	91,832	42,641	1,220,825	921,308	663,597	5,972	558	643	3,454	2,884	2,258	2,502	1,874	1,154	4,694	5,522	6,472
TN	168,389	109,716	63,916	233,324	147,591	66,879	1,881,893	1,359,880	961,929	9,202	833	944	5,349	4,247	3,199	3,927	2,788	1,643	6,629	7,753	8,962
VA	143,969	91,230	59,737	222,830	133,039	64,079	1,996,287	1,483,125	1,091,546	7,234	902	1,059	4,546	3,768	3,343	3,097	2,258	1,641	7,852	9,084	10,757
WV	39,581	23,914	15,375	60,335	36,000	16,940	533,258	379,272	273,900	2,495	228	255	1,399	1,099	844	1,005	705	428	1,938	2,188	2,484
VISTAS	**1,733,382**	**1,128,638**	**683,942**	**2,077,822**	**1,378,416**	**628,551**	**18,389,312**	**13,961,764**	**9,801,505**	**85,868**	**8,622**	**9,783**	**49,414**	**41,513**	**33,086**	**35,191**	**26,330**	**16,687**	**71,778**	**85,652**	**98,664**

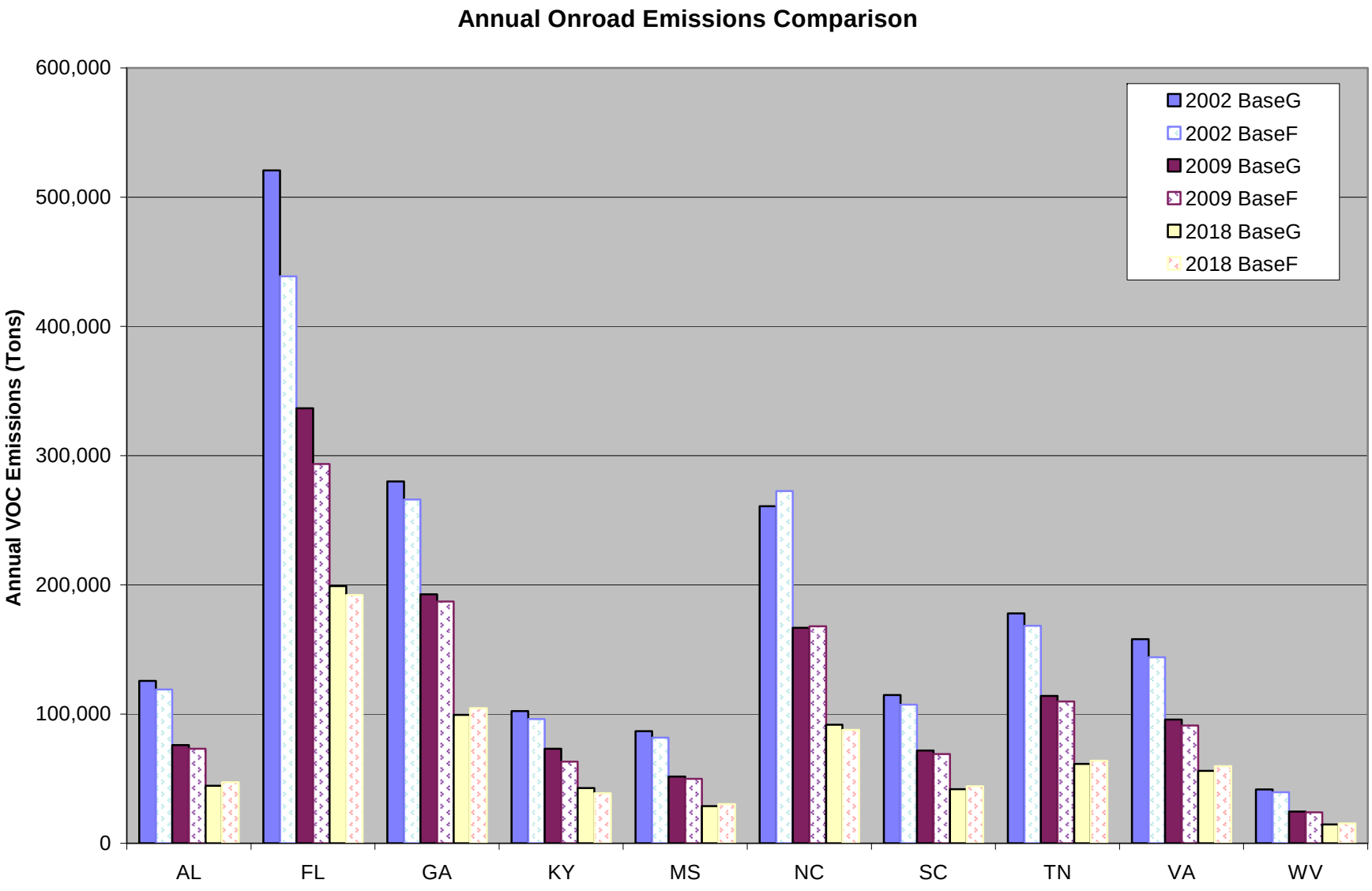
Emissions Change (Base G - Base F, Annual Tons) -- Positive Value Indicates Increase from Base F

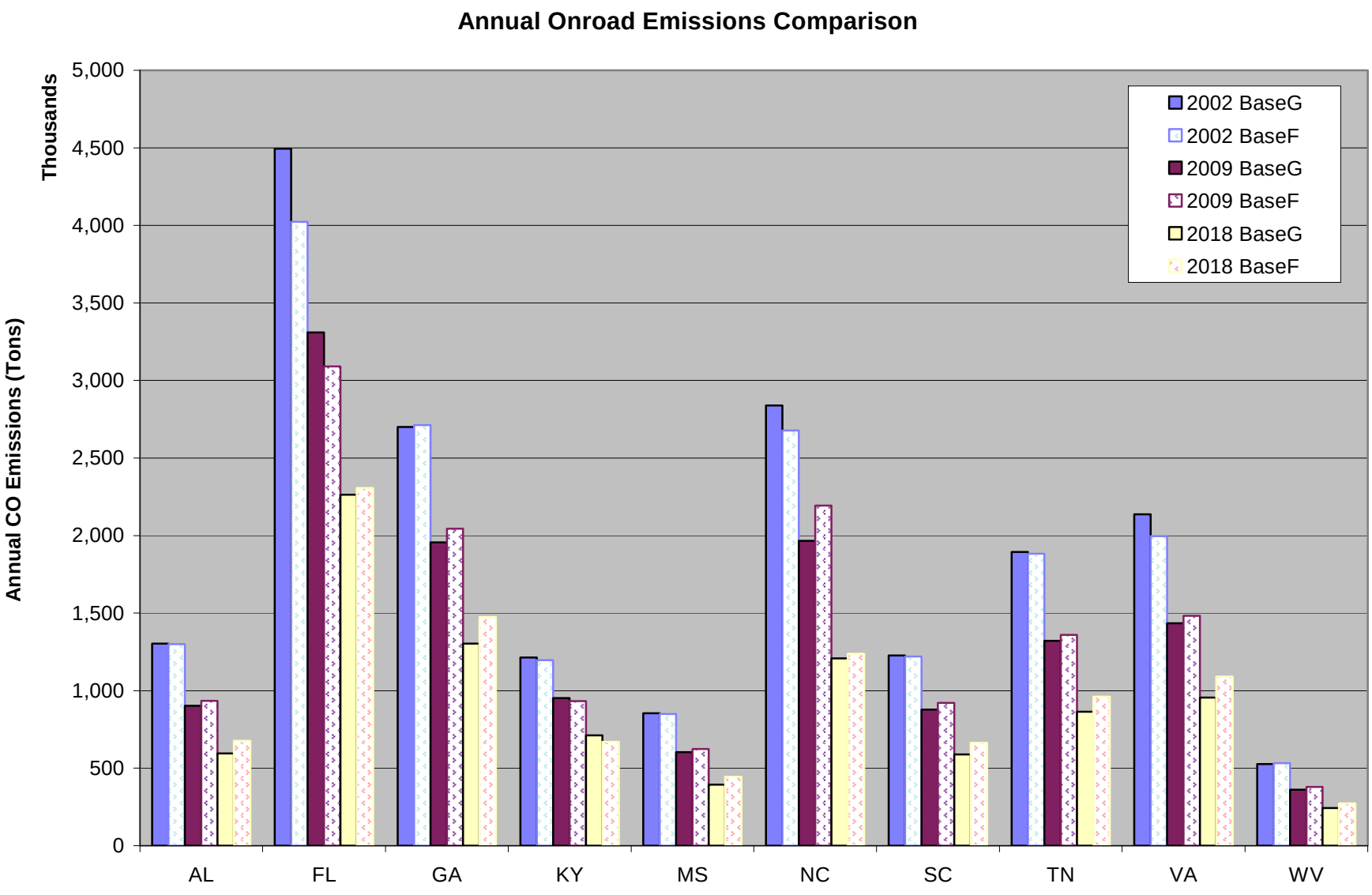
	VOC			NOx			CO			SO2			PM-10			PM-2.5			NH3		
FIPSST	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**
AL	6,789	2,928	-2,647	-1,166	-606	-3,977	2,754	-31,973	-81,178	-71	165	-66	-45	-58	-295	-31	-43	-178	-56	-63	-666
FL	81,997	43,284	6,955	58,404	27,584	1,575	471,820	218,420	-43,569	1,885	672	14	963	774	-175	653	451	-177	1,738	1,996	183
GA	14,003	5,671	-5,214	-2,689	-1,544	-8,594	-12,823	-87,906	-170,500	-139	312	-133	-86	-111	-589	-59	-80	-352	-109	-131	-1,359
KY	6,160	9,933	3,996	541	2,294	3,979	18,534	18,615	41,319	250	164	43	-46	-65	65	-32	-47	-2	-52	-70	512
MS	5,110	1,613	-1,638	430	3	-2,209	4,724	-22,319	-50,903	-48	134	-41	-35	-46	-209	-25	-34	-130	-35	-40	-419
NC	-11,699	-1,049	4,001	32,734	-8,389	-3,966	162,165	-226,057	-31,411	-196	174	23	-228	-364	-304	-183	-198	-226	-111	-961	-302
SC	7,625	2,755	-2,255	-462	-362	-3,293	5,731	-42,483	-75,061	-63	156	-59	-40	-53	-272	-29	-40	-166	-48	-56	-594
TN	9,554	4,316	-2,577	2,545	2,589	-4,433	11,811	-39,318	-98,246	-75	232	-82	-37	-87	-385	-22	-68	-238	-73	-52	-766
VA	14,020	4,464	-3,744	-2,995	-340	-6,887	140,001	-47,766	-137,084	962	165	-110	-47	-62	-420	-30	-42	-237	-83	-94	-1,104
WV	2,122	656	-723	-1,995	-766	-1,410	-6,416	-18,407	-30,217	-57	49	-24	-32	-42	-97	-22	-29	-59	-49	-62	-217
VISTAS	**135,680**	**74,570**	**-3,846**	**85,346**	**20,462**	**-29,215**	**798,301**	**-279,194**	**-676,850**	**2,448**	**2,222**	**-435**	**367**	**-114**	**-2,683**	**219**	**-130**	**-1,764**	**1,123**	**466**	**-4,732**

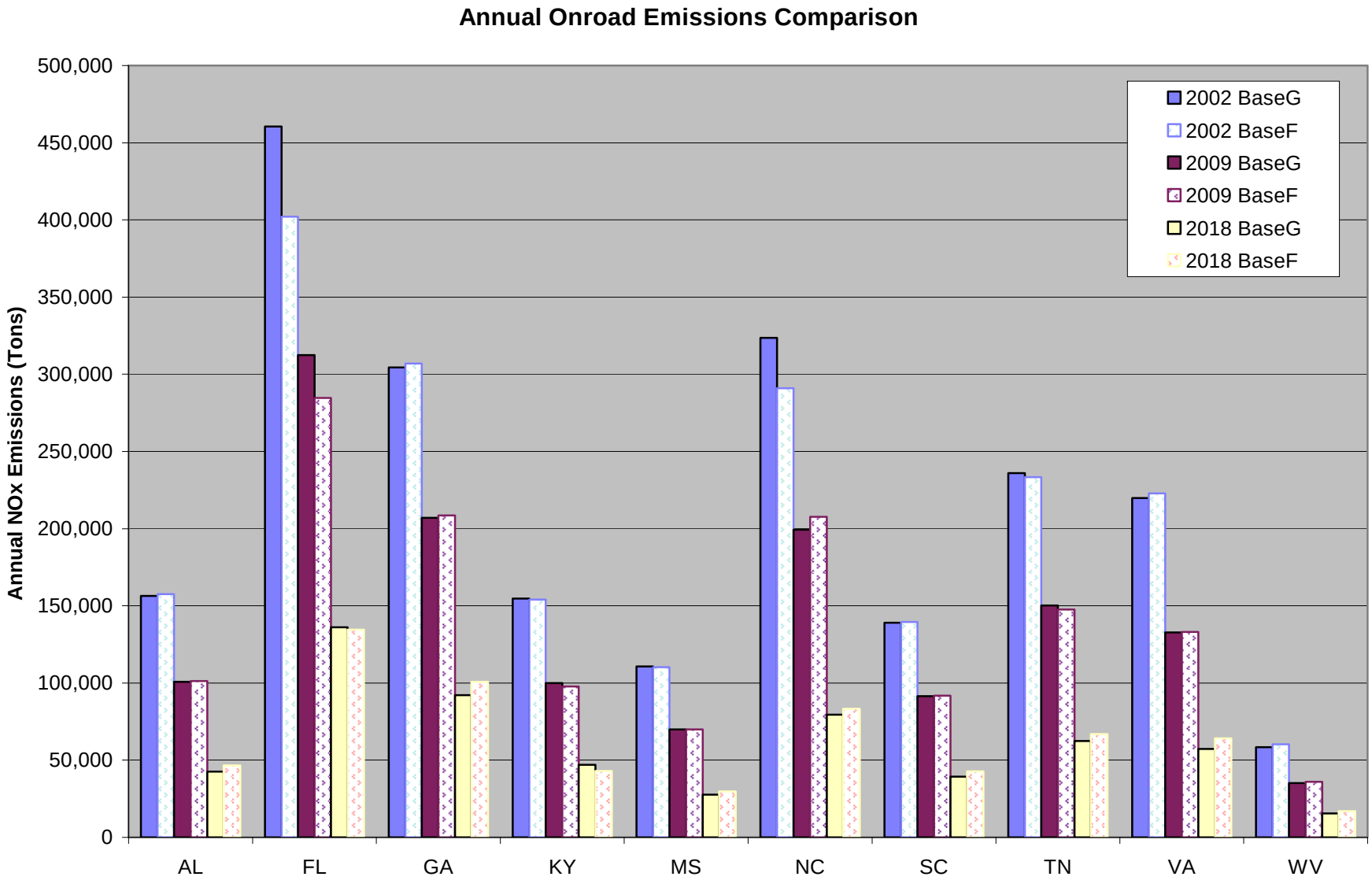
Emissions Change (Base G - Base F/Base F, Annual %) -- Positive Value Indicates Increase from Base F

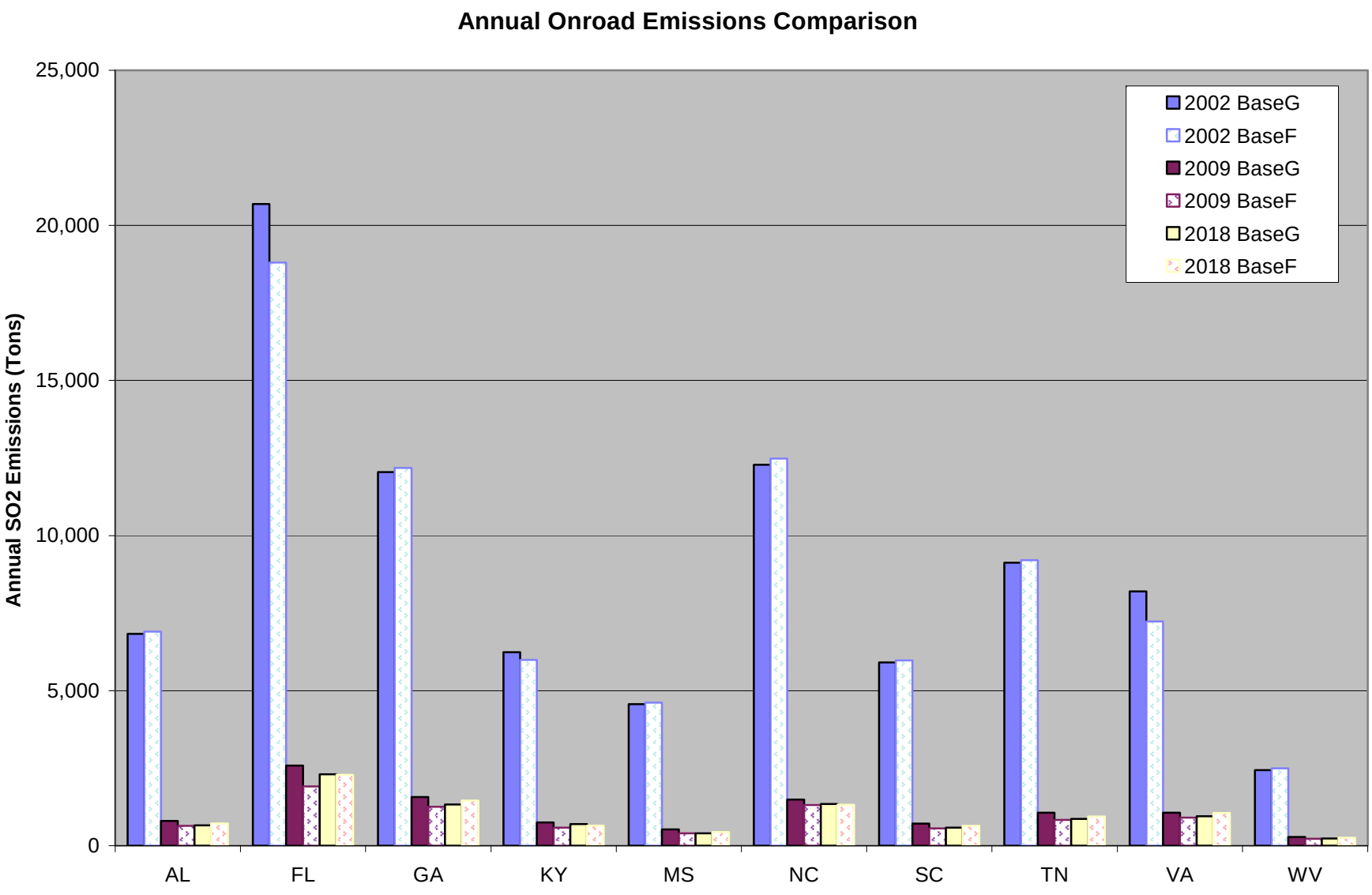
	VOC			NOx			CO			SO2			PM-10			PM-2.5			NH3		
FIPSST	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**	**2002**	**2009**	**2018**
AL	6%	4%	-6%	-1%	-1%	-9%	0%	-3%	-12%	-1%	26%	-9%	-1%	-2%	-12%	-1%	-2%	-14%	-1%	-1%	-9%
FL	19%	15%	4%	15%	10%	1%	12%	7%	-2%	10%	35%	1%	9%	9%	-2%	9%	8%	-5%	11%	10%	1%
GA	5%	3%	-5%	-1%	-1%	-9%	0%	-4%	-12%	-1%	25%	-9%	-1%	-2%	-12%	-1%	-2%	-14%	-1%	-1%	-9%
KY	6%	16%	10%	0%	2%	9%	2%	2%	6%	4%	28%	7%	-1%	-2%	3%	-1%	-2%	0%	-1%	-1%	8%
MS	6%	3%	-5%	0%	0%	-7%	1%	-4%	-11%	-1%	34%	-9%	-1%	-2%	-12%	-1%	-2%	-15%	-1%	-1%	-9%
NC	-4%	-1%	5%	11%	-4%	-5%	6%	-10%	-3%	-2%	13%	2%	-3%	-6%	-7%	-4%	-5%	-10%	-1%	-8%	-2%
SC	7%	4%	-5%	0%	0%	-8%	0%	-5%	-11%	-1%	28%	-9%	-1%	-2%	-12%	-1%	-2%	-14%	-1%	-1%	-9%
TN	6%	4%	-4%	1%	2%	-7%	1%	-3%	-10%	-1%	28%	-9%	-1%	-2%	-12%	-1%	-2%	-14%	-1%	-1%	-9%
VA	10%	5%	-6%	-1%	0%	-11%	7%	-3%	-13%	13%	18%	-10%	-1%	-2%	-13%	-1%	-2%	-14%	-1%	-1%	-10%
WV	5%	3%	-5%	-3%	-2%	-8%	-1%	-5%	-11%	-2%	21%	-9%	-2%	-4%	-12%	-2%	-4%	-14%	-3%	-3%	-9%
VISTAS	**8%**	**7%**	**-1%**	**4%**	**1%**	**-5%**	**4%**	**-2%**	**-7%**	**3%**	**26%**	**-4%**	**1%**	**0%**	**-8%**	**1%**	**0%**	**-11%**	**2%**	**1%**	**-5%**

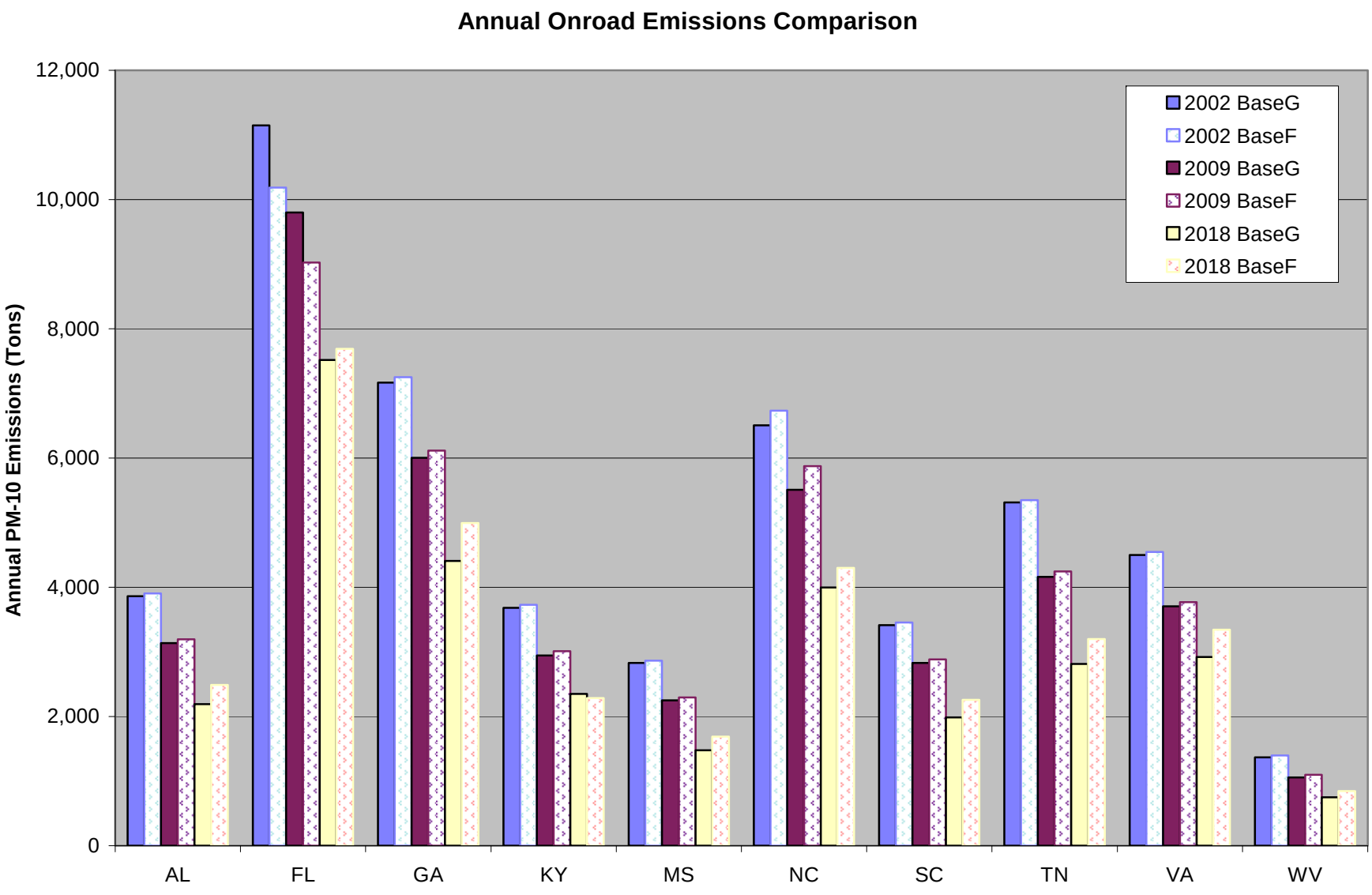
Note: Base G is equivalent to the Best and Final inventory for onroad mobile sources.

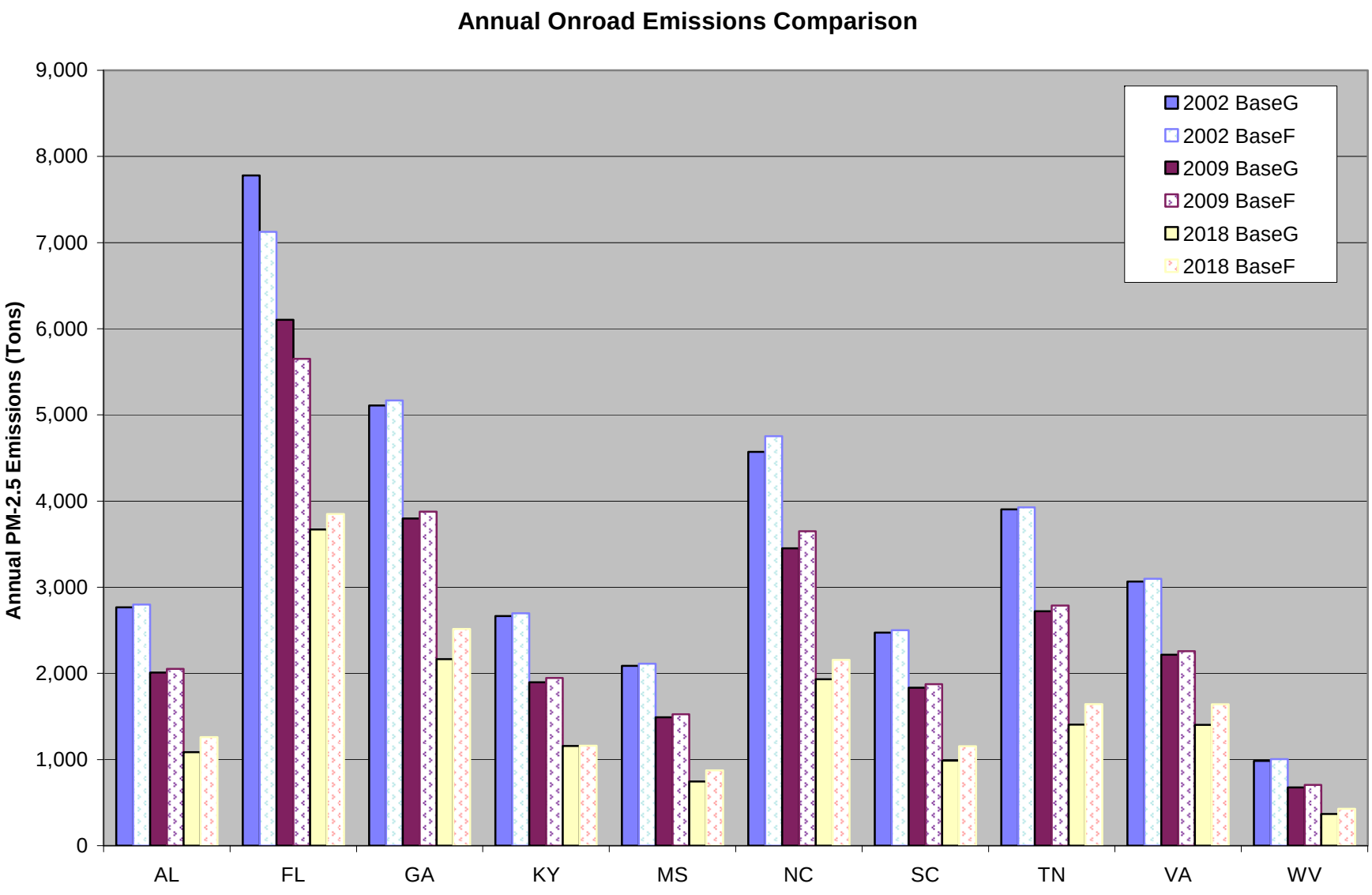

Annual Onroad Emissions Comparison
Annual VOC Emissions (Tons)
600,000
500,000
400,000
300,000
200,000
100,000
0
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV

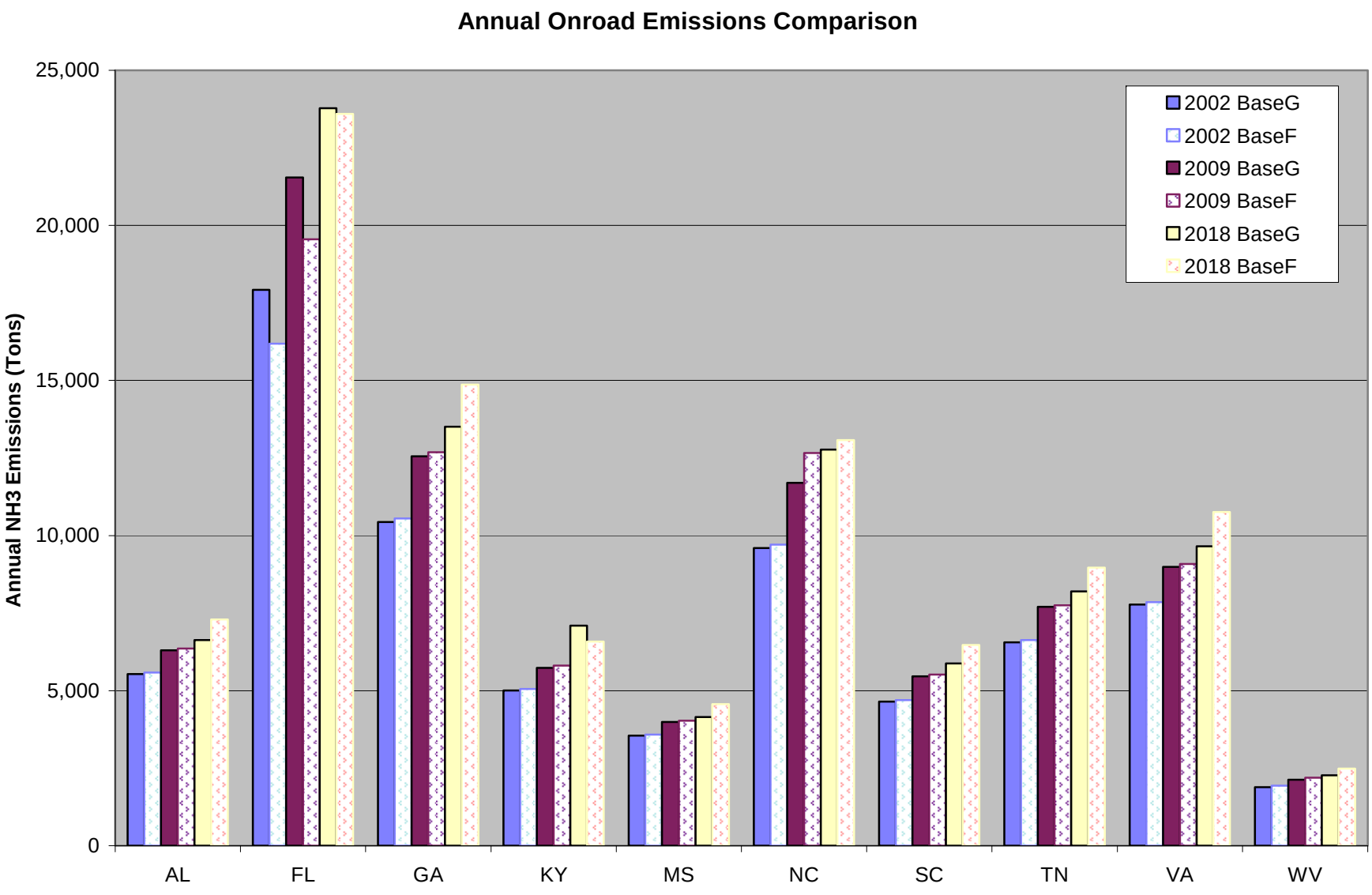

Annual Onroad Emissions Comparison
Annual CO Emissions (Tons)
Thousands
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV


Annual Onroad Emissions Comparison
Annual NOx Emissions (Tons)
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF


Annual Onroad Emissions Comparison
Annual SO2 Emissions (Tons)
25,000
20,000
15,000
10,000
5,000
0
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF


Annual Onroad Emissions Comparison
Annual PM-10 Emissions (Tons)
12,000
10,000
8,000
6,000
4,000
2,000
0
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF


Annual Onroad Emissions Comparison
Annual PM-2.5 Emissions (Tons)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF


Annual Onroad Emissions Comparison
Annual NH3 Emissions (Tons)
25,000
20,000
15,000
10,000
5,000
0
AL
FL
GA
KY
MS
NC
SC
TN
VA
WV
2002 BaseG
2002 BaseF
2009 BaseG
2009 BaseF
2018 BaseG
2018 BaseF

APPENDIX G:

CONVERSION OF MRPO BaseM POINT SOURCE DATA TO SMOKE INPUT FORMAT

MEMORANDUM

To: Pat Brewer, VISTAS
From: Gregory Stella, Alpine Geophysics, LLC
Re: Conversion of MRPO BaseM Point Source Data to SMOKE Input Format
Date: 13 February 2008

The Midwest Regional Planning Organization (MRPO) periodically produces a five State emission inventory for Illinois, Indiana, Michigan, Wisconsin, and Ohio. These data are used as the basis for various MRPO modeling and regulatory analyses. These data are prepared with the help of each State's emission inventory divisions and are felt to be the most representative account for emissions activities for those States at any one time.

The most recent version prepared and distributed by MRPO is currently called BaseM. Associated with this 2005 base year inventory release is a set of growth and control factors that are used to additionally simulate future year conditions under "On-The-Books" (base case or known control programs requirements to be implemented in future years) or incremental control situations to test sensitivity or strategies which would be implemented in whole or in part during the same future years.

The purpose of this document is to detail the technical steps that were made as part of the conversion of the MRPO BaseM point sources files (electric generating unit [EGU] and non-EGU) into IDA format for ASIP PM-2.5 CAMx modeling of the future year 2009. Because of the timing and complications relative to converting multiple and various emission files for all source types, it was determined that only point source emissions would be converted for processing at this time.

Data Sources and Description

A series of data files and associated documentation was obtained from MRPO staff in 2007. These files were the input data sets for base year 2005 and growth and control factors related to MRPO's BaseM and Round 5 inventories[6]. Because of the emission processing tools that MRPO currently executes for its analyses, these files are in formats that are not read by the SMOKE emissions processor currently in use by VISTAS/ASIP modelers (contract teams and participating states). Alpine Geophysics, under the Emissions Inventory Technical Advisor contract, was asked to obtain and convert these data into the formats that could be used by these modeling agencies.

Through additional contact with MRPO staff, the base year 2005 non-EGU point source files and associated growth and control factors necessary to forecast the data to 2009 base case conditions were identified and extracted from the originally provided data. EGU sources were identified to be already prepared for the future year (2010 substituted for 2009) and were based on recent IPM 3.0 model runs with incremental adjustment made by MRPO states to best reflect expected emission controls and operating conditions. The "will do" simulation series for EGUs was identified as "egu5b_2010."

The main purpose of the SMOKE conversion task was to prepare five state emission inventories provided in National Input Format (NIF) format into the IDA format required by the SMOKE model for the criteria pollutants VOC, NOx, CO, SO2, PM-10, PM-2.5, and NH3. Annual emissions were taken directly from the NIF structured inventories with no alternate temporal calculations performed (e.g., estimate seasonal emissions from annual or annual from seasonal). The temporal allocation module of the SMOKE emissions processor was intended to be used to further define temporal distribution of these emissions.

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[6] http://www.ladco.org/tech/emis/r5/round5_reports.htm

No quality assurance (QA) related to the reported values in the MRPO was conducted (e.g., it was assumed that reported emission levels were correct) and therefore the QA focus of these tasks was to maintain the integrity of the mass files in the conversion to IDA.

Each set of NIF structured data had a unique set of relational tables necessary to maintain the information required in each source sector based on its reporting requirements. Alpine had previously developed scripts to read the information from each of these relational data sets and convert them to the IDA structures required by this task. Prior to and after each major source sector was converted from NIF to IDA, we developed a list of emission summary reports to check that the emissions input into the conversion process were the same as output into the IDA formatted files.

Non-EGU Point Source Conversion

Non-EGU point source emissions from 2005 BaseM were converted to future year 2009 IDA format using the annual emission records directly from the NIF structured data sets and associated SCC growth factors and unit, facility, county, state, or nationally applied controls[7]. These controls were applied in a hierarchical fashion starting with the most defined (unit-segment-pollutant level) through least defined (national-SCC-pollutant) and when a match was found during the implementation, no additional controls were sought or applied to that emission record. In other words, if a match were found at the unit-segment level of control, no additional controls were applied to that segment/pollutant combination again in the forecast process. This prevented multiple control programs from being implemented when the intent of the originally provided control files were to assign a single applicable reduction.

The Round 5 factors for point sources provided by MRPO were in the RPO Data Exchange Format (RPODx) and had growth and control factors available at the State, county, plant, unit, segment, stack, and SCC level of detail. In order to apply these factors in a fashion consistent with that of the MRPO utilized processing system and duplicative of how MRPO would have generated its BaseM forecasts, a hierarchical approach was utilized to match and assign growth and control values.

Growth Factor Application

Using the 2005 EM table from the BaseM inventory files in NIF format, we first selected each emissions record for forecasting. In this conversion case, these EM records were limited to those emissions identified as annual using the NIF coding convention. As noted in the limitations section below, there oftentimes were emissions provided by MRPO in a summer season convention.

We next selected the base year for application as the RPODx for growth rates allows for the flexibility of input growth factors for multiple base year inventories. In this assignment, the base year was always 2005, as that was the base year provided by MRPO and the future year was 2009, as selected by ASIP.

The next step was to determine the growth basis for each individual emission record of the file. This "growth basis" is the key with which the growth factor is associated. For point sources, this key is based on a combination of FIPS, SCC, and pollutant codes. Multiple keys are calculated for each individual emission record and that key with the highest resolution of matching to the growth factor file using the hierarchy identified in Table 1 below is the one chosen to assign a growth rate to the base year emissions.

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7 http://www.ladco.org/tech/emis/r5/reports/LADCO%202005%20Base%20Yr%20Growth%20and%20Controls%20Report_Final.pdf

Table 1. Point Source Growth Factor Application Hierarchy.

Order	Key or "Growth/Control Basis"
1	state/county code, 10-digit SCC, pollutant
2	state/county code, 10-digit SCC
3	state code, 10-digit SCC, pollutant
4	state code, 10-digit SCC
5	state/county code, pollutant
6	state/county code
7	state code, pollutant
8	state code
9	10-digit SCC, pollutant
10	10-digit SCC
11	Pollutant

Using the hierarchical application, growth basis, and dates (base year and alternate year), we matched each emission record to the growth table to obtain a growth factor. The factors are defined in the growth table as a multiplier for the base year period that calculates the alternate year of interest. In other words, multiplying the base year emissions value by the growth factor provides you with the emissions for the alternate year of interest.

When no match from any of the hierarchical keys was identified, a growth rate of 1.00 (no growth) was assigned. This maintained the 2005 emission level in the future year inventory.

Control Factor Application

Similar to the process identified above for the assignment and application of growth factors, the control factor assignment was based on a hierarchical key, this time, however, using FIPS, plantid, pointid, stackid, segment, SCC, and pollutant codes applied in a parallel process to the growth factor assignment.

Using the 2005 EM table from the BaseM inventory files in NIF format, we selected each annual emissions record for forecasting. We next selected the base year for application, and again, the base year was always 2005, as that was the base year provided by MRPO.

Once the base year was identified, we determined the alternate year for our forecast. Depending on the specific year used in each conversion, growth rates were limited to those with a base year of 2005 and a future year *less than or equal to* that of our forecast. This variation in method is intended to allow us to identify all controls implemented prior to or during the year of interest and will consider them as viable options at the latest provided level of control.

In other words, since we selected 2009 as the future year of choice, we limit the control factor table to control strategies implemented during or prior to 2009. If in our matching to the control factor table we find that for a certain control basis key there is no match because a program may have been fully implemented in a prior year (say 2007), then we do not want to exclude this reduction from our forecast. Additionally, if we find that there are multiple entries in the control factor table because of incremental implementation of a rule, we select the closest year to that of our intended forecast. So if a particular rule was incrementally implemented from 2005 through 2009 and there were control records available for each year in between, we would select the record with the latest year to apply in our forecast.

The next step was to determine the control basis for each individual emission record of the file. This "control basis" is the key with which the control strategy or technology is associated. Although we developed code to support the hierarchical application of control factors for the BaseM emissions, all control factors provided by MRPO in the Round 5 files were segment-SCC-pollutant specific. This eliminated the need for a search on the key that has the greatest resolution as all matches were at the segment-SCC-pollutant level.

Using the control basis and dates (base year and alternate year), we matched each emission record to the control table to obtain a control factor. The factors are defined in the control table as a group of values (control efficiency, rule effectiveness, and rule penetration) for the future year period that gets assigned to an uncontrolled future year emission value. In other words, we first "backed out" existing base year controls from our future year emissions estimate and then multiplied this uncontrolled value by the control factors for the alternate year of interest. These calculations are defined in Equations 1 and 2 below.

Equation 1. Uncontrolled emissions calculation.

$$Emiss_{Unc} = Emiss_{Base} / (1-((CE_{Base}/100)*(RE_{Base}/100)*(RP_{Base}/100)))$$

Where,

$Emiss_{Unc}$	= Uncontrolled emissions
$Emiss_{Base}$	= Base year emissions
CE_{Base}	= Base year control efficiency
RE_{Base}	= Base year rule effectiveness
RP_{Base}	= Base year rule penetration

Equation 2. Application of new control calculation.

$$Emiss_{New} = Emiss_{Unc} *(1-((CE_{New}/100)*(RE_{New}/100)*(RP_{New}/100)))$$

Where,

$Emiss_{New}$	= Future year emissions
$Emiss_{Unc}$	= Uncontrolled emissions
CE_{New}	= Future year control efficiency
RE_{New}	= Future year rule effectiveness
RP_{New}	= Future year rule penetration

When no match from any of the hierarchical keys was identified, the same control efficiency, rule efficiency, and rule penetration values from the base year inventory were used in the calculation and the only change in emissions would have been the result of growth factor application. In instances where PM-10 annual emissions were found to be less than PM-2.5 annual emission values, the PM-2.5 emission values were changed to equal that of PM-10.

EGU Point Source Conversion

EGU point source emissions from the egu5b_2010 scenario (2010 IPM 3.0 run with modifications) were converted to year 2009 IDA format using the annual emission records directly from the NIF structured data sets. Since these emissions already accounted for growth and control application, no additional modifications were required.

One ASIP requested modification for its PM-2.5 CAMx modeling was to adjust the 2009 file to match W. H. Sammis facility's planned response to the control requirements from the consent decree USA vs. Ohio Edison; Civil Action No: 2:99-CV-1181; March 18, 2005. These changes were not implemented in the ASIP 2009 CMAQ runs. These adjustments for SO2 are noted in Table 2 below.

Table 2. SO2 Control Requirements from USA vs. Ohio Edison Consent Decree

Units 1-4	Induct Scrubbing
	50% removal (1.1 lbs/MMBtu)
	At least one unit by Sept. 30, 2008
	Second unit by Dec. 31, 2008
	Other two units by Dec. 31, 2009
Unit 5	Flash Dryer Absorber or Electro-Catalytic Oxidation no later than Dec. 31, 2008
	50% removal (1.1 lbs/MMBtu)
Units 6/7	Scrubber no later than December 31, 2010
	95% removal (0.13 lbs/MMBtu)
Plantwide	Emission cap of 101,500 by end of 2009
	Emission cap of 101,500 by end of 2010
	Emission cap of 29,900 by end of 2011

Conversion Limitations

As noted above, Alpine limited our conversion to all records in the MRPO point source files that were identified as annual. In some cases the MRPO NIF files had additional non-annual summer season emission records configured as a higher percentage than the annual average that was used in our emissions comparison.

In other words, the MRPO file sometimes had two emission record types that it uses for its modeling; one for the summer period and one for the rest of the year. Since SMOKE uses temporal allocation factors to make this summer/winter split, our converted values do not match MRPO's summertime reports. We see a high percentage difference in the Alpine converted data compared to the MRPO output reports in these two States for the July 12 example for this reason.

Since we confirmed this difference and reason for this difference in the 2005 data sets with MRPO, our objective for QA on the projections also included delta emissions from the projection year to the base year. Although the absolute daily emission values (in tpd) were found to be different as noted above, in all cases, the difference between 2005 and the projection year calculations as made by Alpine was within confidence ranges of the ratio of future year to base year as posted by MRPO. See Table 3 below. For this reason, we were convinced that our projection methodology is capturing the growth and control factors that MRPO applied in its emissions modeling.

Table 3. Emissions Comparison of ASIP Converted and MRPO Non-EGU Emissions.

Comparison of ASIP Converted and MRPO Non-EGU Emissions

		ASIP 2009 Annual Emissions (Tons/Year)						
FIPSST	**State**	**VOC**	**NOX**	**CO**	**SO2**	**PM-10**	**PM-2.5**	**NH3**
17	Illinois	61,760	85,142	71,725	150,506	20,315	6,256	1,059
18	Indiana	48,287	65,132	339,642	82,040	22,118	12,774	782
26	Michigan	36,753	85,014	67,564	55,435	13,235	6,567	788
39	Ohio	31,530	67,275	212,626	116,942	15,930	10,443	3,239
55	Wisconsin	31,377	36,827	43,014	60,955	456	43	346
	MRPO	**209,707**	**339,390**	**734,570**	**465,878**	**72,054**	**36,082**	**6,214**

		ASIP 2009 July 12 Summer Daily Emissions (Tons/Day)						
FIPSST	**State**	**VOC**	**NOX**	**CO**	**SO2**	**PM-10**	**PM-2.5**	**NH3**
17	Illinois	222.3	315.1	250.9	412.3	55.6	17.1	2.9
18	Indiana	132.3	178.4	930.5	224.8	60.6	35.0	2.1
26	Michigan	115.8	232.4	193.6	144.9	40.8	19.3	2.4
39	Ohio	86.4	184.3	582.5	320.4	43.6	28.6	8.9
55	Wisconsin	86.0	100.9	117.8	167.0	1.3	0.1	0.9
	MRPO	**642.7**	**1,011.1**	**2,075.4**	**1,269.4**	**202.0**	**100.2**	**17.2**

		2009 July 12 Summer Daily Emissions (Tons/Day)						
FIPSST	**State**	**VOC**	**NOX**	**CO**	**SO2**	**PM-10**	**PM-2.5**	**NH3**
17	Illinois	218.1	217.8	255.7	335.0	56.0	16.8	2.8
18	Indiana	137.2	175.2	888.8	216.2	60.7	36.5	2.3
26	Michigan	119.1	242.0	206.5	148.6	43.6	20.3	2.4
39	Ohio	87.1	166.3	540.7	288.0	43.0	27.6	8.3
55	Wisconsin	87.7	92.9	120.0	152.1	23.2	0.1	1.0
	MRPO	**649.2**	**894.2**	**2,011.7**	**1,139.9**	**226.5**	**101.3**	**16.8**

		ASIP 2009 July 12 Summer Daily Emissions (% of MRPO Total)						
FIPSST	**State**	**VOC**	**NOX**	**CO**	**SO2**	**PM-10**	**PM-2.5**	**NH3**
17	Illinois	29.5%	25.1%	9.8%	32.3%	28.2%	17.3%	17.0%
18	Indiana	23.0%	19.2%	46.2%	17.6%	30.7%	35.4%	12.6%
26	Michigan	17.5%	25.0%	9.2%	11.9%	18.4%	18.2%	12.7%
39	Ohio	15.0%	19.8%	28.9%	25.1%	22.1%	28.9%	52.1%
55	Wisconsin	15.0%	10.9%	5.9%	13.1%	0.6%	0.1%	5.6%
	MRPO	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

		2009 July 12 Summer Daily Emissions (% of MRPO Total)						
FIPSST	**State**	**VOC**	**NOX**	**CO**	**SO2**	**PM-10**	**PM-2.5**	**NH3**
17	Illinois	33.6%	24.4%	12.7%	29.4%	24.7%	16.6%	16.7%
18	Indiana	21.1%	19.6%	44.2%	19.0%	26.8%	36.0%	13.7%
26	Michigan	18.3%	27.1%	10.3%	13.0%	19.2%	20.0%	14.3%
39	Ohio	13.4%	18.6%	26.9%	25.3%	19.0%	27.2%	49.4%
55	Wisconsin	13.5%	10.4%	6.0%	13.3%	10.2%	0.1%	6.0%
	MRPO	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

APPENDIX H:

COMPARISON OF EGU CONTROLS FOR COAL AND OIL/GAS UNITS BASED ON IPM MODELING AND STATE-PROVIDED INFORMATION FOR THE BASE G/G2 INVENTORY

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01033	TVA COLBERT	47	1	0010	010	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	2	0010	011	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	3	0010	012	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	4	0010	013	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	5	0010	014	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01055	ALABAMA POWER COMPANY GADSDEN	7	1	0002	002	Coal Steam	None	None	None	None	None	None	None	None
01055	ALABAMA POWER COMPANY GADSDEN	7	2	0002	003	Coal Steam	None	None	None	None	None	None	None	None
01063	ALABAMA POWER COMPANY GREENE COUNTY	10	1	0001	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
01063	ALABAMA POWER COMPANY GREENE COUNTY	10	2	0001	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
01071	TVA - WIDOWS CREEK	50	1	0008	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	2	0008	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	3	0008	004	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	4	0008	005	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	5	0008	006	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	6	0008	007	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	7	0008	008	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01071	TVA - WIDOWS CREEK	50	8	0008	009	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	4	010730011	001	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	3	010730011	002	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	2	010730011	004	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	1	010730011	005	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01097	ALABAMA POWER COMPANY BARRY	3	1	1001	002	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	2	1001	003	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	3	1001	004	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	4	1001	005	Coal Steam	SNCR	None	SNCR	SCR	None	None	Scrubber	Scrubber
01097	ALABAMA POWER COMPANY BARRY	3	5	1001	006	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	1	0005	002	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	2	0005	003	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	3	0005	004	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	4	0005	005	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	5	0005	006	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
01127	ALABAMA POWER COMPANY GORGAS	8	6	0001	004	Coal Steam	None	None	None	None	None	None	None	None
01127	ALABAMA POWER COMPANY GORGAS	8	7	0001	005	Coal Steam	None	None	None	None	None	None	None	None
01127	ALABAMA POWER COMPANY GORGAS	8	8	0001	006	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01127	ALABAMA POWER COMPANY GORGAS	8	9	0001	007	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
01127	ALABAMA POWER COMPANY GORGAS	8	10	0001	008	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	1	0001	002	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	2	0001	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	3	0001	004	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK6			O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK7			O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK8	0010005	7		O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	CITY OF GAINESVILLE, GRU DEERHAVEN	663	B1	0010006	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12001	CITY OF GAINESVILLE, GRU DEERHAVEN	663	B2	0010006	5	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
12005	GULF POWER COMPANY LANSING SMITH PLANT	643	1	0050014	1	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
12005	GULF POWER COMPANY LANSING SMITH PLANT	643	2	0050014	2	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
12009	FLORIDA POWER & LIGHT (PCC) CAPE CANAVERAL	609	PCC1	0090006	1	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12009	FLORIDA POWER & LIGHT (PCC) CAPE CANAVERAL	609	PCC2	0090006	2	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE1	0110036	1	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE2	0110036	2	O/G Steam	None	None	None	None	None	None	None	None
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE3	0110036	3	O/G Steam	None	None	None	None	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE4	0110036	4	O/G Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	1	0170004	1	Coal Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	2	0170004	2	Coal Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	5	0170004	3	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	4	0170004	4	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	SAINT JOHNS RIVER	207	1	0310045-A	16		SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	SAINT JOHNS RIVER	207	2	0310045-A	17		SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	NORTHSIDE	667	2A	0310045-B	26	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	None	No Operation
12031	NORTHSIDE	667	1A	0310045-B	27	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	None	No Operation
12031	NORTHSIDE	667	3	0310045-B	3	O/G Steam	None	None	None	No Operation	None	None	None	None
12031	CEDAR BAY COGENERATION INC.	10672	GEN1	0310337	1	Coal Steam	None	SNCR	None	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	CEDAR BAY COGENERATION INC.			0310337	2									
12031	CEDAR BAY COGENERATION INC.			0310337	3									
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	1	0330045	1									
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	2	0330045	2	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	3	0330045	3	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	4	0330045	4	Coal Steam	None	None	None	None	None	None	Scrubber	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	5	0330045	5	Coal Steam	None	None	None	None	None	None	Scrubber	None
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	6	0330045	6	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	7	0330045	7	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
12053	Central Power and Lime Incorporated	10333	GEN1	0530021	18	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB01	0570039	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB02	0570039	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB03	0570039	3	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB04	0570039	4	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB01	0570040	1		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB02	0570040	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB03	0570040	3		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB04	0570040	4		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB05	0570040	5		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB06	0570040	6		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12061	CITY OF VERO BEACH	693		0610029	1	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12061	CITY OF VERO BEACH	693	3	0610029	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12061	CITY OF VERO BEACH	693	4	0610029	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12063	GULF POWER COMPANY SCHOLZ	642	1	0630014	1	Coal Steam	None	None	None	None	None	None	None	None
12063	GULF POWER COMPANY SCHOLZ	642	2	0630014	2	Coal Steam	None	None	None	None	None	None	None	None
12073	CITY OF TALLAHASSEE ARVAH B.HOPKINS	688	1	0730003	1	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12073	CITY OF TALLAHASSEE ARVAH B.HOPKINS	688	2	0730003	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12081	FLORIDA POWER & LIGHT (PMT) MANATEE POWER	6042	PMT1	0810010	1	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12081	FLORIDA POWER & LIGHT (PMT) MANATEE POWER	6042	PMT2	0810010	2	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12085	FLORIDA POWER & LIGHT (PMR) FPL / MARTIN	6043	PMR1	0850001	1	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12085	FLORIDA POWER & LIGHT (PMR) FPL / MARTIN	6043	PMR2	0850001	2	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12085	INDIANTOWN COGENERATION, L.P.	50976	GEN1	0850102	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12086	FLORIDA POWER & LIGHT (PCU) CUTLER POWER	610	PCU5	0250001	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12086	FLORIDA POWER & LIGHT (PCU) CUTLER POWER	610	PCU6	0250001	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12086	FLORIDA POWER & LIGHT (PTF) TURKEY POINT	621	PTP1	0250003	1	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12086	FLORIDA POWER & LIGHT (PTF) TURKEY POINT	621	PTP2	0250003	2	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12095	ORLANDO UTILITIES COMMISSION STANTON ENERGY	564	1	0950137	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12095	ORLANDO UTILITIES COMMISSION STANTON ENERGY	564	2	0950137	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12099	FLORIDA POWER & LIGHT (PRV) RIVIERA POWE	619	PRV3	0990042	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12099	FLORIDA POWER & LIGHT (PRV) RIVIERA POWE	619	PRV4	0990042	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12099	CITY OF LAKE WORTH UTILITIES TOM G. SMITH	673	S-1	0990045	7	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12099	CITY OF LAKE WORTH UTILITIES TOM G. SMITH	673	S-3	0990045	9	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12101	PROGRESS ENERGY FLORIDA ANCLOTE	8048	1	1010017	1	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12101	PROGRESS ENERGY FLORIDA ANCLOTE	8048	2	1010017	2	O/G Steam	None	None	No Operation	No Operation	None	None	No Operation	No Operation
12103	PROGRESS ENERGY FLORIDA BARTOW	634	1	1030011	1	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	No Operation	No Operation
12103	PROGRESS ENERGY FLORIDA BARTOW	634	2	1030011	2	O/G Steam	O/G Early Retirement	O/G Early Retirement	None	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12103	PROGRESS ENERGY FLORIDA BARTOW	634	3	1030011	3	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	No Operation	No Operation
12105	LAKELAND ELECTRIC CHARLES LARSEN	675	7	1050003	4	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12105	LAKELAND ELECTRIC C.D. MCINTOSH, JR.	676	3	1050004	6	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12107	SEMINOLE ELECTRIC COOPERATIVE, INC.	136	1	1070025	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12107	SEMINOLE ELECTRIC COOPERATIVE, INC.	136	2	1070025	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12111	FT PIERCE UTILITIES AUTHORITY FT PIERCE	658	7	1110003	7	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12111	FT PIERCE UTILITIES AUTHORITY FT PIERCE	658	8	1110003	8	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	1	1210003	1	O/G Steam	O/G Early Retirement	O/G Early Retirement	None	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	2	1210003	2	O/G Steam	O/G Early Retirement	O/G Early Retirement	None	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	3	1210003	3	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	No Operation	No Operation
12127	FLORIDA POWER & LIGHT (PSN) SANFORD POWER	620	PSN3	1270009	1	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12127	FLORIDA POWER & LIGHT (PSN) SANFORD POWER	620	PSN4	1270009	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12129	TALLAHASSEE CITY PURDOM GENERATING STATION	689	7	1290001	7	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	1BLR	01500011	SG01	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	2BLR	01500011	SG02	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	3BLR	01500011	SG03	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	4BLR	01500011	SG04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13021	ARKWRIGHT	699	1	0002	1		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	2	0002	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	3	0002	3		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	4	0002	4		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	1	05100006	SG01	Coal Steam	None	None	None	None	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	2	05100006	SG02	Coal Steam	None	None	None	None	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	3	05100006	SG03	Coal Steam	None	None	None	SCR	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	4	05100006	SG04	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	11	05100018	11	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	12	05100018	12	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	4	05100018	4	O/G Steam	None	None	None	None	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
13051	RIVERSIDE	734	5	05100018	5	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	6	05100018	6	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13067	GEORGIA POWER COMPANY, MCDONOUGH STEAM	710	MB1	06700003	SGM1	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13067	GEORGIA POWER COMPANY, MCDONOUGH STEAM	710	MB2	06700003	SGM2	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y1BR	07700001	SG01	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y2BR	07700001	SG02	Coal Steam	None	None	None	None	None	None	None	None
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y3BR	07700001	SG03	Coal Steam	None	None	None	None	None	None	None	None
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y4BR	07700001	SG04	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y5BR	07700001	SG05	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y6BR	07700001	SG06	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y7BR	07700001	SG07	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727		09500002	SG01		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727		09500002	SG02		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727	3	09500002	SG03	Coal Steam	None	None	None	None	None	None	None	None
13103	SAVANNAH ELECTRIC: MCINTOSH STEAM - ELECTRIC	6124	1	10300003	SG01	Coal Steam	None	None	None	SCR	None	None	None	None
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	1	11500003	SG01	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	2	11500003	SG02	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	3	11500003	SG03	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	4	11500003	SG04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13127	GEORGIA POWER COMPANY, MCMANUS STEAM-ELECTRIC	715	1	12700004	SG01	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13127	GEORGIA POWER COMPANY, MCMANUS STEAM-ELECTRIC	715	2	12700004	SG02	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13149	GEORGIA POWER COMPANY, WANSLEY STEAM-ELECTRIC	6052	1	14900001	SG01	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13149	GEORGIA POWER COMPANY, WANSLEY STEAM-ELECTRIC	6052	2	14900001	SG02	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	1	20700008	SG01	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	2	20700008	SG02	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	3	20700008	SG03	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	4	20700008	SG04	Coal Steam	None	None	None	None	None	None	Scrubber	None
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	1	23700008	SG01	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	2	23700008	SG02	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	3	23700008	SG03	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	4	23700008	SG04	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
21015	CINCINNATI GAS & ELECTRIC EAST BEND STAT	6018	2	2101500029	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	1	2104100010	001	Coal Steam	SCR	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	2	2104100010	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	3	2104100010	003	Coal Steam	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	4	2104100010	004	Coal Steam	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	1	2104900003	001	Coal Steam	None	None	None	None	None	None	None	None
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	2	2104900003	002	Coal Steam	None	None	None	None	None	None	None	None
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	3	2104900003	003	Coal Steam	None	None	None	None	None	None	None	None
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	4	2104900003	004	Coal Steam	None	None	None	None	None	None	None	None
21059	OWENSBORO MUNICIPAL UTIL ELMER SMITH STATION	1374	1	2105900027	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21059	OWENSBORO MUNICIPAL UTIL ELMER SMITH STATION	1374	2	2105900027	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C1	2109100003	001	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C2	2109100003	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C3	2109100003	003	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21101	HENDERSON MUN POW & LIGHT	1372	6	2110100012	002	Coal Steam	None	None	None	None	None	None	None	None
21101	HENDERSON MUN POW & LIGHT	1372	5	2110100012	5	Coal Steam	None	None	None	None	None	None	None	None
21111	LOU GAS & ELEC, CANE RUN	1363	4	0126	04	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, CANE RUN	1363	5	0126	05	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, CANE RUN	1363	6	0126	06	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	1	0127	01	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21111	LOU GAS & ELEC, MILL CREEK	1364	2	0127	02	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	3	0127	03	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	4	0127	04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21127	KENTUCKY POWER CO BIG SANDY PLANT	1353	BSU1	2112700003	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21127	KENTUCKY POWER CO BIG SANDY PLANT	1353	BSU2	2112700003	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	1	2114500006	001	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	2	2114500006	002	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	3	2114500006	003	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	4	2114500006	004	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	5	2114500006	005	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	6	2114500006	006	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	7	2114500006	007	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	8	2114500006	008	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	9	2114500006	009	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	10	2114500006	016	Coal Steam	None	None	None	None	None	None	None	None
21161	EAST KY POWER COOP SPURLOCK ST. MAYSVILLE	6041	1	2116100009	001	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21161	EAST KY POWER COOP SPURLOCK ST. MAYSVILLE	6041	2	2116100009	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	1	2116700001	001	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	2	2116700001	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	3	2116700001	003	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21177	KENTUCKY UTILITIES CO GREEN RIVER STATION	1357	4	2117700001	003	Coal Steam	None	None	None	None	None	None	None	None
21177	KENTUCKY UTILITIES CO GREEN RIVER STATION	1357	5	2117700001	004	Coal Steam	None	None	None	None	None	None	None	None
21177	TVA PARADISE STEAM PLANT	1378	1	2117700006	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21177	TVA PARADISE STEAM PLANT	1378	2	2117700006	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21177	TVA PARADISE STEAM PLANT	1378	3	2117700006	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21183	WESTERN KY ENERGY CORP WILSON STATION	6823	W1	2118300069	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21199	EAST KY POWER COOP JOHN SHERMAN COOPER	1384	1	2119900005	001	Coal Steam	None	None	None	None	None	None	None	None
21199	EAST KY POWER COOP JOHN SHERMAN COOPER	1384	2	2119900005	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
21223	LOUISVILLE GAS & ELECTRIC TRIMBLE CO GEN	6071	1	2122300002	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	HENDERSON STATION 2	1382	H1	2123300001-A	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	HENDERSON STATION 2	1382	H2	2123300001-A	003	Coal Steam	SCR	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	WESTERN KY ENERGY CORP REID	1383	R1	2123300001-B	001	Coal Steam	None	None	None	None	None	None	None	None
21233	WESTERN KY ENERGY CORP GREEN STATION	6639	G1	2123300052	001	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21233	WESTERN KY ENERGY CORP GREEN STATION	6639	G2	2123300052	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21239	KENTUCKY UTILITIES TYRONE FACILITY	1361	5	2123900001	005	Coal Steam	None	None	None	None	None	None	None	None
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051	1	2801100031	001	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051		2801100031	002		O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051	2	2801100031	003	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051		2801100031	004		O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28019	CHOCTAW GENERATION LLP, RED HILLS GENERATING	55076	AA001	2801900011	001A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28019	CHOCTAW GENERATION LLP, RED HILLS GENERATING	55076	AA002	2801900011	001B		None	None	None	None	None	None	None	None
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	1	2804700055	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	2	2804700055	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	3	2804700055	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	4	2804700055	004	Coal Steam	None	SCR	SCR	SCR	None	None	None	Scrubber
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	5	2804700055	005	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
28049	ENTERGY MISSISSIPPI INC, REX BROWN PLANT	2053	4	2804900112	001	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28049	ENTERGY MISSISSIPPI INC, REX BROWN PLANT	2053	3	2804900112	002	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28059	MISSISSIPPI POWER COMPANY, PLANT DANIEL	6073	1	2805900090	001	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
28059	MISSISSIPPI POWER COMPANY, PLANT DANIEL	6073	2	2805900090	002	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	1	2806700035	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	2	2806700035	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	3	2806700035	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28073	RD MORROW SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	6061	1	2807300021	001	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28073	RD MORROW SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	6061	2	2807300021	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28075	MISSISSIPPI POWER COMPANY, PLANT SWEATT	2048	1	2807500032	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28075	MISSISSIPPI POWER COMPANY, PLANT SWEATT	2048	2	2807500032	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28083	GREENWOOD UTILITIES, HENDERSON STATION	2062	H1	2808300048	001	O/G Steam	None	None	None	None	No Operation	No Operation	No Operation	No Operation
28083	GREENWOOD UTILITIES, HENDERSON STATION	2062	H3	2808300048	003	O/G Steam	None	None	None	None	No Operation	No Operation	No Operation	No Operation
28149	ENTERGY MISSISSIPPI INC, BAXTER WILSON	2050	1	2814900027	001	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28149	ENTERGY MISSISSIPPI INC, BAXTER WILSON	2050	2	2814900027	002	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
28151	ENTERGY MISSISSIPPI INC, GERALD ANDRUS	8054	1	2815100048	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
28163	YAZOO CITY PUBLIC SERVICE COMMISSION	2067	3	2816300005	001	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
37017	ELIZABETHTOWN POWER, LLC	10380	UNIT1	3701700043	G-17A	Coal Steam	None	None	None	None	None	None	None	None
37017	ELIZABETHTOWN POWER, LLC	10380	UNIT2	3701700043	G-17B		None	None	None	None	None	None	None	None
37019	COGENTRIX OF NORTH CAROLINA INC - SOUTHPORT	10378	GEN1	3701900067	G-29	Coal Steam	None	None	None	None	None	None	None	None
37019	COGENTRIX OF NORTH CAROLINA INC - SOUTHPORT	10378	GEN2	3701900067	G-30	Coal Steam	None	None	None	None	None	None	None	None
37021	CAROLINA POWER & LIGHT ASHEVILLE STEAM	2706	1	628	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37021	CAROLINA POWER & LIGHT ASHEVILLE STEAM	2706	2	628	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37025	KANNAPOLIS ENERGY PARTNERS LLC			3702500113	G-2	Coal Steam	None	None	None	None	None	None	None	None
37025	KANNAPOLIS ENERGY PARTNERS LLC			3702500113	G-3	Coal Steam	None	None	None	None	None	None	None	None
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	3	3703500073	G-1	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	4	3703500073	G-2	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	1	3703500073	G-4	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	2	3703500073	G-5	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37037	PROGRESS ENERGY CAROLINAS CAPE FEAR	2708	5	3703700063	G-1	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber
37037	PROGRESS ENERGY CAROLINAS CAPE FEAR	2708	6	3703700063	G-2	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	1	3707100039	G-14	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	2	3707100039	G-15	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	3	3707100039	G-16	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	4	3707100039	G-17	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	5	3707100039	G-18	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	7	3707100040	G-17	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	8	3707100040	G-18	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	9	3707100040	G-19	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	10	3707100040	G-20	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37083	ROANOKE VALLEY ENERGY FACILITY			3708300174	G-27	Coal Steam	None	None	None	None	None	None	None	None
37083	ROANOKE VALLEY ENERGY FACILITY			3708300174	G-7	Coal Steam	None	None	None	None	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	1	3712900036	G-187	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	2	3712900036	G-188	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	3	3712900036	G-189	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	1	3714500029	G-29	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	2	3714500029	G-30	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	3A	3714500029	G-35A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	3B	3714500029	G-35B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	4A	3714500029	G-36A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	4B	3714500029	G-36B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - MAYO FACILITY	6250	1A	3714500045	G-46A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - MAYO FACILITY	6250	1B	3714500045	G-46B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	1	3715500147	G-24	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	2	3715500147	G-25	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	3	3715500147	G-26	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37155	LUMBERTON POWER, LLC	10382	UNIT1	3715500166	G-17A	Coal Steam	None	None	None	None	None	None	None	None
37155	LUMBERTON POWER, LLC	10382	UNIT2	3715500166	G-17B		None	None	None	None	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	3	3715700015	G-21	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	1	3715700015	G-22	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	2	3715700015	G-23	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	5	3715900004	G-1	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	6	3715900004	G-2	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	7	3715900004	G-3	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	8	3715900004	G-4	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	9	3715900004	G-5	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	1	3716100028	G-82	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	2	3716100028	G-83	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	3	3716100028	G-84	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	4	3716100028	G-85	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	5	3716100028	G-86	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	6	3716100028	G-87		No Operation	Not in IPM	SCR	Not in IPM	No Operation	Not in IPM	Scrubber	Not in IPM
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	7	3716100028	G-88		No Operation	Not in IPM	SCR	Not in IPM	No Operation	Not in IPM	Scrubber	Not in IPM
37169	DUKE ENERGY CORP BELEWS CREEK STEAM	8042	1	3716900004	G-17	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37169	DUKE ENERGY CORP BELEWS CREEK STEAM	8042	2	3716900004	G-18	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37191	PROGRESS ENERGY F LEE PLANT	2709	1	3719100017	G-2	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37191	PROGRESS ENERGY F LEE PLANT	2709	2	3719100017	G-3	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37191	PROGRESS ENERGY F LEE PLANT	2709	3	3719100017	G-4	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	None	Scrubber
45003	SCE&G:URQUHART	3295	URQ3	0080-0011	003	Coal Steam	None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	001	Coal Steam	None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	002		None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	003		None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	004		None	None	None	None	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
45007	DUKE ENERGY:LEE	3264	1	0200-0004	001	Coal Steam	None	None	None	None	None	None	None	None
45007	DUKE ENERGY:LEE	3264	2	0200-0004	002	Coal Steam	None	None	None	None	None	None	None	None
45007	DUKE ENERGY:LEE	3264	3	0200-0004	003	Coal Steam	None	None	None	None	None	None	None	None
45015	SANTEE COOPER JEFFERIES	3319	1	0420-0003	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
45015	SANTEE COOPER JEFFERIES	3319	2	0420-0003	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
45015	SANTEE COOPER JEFFERIES	3319	3	0420-0003	003	Coal Steam	None	SCR	None	SCR	None	None	None	None
45015	SANTEE COOPER JEFFERIES	3319	4	0420-0003	004	Coal Steam	None	None	None	None	None	None	None	None
45015	SCE&G:WILLIAMS	3298	WIL1	0420-0006	001	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
45015	SANTEE COOPER CROSS	130	1	0420-0030	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45015	SANTEE COOPER CROSS	130	2	0420-0030	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45015	SANTEE COOPER CROSS	130	3	0420-0030	3	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45015	SANTEE COOPER CROSS	130	4	0420-0030	4		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
45029	SCE&G:CANADYS	3280	CAN1	0740-0002	001	Coal Steam	None	None	None	None	None	None	None	None
45029	SCE&G:CANADYS	3280	CAN2	0740-0002	002	Coal Steam	None	None	None	None	None	None	None	None
45029	SCE&G:CANADYS	3280	CAN3	0740-0002	003	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
45031	PROGRESS ENERGY ROBINSON STATION	3251	1	0820-0002	001	Coal Steam	None	None	None	None	None	None	None	None
45043	SANTEE COOPER WINYAH	6249	1	1140-0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
45043	SANTEE COOPER WINYAH	6249	2	1140-0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45043	SANTEE COOPER WINYAH	6249	3	1140-0005	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45043	SANTEE COOPER WINYAH	6249	4	1140-0005	004	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45051	SANTEE COOPER GRAINGER	3317	1	1340-0003	001	Coal Steam	None	None	None	None	None	None	None	None
45051	SANTEE COOPER GRAINGER	3317	2	1340-0003	002	Coal Steam	None	None	None	None	None	None	None	None
45063	SCE&G:MCMEEKIN	3287	MCM1	1560-0003	001	Coal Steam	None	None	None	None	None	None	None	None
45063	SCE&G:MCMEEKIN	3287	MCM2	1560-0003	002	Coal Steam	None	None	None	None	None	None	None	None
45075	SCE&G:COPE	7210	COP1	1860-0044	001	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
45079	SCE&G:WATEREE	3297	WAT1	1900-0013	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	None
45079	SCE&G:WATEREE	3297	WAT2	1900-0013	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
47001	TVA BULL RUN FOSSIL PLANT	3396	1	0009	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	1	0007	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	2	0007	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	3	0007	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	4	0007	004	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	1	0011	001	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	2	0011	002	Coal Steam	None	SCR	SCR	SCR	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	3	0011	003	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	4	0011	004	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	5	0011	005	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	6	0011	006	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	7	0011	007	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	8	0011	008	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	9	0011	009	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	10	0011	010	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47145	TVA KINGSTON FOSSIL PLANT	3407	1	0013	001	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	2	0013	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	3	0013	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	4	0013	004	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	5	0013	005	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	6	0013	006	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	7	0013	007	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	8	0013	008	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	9	0013	009	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
47157	ALLEN FOSSIL PLANT	3393	1	00528	Boilr1	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47157	ALLEN FOSSIL PLANT	3393	2	00528	Boilr2	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47157	ALLEN FOSSIL PLANT	3393	3	00528	Boilr3	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47161	TVA CUMBERLAND FOSSIL PLANT	3399	1	0011	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47161	TVA CUMBERLAND FOSSIL PLANT	3399	2	0011	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	1	0025	001	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	2	0025	002	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	3	0025	003	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	4	0025	004	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
51031	DOMINION - ALTAVISTA POWER STATION	10773	1	00156	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51031	DOMINION - ALTAVISTA POWER STATION	10773	2	00156	2		None	None	None	None	None	None	None	None
51041	DOMINION - CHESTERFIELD POWER STATION	3797	3	00002	3	Coal Steam	None	None	None	None	None	None	Scrubber	None
51041	DOMINION - CHESTERFIELD POWER STATION	3797	4	00002	4	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
51041	DOMINION - CHESTERFIELD POWER STATION	3797	5	00002	6	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
51041	DOMINION - CHESTERFIELD POWER STATION	3797	6	00002	8	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
51065	DOMINION - BREMO POWER STATION	3796	3	00001	1	Coal Steam	None	None	None	None	None	None	None	None
51065	DOMINION - BREMO POWER STATION	3796	4	00001	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	51	00002	1	Coal Steam	None	None	None	None	None	None	None	None
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	52	00002	2	Coal Steam	None	None	None	None	None	None	None	None
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	6	00002	3	Coal Steam	None	None	None	None	None	None	None	Scrubber
51083	DOMINION - CLOVER POWER STATION	7213	1	00046	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51083	DOMINION - CLOVER POWER STATION	7213	2	00046	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51099	BIRCHWOOD POWER PARTNERS, L.P.	54304	1	00012	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
51117	Mecklenburg Cogeneration Facility	52007	GEN1	00051	1	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51117	Mecklenburg Cogeneration Facility	52007	GEN2	00051	2	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51153	DOMINION - POSSUM POINT	3804	3	00002	3	Coal Steam	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle
51153	DOMINION - POSSUM POINT	3804	4	00002	4	Coal Steam	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle
51153	DOMINION - POSSUM POINT	3804	5	00002	5	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
51153	DOMINION - POSSUM POINT	3804	6	00002		Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	1	00003	1	Coal Steam	None	None	None	SCR	None	None	None	Scrubber
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	2	00003	2	Coal Steam	None	None	None	SCR	None	None	None	Scrubber
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	3	00003	3	Coal Steam	None	None	None	SCR	None	None	None	Scrubber
51175	LG&E Westmoreland Southampton	10774	GEN1	00051	1	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51175	LG&E Westmoreland Southampton			00051	2		None	None	None	None	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
51175	LG&E Westmoreland Southampton			00051	4		None	None	None	None	None	None	None	None
51199	DOMINION - YORKTOWN POWER STATION	3809	3	00001	3	O/G Steam	SNCR	No Operation	SNCR	No Operation	None	No Operation	Scrubber	No Operation
51199	DOMINION - YORKTOWN POWER STATION	3809	2	00001	5	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51199	DOMINION - YORKTOWN POWER STATION	3809	1	00001	6	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51510	POTOMAC RIVER GENERATING STATION	3788	1	00003	1	Coal Steam	SNCR	Coal Early Retirement	SNCR	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement
51510	POTOMAC RIVER GENERATING STATION	3788	2	00003	2	Coal Steam	SNCR	Coal Early Retirement	SNCR	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement
51510	POTOMAC RIVER GENERATING STATION	3788	3	00003	3	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51510	POTOMAC RIVER GENERATING STATION	3788	4	00003	4	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51510	POTOMAC RIVER GENERATING STATION	3788	5	00003	5	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51550	DOMINION - CHESAPEAKE	3803	1	00026	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51550	DOMINION - CHESAPEAKE	3803	2	00026	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51550	DOMINION - CHESAPEAKE	3803	3	00026	3	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
51550	DOMINION - CHESAPEAKE	3803	4	00026	4	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	1	0003	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	2	0003	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	3	0003	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	NORTH BRANCH POWER STATION	7537	1A	0014	001	Coal Steam	None	None	None	None	None	None	None	None

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
54023	NORTH BRANCH POWER STATION	7537	1B	0014	002	Coal Steam	None	None	None	None	None	None	None	None
54033	MONONGAHELA POWER CO HARRISON	3944	1	0015	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54033	MONONGAHELA POWER CO HARRISON	3944	2	0015	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54033	MONONGAHELA POWER CO HARRISON	3944	3	0015	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54039	APPALACHIAN POWER KANAWHA RIVER PLANT	3936	1	0006	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54039	APPALACHIAN POWER KANAWHA RIVER PLANT	3936	2	0006	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54049	MONONGAHELA POWER CO. RIVESVILLE POWER	3945	7	0009	001	Coal Steam	None	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54049	MONONGAHELA POWER CO. RIVESVILLE POWER	3945	8	0009	002	Coal Steam	None	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54049	AMERICAN BITUMINOUS POWER GRANT TOWN PLT	10151		0026	001		None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
54049	GRANT TOWN POWER PLANT	10151	GEN1	ORIS10151	GEN1	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER MITCHELL PLANT	3948	1	0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER MITCHELL PLANT	3948	2	0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	1	0006	001	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	2	0006	002	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	3	0006	003	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	11	0001	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	21	0001	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	31	0001	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	41	0001	004	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	51	0001	005	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER MOUNTAINEER PLANT	6264	1	0009		Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54061	MONONGAHELA POWER CO. FORT MARTIN POWER	3943	1	0001	001	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber
54061	MONONGAHELA POWER CO. FORT MARTIN POWER	3943	2	0001	002	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber
54061	MORGANTOWN ENERGY ASSOCIATES			0027	043		None	None	None	None	None	None	None	None
54061	MORGANTOWN ENERGY FACILITY	10743	GEN1	ORIS10743	GEN1	Coal Steam	None	None	None	None	None	None	None	None
54073	MONONGAHELA POWER CO. WILLOW ISLAND	3946	1	0004	001	Coal Steam	None	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54073	MONONGAHELA POWER CO. WILLOW ISLAND	3946	2	0004	002	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54073	MONONGAHELA POWER CO PLEASANTS POWER STATION	6004	1	0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54073	MONONGAHELA POWER CO PLEASANTS POWER STATION	6004	2	0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber Upgrade	Scrubber
54077	MONONGAHELA POWER CO ALBRIGHT	3942	1	0001	001	Coal Steam	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54077	MONONGAHELA POWER CO ALBRIGHT	3942	2	0001	002	Coal Steam	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54077	MONONGAHELA POWER CO ALBRIGHT	3942	3	0001	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	1	0006	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	2	0006	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX H: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE BASE G/G2 INVENTORY

							Post-Combustion Controls							
FIPS	**Facility Name**	**ORIS ID**	**BLR ID**	**SITE ID**	**UNIT ID**	**Plant Type**	**VISTAS NOx 2009 Controls**	**IPM NOx 2009 Controls**	**VISTAS NOx 2018 Controls**	**IPM NOx 2018 Controls**	**VISTAS SO2 2009 Controls**	**IPM SO2 2009 Controls**	**VISTAS SO2 2018 Controls**	**IPM SO2 2018 Controls**
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	3	0006	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX I:

COMPARISON OF EGU CONTROLS FOR COAL AND OIL/GAS UNITS BASED ON IPM MODELING AND STATE-PROVIDED INFORMATION FOR THE B&F INVENTORY

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01033	TVA COLBERT	47	1	0010	010	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	2	0010	011	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	3	0010	012	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	4	0010	013	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01033	TVA COLBERT	47	5	0010	014	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01055	ALABAMA POWER COMPANY GADSDEN	7	1	0002	002	Coal Steam	None	None	None	None	None	None	None	None
01055	ALABAMA POWER COMPANY GADSDEN	7	2	0002	003	Coal Steam	None	None	None	None	None	None	None	None
01063	ALABAMA POWER COMPANY GREENE COUNTY	10	1	0001	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
01063	ALABAMA POWER COMPANY GREENE COUNTY	10	2	0001	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
01071	TVA - WIDOWS CREEK	50	1	0008	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	2	0008	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	3	0008	004	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	4	0008	005	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	5	0008	006	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	6	0008	007	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
01071	TVA - WIDOWS CREEK	50	7	0008	008	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01071	TVA - WIDOWS CREEK	50	8	0008	009	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	4	010730011	001	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	3	010730011	002	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	2	010730011	004	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01073	ALABAMA POWER COMPANY (MILLER POWER PLANT)	6002	1	010730011	005	Coal Steam	SCR All Year	SCR Summer	SCR All Year	SCR Summer	None	None	Scrubber	None
01097	ALABAMA POWER COMPANY BARRY	3	1	1001	002	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	2	1001	003	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	3	1001	004	Coal Steam	SNCR	None	SNCR	SCR	None	None	None	None
01097	ALABAMA POWER COMPANY BARRY	3	4	1001	005	Coal Steam	SNCR	None	SNCR	SCR	None	None	Scrubber	Scrubber
01097	ALABAMA POWER COMPANY BARRY	3	5	1001	006	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	1	0005	002	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	2	0005	003	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	3	0005	004	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	4	0005	005	Coal Steam	None	SCR	None	SCR	None	None	Scrubber	Scrubber
01117	ALABAMA POWER COMPANY E C GASTON	26	5	0005	006	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
01127	ALABAMA POWER COMPANY GORGAS	8	6	0001	004	Coal Steam	None	None	None	None	None	None	None	None
01127	ALABAMA POWER COMPANY GORGAS	8	7	0001	005	Coal Steam	None	None	None	None	None	None	None	None
01127	ALABAMA POWER COMPANY GORGAS	8	8	0001	006	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
01127	ALABAMA POWER COMPANY GORGAS	8	9	0001	007	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
01127	ALABAMA POWER COMPANY GORGAS	8	10	0001	008	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	1	0001	002	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	2	0001	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
01129	ALABAMA ELECTRIC COOP CHARLES R LOWMAN	56	3	0001	004	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK6			O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK7			O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	GAINESVILLE REGIONAL UTILITIES JOHN R KELLY	664	JRK8	0010005	7		O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12001	CITY OF GAINESVILLE, GRU DEERHAVEN	663	B1	0010006	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12001	CITY OF GAINESVILLE, GRU DEERHAVEN	663	B2	0010006	5	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
12005	GULF POWER COMPANY LANSING SMITH PLANT	643	1	0050014	1	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
12005	GULF POWER COMPANY LANSING SMITH PLANT	643	2	0050014	2	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
12009	FLORIDA POWER & LIGHT (PCC) CAPE CANAVERAL	609	PCC1	0090006	1	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12009	FLORIDA POWER & LIGHT (PCC) CAPE CANAVERAL	609	PCC2	0090006	2	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE1	0110036	1	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE2	0110036	2	O/G Steam	None	None	None	None	None	None	None	None
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE3	0110036	3	O/G Steam	None	None	None	None	None	None	None	None
12011	FLORIDA POWER & LIGHT (PPE) PORT EVERGLADES	617	PPE4	0110036	4	O/G Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	1	0170004	1	Coal Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	2	0170004	2	Coal Steam	None	None	None	None	None	None	None	None
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	5	0170004	3	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
12017	PROGRESS ENERGY FLORIDA CRYSTAL RIVER	628	4	0170004	4	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	SAINT JOHNS RIVER	207	1	0310045-A	16		SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	SAINT JOHNS RIVER	207	2	0310045-A	17		SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	NORTHSIDE	667	2A	0310045-B	26	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12031	NORTHSIDE	667	1A	0310045-B	27	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12031	NORTHSIDE	667	3	0310045-B	3	O/G Steam	None	None	None	No Operation	None	None	None	None
12031	CEDAR BAY COGENERATION INC.	10672	GEN1	0310337	1	Coal Steam	None	SNCR	None	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
12031	CEDAR BAY COGENERATION INC.			0310337	2		None		None					

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12031	CEDAR BAY COGENERATION INC.			0310337	3		None		None					
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	1	0330045	1									
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	2	0330045	2	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	3	0330045	3	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	4	0330045	4	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	5	0330045	5	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	6	0330045	6	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	None	Scrubber	None
12033	GULF POWER COMPANY CRIST ELECTRIC GENERATION	641	7	0330045	7	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
12053	Central Power and Lime Incorporated	10333	GEN1	0530021	18	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB01	0570039	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB02	0570039	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB03	0570039	3	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY BIG BEND STATION	645	BB04	0570039	4	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB01	0570040	1		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB02	0570040	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB03	0570040	3		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB04	0570040	4		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB05	0570040	5		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12057	TAMPA ELECTRIC COMPANY F.J. GANNON STATION	646	GB06	0570040	6		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12061	CITY OF VERO BEACH	693		0610029	1	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12061	CITY OF VERO BEACH	693	3	0610029	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12061	CITY OF VERO BEACH	693	4	0610029	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12063	GULF POWER COMPANY SCHOLZ	642	1	0630014	1	Coal Steam	None	None	Shut Down	None	None	None	Shut Down	None
12063	GULF POWER COMPANY SCHOLZ	642	2	0630014	2	Coal Steam	None	None	Shut Down	None	None	None	Shut Down	None
12073	CITY OF TALLAHASSEE ARVAH B.HOPKINS	688	1	0730003	1	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12073	CITY OF TALLAHASSEE ARVAH B.HOPKINS	688	2	0730003	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12081	FLORIDA POWER & LIGHT (PMT) MANATEE POWER	6042	PMT1	0810010	1	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12081	FLORIDA POWER & LIGHT (PMT) MANATEE POWER	6042	PMT2	0810010	2	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12085	FLORIDA POWER & LIGHT (PMR) FPL / MARTIN	6043	PMR1	0850001	1	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12085	FLORIDA POWER & LIGHT (PMR) FPL / MARTIN	6043	PMR2	0850001	2	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12085	INDIANTOWN COGENERATION, L.P.	50976	GEN1	0850102	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12086	FLORIDA POWER & LIGHT (PCU) CUTLER POWER	610	PCU5	0250001	3	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12086	FLORIDA POWER & LIGHT (PCU) CUTLER POWER	610	PCU6	0250001	4	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12086	FLORIDA POWER & LIGHT (PTF) TURKEY POINT	621	PTP1	0250003	1	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12086	FLORIDA POWER & LIGHT (PTF) TURKEY POINT	621	PTP2	0250003	2	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12095	ORLANDO UTILITIES COMMISSION STANTON ENERGY	564	1	0950137	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12095	ORLANDO UTILITIES COMMISSION STANTON ENERGY	564	2	0950137	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12099	FLORIDA POWER & LIGHT (PRV) RIVIERA POWE	619	PRV3	0990042	3	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12099	FLORIDA POWER & LIGHT (PRV) RIVIERA POWE	619	PRV4	0990042	4	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12099	CITY OF LAKE WORTH UTILITIES TOM G. SMITH	673	S-1	0990045	7	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12099	CITY OF LAKE WORTH UTILITIES TOM G. SMITH	673	S-3	0990045	9	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12101	PROGRESS ENERGY FLORIDA ANCLOTE	8048	1	1010017	1	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12101	PROGRESS ENERGY FLORIDA ANCLOTE	8048	2	1010017	2	O/G Steam	None	None	None	No Operation	None	None	None	No Operation
12103	PROGRESS ENERGY FLORIDA BARTOW	634	1	1030011	1	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	No Operation	No Operation
12103	PROGRESS ENERGY FLORIDA BARTOW	634	2	1030011	2	O/G Steam	O/G Early Retirement	O/G Early Retirement	None	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12103	PROGRESS ENERGY FLORIDA BARTOW	634	3	1030011	3	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	No Operation	No Operation
12105	LAKELAND ELECTRIC CHARLES LARSEN	675	7	1050003	4	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
12105	LAKELAND ELECTRIC C.D. MCINTOSH, JR.	676	3	1050004	1	Coal Steam	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
12105	LAKELAND ELECTRIC C.D. MCINTOSH, JR.	676	3	1050004	5	Coal Steam	None	Combine d Cycle	None	Combine d Cycle	None	Combine d Cycle	None	Combine d Cycle
12105	LAKELAND ELECTRIC C.D. MCINTOSH, JR.	676	3	1050004	6	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12107	SEMINOLE ELECTRIC COOPERATIVE, INC.	136	1	1070025	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12107	SEMINOLE ELECTRIC COOPERATIVE, INC.	136	2	1070025	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
12111	FT PIERCE UTILITIES AUTHORITY FT PIERCE	658	7	1110003	7	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12111	FT PIERCE UTILITIES AUTHORITY FT PIERCE	658	8	1110003	8	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	1	1210003	1	O/G Steam	O/G Early Retireme nt	O/G Early Retireme nt	None	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	None	O/G Early Retireme nt
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	2	1210003	2	O/G Steam	O/G Early Retireme nt	O/G Early Retireme nt	None	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	None	O/G Early Retireme nt
12121	PROGRESS ENERGY FLORIDA SUWANNEE RIVER	638	3	1210003	3	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
12127	FLORIDA POWER & LIGHT (PSN) SANFORD POWER	620	PSN3	1270009	1	O/G Steam	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt	O/G Early Retireme nt
12127	FLORIDA POWER & LIGHT (PSN) SANFORD POWER	620	PSN4	1270009	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
12129	TALLAHASSEE CITY PURDOM GENERATING STATION	689	7	1290001	7	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	1BLR	01500011	SG01	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	2BLR	01500011	SG02	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	3BLR	01500011	SG03	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13015	GEORGIA POWER COMPANY, BOWEN STEAM-ELECT	703	4BLR	01500011	SG04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
13021	ARKWRIGHT	699	1	0002	1		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	2	0002	2		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	3	0002	3		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13021	ARKWRIGHT	699	4	0002	4		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	1	05100006	SG01	Coal Steam	None	None	None	None	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	2	05100006	SG02	Coal Steam	None	None	None	None	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	3	05100006	SG03	Coal Steam	None	None	None	SCR	None	None	None	None
13051	SAVANNAH ELECTRIC: KRAFT STEAM	733	4	05100006	SG04	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	11	05100018	11	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	12	05100018	12	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	4	05100018	4	O/G Steam	None	None	None	None	None	None	None	None
13051	RIVERSIDE	734	5	05100018	5	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13051	RIVERSIDE	734	6	05100018	6	O/G Steam	None	No Operation	No Operation	No Operation	None	No Operation	No Operation	No Operation
13067	GEORGIA POWER COMPANY, MCDONOUGH STEAM	710	MB1	06700003	SGM1	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13067	GEORGIA POWER COMPANY, MCDONOUGH STEAM	710	MB2	06700003	SGM2	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y1BR	07700001	SG01	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y2BR	07700001	SG02	Coal Steam	None	None	None	None	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y3BR	07700001	SG03	Coal Steam	None	None	None	None	None	None	None	None
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y4BR	07700001	SG04	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y5BR	07700001	SG05	Coal Steam	None	None	SCR	SCR	None	None	None	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y6BR	07700001	SG06	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13077	GEORGIA POWER COMPANY, YATES STEAM-ELECTRIC	728	Y7BR	07700001	SG07	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727		09500002	SG01		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727		09500002	SG02		No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13095	GEORGIA POWER COMPANY, MITCHELL STEAM-ELECTRIC	727	3	09500002	SG03	Coal Steam	None	None	None	None	None	None	None	None
13103	SAVANNAH ELECTRIC: MCINTOSH STEAM - ELECTRIC	6124	1	10300003	SG01	Coal Steam	None	None	None	SCR	None	None	None	None
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	1	11500003	SG01	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	2	11500003	SG02	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	3	11500003	SG03	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
13115	GEORGIA POWER COMPANY, HAMMOND STEAM-ELECTRIC	708	4	11500003	SG04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
13127	GEORGIA POWER COMPANY, MCMANUS STEAM-ELECTRIC	715	1	12700004	SG01	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13127	GEORGIA POWER COMPANY, MCMANUS STEAM-ELECTRIC	715	2	12700004	SG02	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
13149	GEORGIA POWER COMPANY, WANSLEY STEAM-ELECTRIC	6052	1	14900001	SG01	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
13149	GEORGIA POWER COMPANY, WANSLEY STEAM-ELECTRIC	6052	2	14900001	SG02	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	1	20700008	SG01	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	2	20700008	SG02	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	3	20700008	SG03	Coal Steam	None	None	None	None	None	None	Scrubber	None
13207	GEORGIA POWER COMPANY, SCHERER STEAM-ELECTRIC	6257	4	20700008	SG04	Coal Steam	None	None	None	None	None	None	Scrubber	None
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	1	23700008	SG01	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	2	23700008	SG02	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	3	23700008	SG03	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13237	GEORGIA POWER COMPANY, HARLLEE BRANCH	709	4	23700008	SG04	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
13297	GENERIC UNIT	900113	GSC13	ORIS900113	GSC13	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
21015	CINCINNATI GAS & ELECTRIC EAST BEND STAT	6018	2	2101500029	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	1	2104100010	001	Coal Steam	SCR	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	2	2104100010	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	3	2104100010	003	Coal Steam	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21041	KENTUCKY UTILITIES CO GHENT GENERATING STATION	1356	4	2104100010	004	Coal Steam	SCR	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	1	2104900003	001	Coal Steam	None	None	None	None	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	2	2104900003	002	Coal Steam	None	None	None	None	None	None	None	None
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	3	2104900003	003	Coal Steam	None	None	None	None	None	None	None	None
21049	EAST KY POWER COOP WILLIAM C DALE PLANT	1385	4	2104900003	004	Coal Steam	None	None	None	None	None	None	None	None
21059	OWENSBORO MUNICIPAL UTIL ELMER SMITH STATION	1374	1	2105900027	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21059	OWENSBORO MUNICIPAL UTIL ELMER SMITH STATION	1374	2	2105900027	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C1	2109100003	001	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C2	2109100003	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21091	WESTERN KY ENERGY CORP COLEMAN STATION	1381	C3	2109100003	003	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21091	GENERIC UNIT	900121	GSC21	ORIS900121	GSC21	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21101	HENDERSON MUN POW & LIGHT	1372	6	2110100012	002	Coal Steam	None	None	None	None	None	None	None	None
21101	HENDERSON MUN POW & LIGHT	1372	5	2110100012	5	Coal Steam	None	None	None	None	None	None	None	None
21111	LOU GAS & ELEC, CANE RUN	1363	4	0126	04	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, CANE RUN	1363	5	0126	05	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, CANE RUN	1363	6	0126	06	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	1	0127	01	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	2	0127	02	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21111	LOU GAS & ELEC, MILL CREEK	1364	3	0127	03	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21111	LOU GAS & ELEC, MILL CREEK	1364	4	0127	04	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21127	KENTUCKY POWER CO BIG SANDY PLANT	1353	BSU1	2112700003	001	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
21127	KENTUCKY POWER CO BIG SANDY PLANT	1353	BSU2	2112700003	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	1	2114500006	001	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	2	2114500006	002	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	3	2114500006	003	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	4	2114500006	004	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	5	2114500006	005	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	6	2114500006	006	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	7	2114500006	007	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	8	2114500006	008	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	9	2114500006	009	Coal Steam	None	None	None	None	None	None	None	None
21145	TVA-ENVIRONMENTAL AFFAIRS SHAWNEE PLANT	1379	10	2114500006	016	Coal Steam	None	None	None	None	None	None	None	None
21161	EAST KY POWER COOP SPURLOCK ST. MAYSVILLE	6041	1	2116100009	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21161	EAST KY POWER COOP SPURLOCK ST. MAYSVILLE	6041	2	2116100009	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	1	2116700001	001	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	2	2116700001	002	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21167	KENTUCKY UTILITIES CO BROWN FACILITY	1355	3	2116700001	003	Coal Steam	None	None	SCR	SCR	Scrubber	None	Scrubber	Scrubber
21177	KENTUCKY UTILITIES CO GREEN RIVER STATION	1357	4	2117700001	003	Coal Steam	None	None	None	None	None	None	None	None
21177	KENTUCKY UTILITIES CO GREEN RIVER STATION	1357	5	2117700001	004	Coal Steam	None	None	None	None	None	None	None	None
21177	TVA PARADISE STEAM PLANT	1378	1	2117700006	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21177	TVA PARADISE STEAM PLANT	1378	2	2117700006	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21177	TVA PARADISE STEAM PLANT	1378	3	2117700006	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21183	WESTERN KY ENERGY CORP WILSON STATION	6823	W1	2118300069	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21199	EAST KY POWER COOP JOHN SHERMAN COOPER	1384	1	2119900005	001	Coal Steam	None	None	None	None	None	None	Scrubber	None
21199	EAST KY POWER COOP JOHN SHERMAN COOPER	1384	2	2119900005	002	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
21223	LOUISVILLE GAS & ELECTRIC TRIMBLE CO GEN	6071	1	2122300002	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	HENDERSON STATION 2	1382	H1	2123300001 -A	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	HENDERSON STATION 2	1382	H2	2123300001 -A	003	Coal Steam	SCR	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21233	WESTERN KY ENERGY CORP REID	1383	R1	2123300001 -B	001	Coal Steam	None	None	None	None	None	None	None	None
21233	WESTERN KY ENERGY CORP GREEN STATION	6639	G1	2123300052	001	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
21233	WESTERN KY ENERGY CORP GREEN STATION	6639	G2	2123300052	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
21239	KENTUCKY UTILITIES TYRONE FACILITY	1361	5	2123900001	005	Coal Steam	None	None	None	None	None	None	None	None
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051	1	2801100031	001	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051		2801100031	002		None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051	2	2801100031	003	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28011	ENTERGY MISSISSIPPI INC, DELTA PLANT	2051		2801100031	004		None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28019	CHOCTAW GENERATION LLP, RED HILLS GENERATING	55076	AA001	2801900011	001A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28019	CHOCTAW GENERATION LLP, RED HILLS GENERATING	55076	AA002	2801900011	001B									
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28035	MISSISSIPPI POWER COMPANY, PLANT EATON	2046		2803500038	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	1	2804700055	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	2	2804700055	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	3	2804700055	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	4	2804700055	004	Coal Steam	None	SCR	SCR	SCR	None	None	None	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
28047	MISSISSIPPI POWER COMPANY, PLANT JACK WATSON	2049	5	2804700055	005	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
28049	ENTERGY MISSISSIPPI INC, REX BROWN PLANT	2053	4	2804900112	001	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28049	ENTERGY MISSISSIPPI INC, REX BROWN PLANT	2053	3	2804900112	002	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28059	MISSISSIPPI POWER COMPANY, PLANT DANIEL	6073	1	2805900090	001	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
28059	MISSISSIPPI POWER COMPANY, PLANT DANIEL	6073	2	2805900090	002	Coal Steam	None	SCR	SCR	SCR	None	None	Scrubber	Scrubber
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	1	2806700035	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	2	2806700035	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28067	MOSELLE SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	2070	3	2806700035	003	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28073	RD MORROW SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	6061	1	2807300021	001	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28073	RD MORROW SOUTH MISSISSIPPI ELECTRIC POWER ASSOCIATION	6061	2	2807300021	002	Coal Steam	None	None	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
28075	MISSISSIPPI POWER COMPANY, PLANT SWEATT	2048	1	2807500032	001	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28075	MISSISSIPPI POWER COMPANY, PLANT SWEATT	2048	2	2807500032	002	O/G Steam	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation	No Operation
28083	GREENWOOD UTILITIES, HENDERSON STATION	2062	H1	2808300048	001	O/G Steam	None	None	None	None	No Operation	No Operation	No Operation	No Operation
28083	GREENWOOD UTILITIES, HENDERSON STATION	2062	H3	2808300048	003	O/G Steam	None	None	None	None	No Operation	No Operation	No Operation	No Operation
28149	ENTERGY MISSISSIPPI INC, BAXTER WILSON	2050	1	2814900027	001	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
28149	ENTERGY MISSISSIPPI INC, BAXTER WILSON	2050	2	2814900027	002	O/G Steam	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement	None	O/G Early Retirement
28151	ENTERGY MISSISSIPPI INC, GERALD ANDRUS	8054	1	2815100048	001	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
28163	YAZOO CITY PUBLIC SERVICE COMMISSION	2067	3	2816300005	001	O/G Steam	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement	O/G Early Retirement
37017	ELIZABETHTOWN POWER, LLC	10380	UNIT1	3701700043	G-17A	Coal Steam	None	None	None	None	None	None	None	None
37017	ELIZABETHTOWN POWER, LLC	10380	UNIT2	3701700043	G-17B		None	None	None	None	None	None	None	None
37019	COGENTRIX OF NORTH CAROLINA INC - SOUTHPORT	10378	GEN1	3701900067	G-29	Coal Steam	None	None	None	None	None	None	None	None
37019	COGENTRIX OF NORTH CAROLINA INC - SOUTHPORT	10378	GEN2	3701900067	G-30	Coal Steam	None	None	None	None	None	None	None	None
37021	CAROLINA POWER & LIGHT ASHEVILLE STEAM	2706	1	628	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37021	CAROLINA POWER & LIGHT ASHEVILLE STEAM	2706	2	628	2	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37025	KANNAPOLIS ENERGY PARTNERS LLC			3702500113	G-2	Coal Steam	None	None	None	None	None	None	None	None
37025	KANNAPOLIS ENERGY PARTNERS LLC			3702500113	G-3	Coal Steam	None	None	None	None	None	None	None	None
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	3	3703500073	G-1	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	4	3703500073	G-2	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	1	3703500073	G-4	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37035	DUKE ENERGY CORPORATION MARSHALL STEAM	2727	2	3703500073	G-5	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37037	PROGRESS ENERGY CAROLINAS CAPE FEAR	2708	5	3703700063	G-1	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Furnace Sorbent Injection	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37037	PROGRESS ENERGY CAROLINAS CAPE FEAR	2708	6	3703700063	G-2	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Furnace Sorbent Injection	Scrubber
37045	GENERIC UNIT	900137	GSC37	ORIS900137	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37055	GENERIC UNIT	900237	GSC37	ORIS900237	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37055	GENERIC UNIT	900337	GSC37	ORIS900337	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37061	GENERIC UNIT	900437	GSC37	ORIS900437	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37083	GENERIC UNIT	900537	GSC37	ORIS900537	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37083	GENERIC UNIT	900637	GSC37	ORIS900637	GSC37	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	1	3707100039	G-14	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	2	3707100039	G-15	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	3	3707100039	G-16	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	4	3707100039	G-17	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION ALLEN STEAM	2718	5	3707100039	G-18	Coal Steam	SNCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	7	3707100040	G-17	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	8	3707100040	G-18	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	9	3707100040	G-19	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37071	DUKE ENERGY CORPORATION RIVERBEND STEAM	2732	10	3707100040	G-20	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37083	ROANOKE VALLEY ENERGY FACILITY			3708300174	G-27	Coal Steam	None	None	None	None	None	None	None	None
37083	ROANOKE VALLEY ENERGY FACILITY			3708300174	G-7	Coal Steam	None	None	None	None	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	1	3712900036	G-187	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	2	3712900036	G-188	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
37129	L V SUTTON STEAM ELECTRIC PLANT	2713	3	3712900036	G-189	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	1	3714500029	G-29	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	2	3714500029	G-30	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	3A	3714500029	G-35A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	3B	3714500029	G-35B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	4A	3714500029	G-36A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - ROXBORO STEAM ELECTRIC PLANT	2712	4B	3714500029	G-36B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - MAYO FACILITY	6250	1A	3714500045	G-46A	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37145	CP&L - MAYO FACILITY	6250	1B	3714500045	G-46B	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	1	3715500147	G-24	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	2	3715500147	G-25	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37155	PROGRESS ENERGY CAROLINAS, INC., W.H. WEATHERSPOON	2716	3	3715500147	G-26	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
37155	LUMBERTON POWER, LLC	10382	UNIT1	3715500166	G-17A	Coal Steam	None	None	None	None	None	None	None	None
37155	LUMBERTON POWER, LLC	10382	UNIT2	3715500166	G-17B		None	None	None	None	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	3	3715700015	G-21	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	1	3715700015	G-22	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37157	DUKE ENERGY CORP DAN RIVER STEAM	2723	2	3715700015	G-23	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	5	3715900004	G-1	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	6	3715900004	G-2	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	7	3715900004	G-3	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	8	3715900004	G-4	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37159	DUKE ENERGY CORPORATION BUCK STEAM	2720	9	3715900004	G-5	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	1	3716100028	G-82	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	2	3716100028	G-83	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	3	3716100028	G-84	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	4	3716100028	G-85	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	5	3716100028	G-86	Coal Steam	SCR	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
37161	DUKE ENERGY CORPORATION	2721	6	3716100028	G-87	Coal Steam	No Operation	Not in IPM	SCR	Not in IPM	No Operation	Not in IPM	Scrubber	Not in IPM

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FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
	CLIFFSIDE STEAM													
37161	DUKE ENERGY CORPORATION CLIFFSIDE STEAM	2721	7	3716100028	G-88		No Operation	Not in IPM	No Operation	Not in IPM	No Operation	Not in IPM	No Operation	Not in IPM
37169	DUKE ENERGY CORP BELEWS CREEK STEAM	8042	1	3716900004	G-17	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37169	DUKE ENERGY CORP BELEWS CREEK STEAM	8042	2	3716900004	G-18	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
37191	PROGRESS ENERGY F LEE PLANT	2709	1	3719100017	G-2	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37191	PROGRESS ENERGY F LEE PLANT	2709	2	3719100017	G-3	Coal Steam	None	SNCR	SNCR	SNCR	None	None	None	None
37191	PROGRESS ENERGY F LEE PLANT	2709	3	3719100017	G-4	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	None	Scrubber
45003	SCE&G:URQUHART	3295	URQ3	0080-0011	003	Coal Steam	None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	001	Coal Steam	None	None	None	None	None	None	None	None
45003	SCE&G:SRS AREA D			0080-0044	002		None	None	None	None				
45003	SCE&G:SRS AREA D			0080-0044	003		None	None	None	None				
45003	SCE&G:SRS AREA D			0080-0044	004		None	None	None	None				
45007	DUKE ENERGY:LEE	3264	1	0200-0004	001	Coal Steam	None	None	None	None	None	None	None	None
45007	DUKE ENERGY:LEE	3264	2	0200-0004	002	Coal Steam	None	None	None	None	None	None	None	None
45007	DUKE ENERGY:LEE	3264	3	0200-0004	003	Coal Steam	None	None	None	None	None	None	None	None
45015	SANTEE COOPER JEFFERIES	3319	1	0420-0003	001	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	None	No Operation

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
45015	SANTEE COOPER JEFFERIES	3319	2	0420-0003	002	O/G Steam	No Operation	No Operation	None	No Operation	No Operation	No Operation	None	No Operation
45015	SANTEE COOPER JEFFERIES	3319	3	0420-0003	003	Coal Steam	None	SCR	None	SCR	None	None	None	None
45015	SANTEE COOPER JEFFERIES	3319	4	0420-0003	004	Coal Steam	None	None	None	None	None	None	None	None
45015	SCE&G:WILLIAMS	3298	WIL1	0420-0006	001	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
45015	SANTEE COOPER CROSS	130	1	0420-0030	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45015	SANTEE COOPER CROSS	130	2	0420-0030	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45015	SANTEE COOPER CROSS	130	3	0420-0030	3	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45015	SANTEE COOPER CROSS	130	4	0420-0030	4	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45029	SCE&G:CANADYS	3280	CAN1	0740-0002	001	Coal Steam	None	None	None	None	None	None	None	None
45029	SCE&G:CANADYS	3280	CAN2	0740-0002	002	Coal Steam	None	None	None	None	None	None	None	None
45029	SCE&G:CANADYS	3280	CAN3	0740-0002	003	Coal Steam	None	None	None	None	Scrubber	None	Scrubber	None
45031	PROGRESS ENERGY ROBINSON STATION	3251	1	0820-0002	001	Coal Steam	None	None	None	None	None	None	None	None
45043	SANTEE COOPER WINYAH	6249	1	1140-0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45043	SANTEE COOPER WINYAH	6249	2	1140-0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
45043	SANTEE COOPER WINYAH	6249	3	1140-0005	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45043	SANTEE COOPER WINYAH	6249	4	1140-0005	004	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
45051	SANTEE COOPER GRAINGER	3317	1	1340-0003	001	Coal Steam	None	None	None	None	None	None	None	None

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FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
45051	SANTEE COOPER GRAINGER	3317	2	1340-0003	002	Coal Steam	None	None	None	None	None	None	None	None
45063	SCE&G:MCMEEKIN	3287	MCM1	1560-0003	001	Coal Steam	None	None	None	None	None	None	None	None
45063	SCE&G:MCMEEKIN	3287	MCM2	1560-0003	002	Coal Steam	None	None	None	None	None	None	None	None
45075	SCE&G:COPE	7210	COP1	1860-0044	001	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
45079	SCE&G:WATEREE	3297	WAT1	1900-0013	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	None
45079	SCE&G:WATEREE	3297	WAT2	1900-0013	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	None	Scrubber	Scrubber
45029	GENERIC UNIT	900145	GSC45	ORIS900145	GSC45	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
45031	GENERIC UNIT	900245	GSC45	ORIS900245	GSC45	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
45031	GENERIC UNIT	900345	GSC45	ORIS900345	GSC45	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
45039	GENERIC UNIT	900445	GSC45	ORIS900445	GSC45	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
45043	GENERIC UNIT	900545	GSC45	ORIS900545	GSC45	Coal Steam	No Operation	No Operation	Cross Unit 4	SCR	No Operation	No Operation	Cross Unit 4	Scrubber
47001	TVA BULL RUN FOSSIL PLANT	3396	1	0009	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	1	0007	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	2	0007	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	3	0007	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47073	TVA JOHN SEVIER FOSSIL PLANT	3405	4	0007	004	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	1	0011	001	Coal Steam	None	SCR	SCR	SCR	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	2	0011	002	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	3	0011	003	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	4	0011	004	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	5	0011	005	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	6	0011	006	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	7	0011	007	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	8	0011	008	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	9	0011	009	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47085	TVA JOHNSONVILLE FOSSIL PLANT	3406	10	0011	010	Coal Steam	None	SCR	SCR	SCR	None	None	None	None
47145	TVA KINGSTON FOSSIL PLANT	3407	1	0013	001	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	2	0013	002	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	3	0013	003	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	4	0013	004	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	5	0013	005	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	6	0013	006	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	7	0013	007	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber
47145	TVA KINGSTON FOSSIL PLANT	3407	8	0013	008	Coal Steam	SCR	SCR	SCR	SCR	None	None	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
47145	TVA KINGSTON FOSSIL PLANT	3407	9	0013	009	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
47157	ALLEN FOSSIL PLANT	3393	1	00528	Boilr1	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47157	ALLEN FOSSIL PLANT	3393	2	00528	Boilr2	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47157	ALLEN FOSSIL PLANT	3393	3	00528	Boilr3	Coal Steam	SCR	SCR	SCR	SCR	None	None	None	None
47161	TVA CUMBERLAND FOSSIL PLANT	3399	1	0011	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47161	TVA CUMBERLAND FOSSIL PLANT	3399	2	0011	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	1	0025	001	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	2	0025	002	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	3	0025	003	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
47165	TVA GALLATIN FOSSIL PLANT	3403	4	0025	004	Coal Steam	None	None	None	None	None	None	Scrubber	Scrubber
51031	DOMINION - ALTAVISTA POWER STATION	10773	1	00156	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51031	DOMINION - ALTAVISTA POWER STATION	10773	2	00156	2		0	0	0	0	0	0	0	0
51041	DOMINION - CHESTERFIELD POWER STATION	3797	3	00002	3	Coal Steam	None	None	None	None	None	None	Scrubber	None
51041	DOMINION - CHESTERFIELD POWER STATION	3797	4	00002	4	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
51041	DOMINION - CHESTERFIELD POWER STATION	3797	5	00002	6	Coal Steam	SCR	None	SCR	SCR	None	None	Scrubber	Scrubber
51041	DOMINION - CHESTERFIELD POWER STATION	3797	6	00002	8	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
51065	DOMINION - BREMO POWER STATION	3796	3	00001	1	Coal Steam	None	None	None	None	None	None	None	None

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
51065	DOMINION - BREMO POWER STATION	3796	4	00001	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	None	None
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	51	00002	1	Coal Steam	None	None	None	None	None	None	None	None
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	52	00002	2	Coal Steam	None	None	None	None	None	None	None	None
51071	AMERICAN ELECTRIC POWER GLEN LYN	3776	6	00002	3	Coal Steam	None	None	None	None	None	None	None	Scrubber
51083	DOMINION - CLOVER POWER STATION	7213	1	00046	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51083	DOMINION - CLOVER POWER STATION	7213	2	00046	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	Scrubber	Scrubber	Scrubber	Scrubber
51099	BIRCHWOOD POWER PARTNERS, L.P.	54304	1	00012	1	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
51117	Mecklenburg Cogeneration Facility	52007	GEN1	00051	1	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51117	Mecklenburg Cogeneration Facility	52007	GEN2	00051	2	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51153	DOMINION - POSSUM POINT	3804	3	00002	3	Coal Steam	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle
51153	DOMINION - POSSUM POINT	3804	4	00002	4	Coal Steam	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle	None	Combined Cycle
51153	DOMINION - POSSUM POINT	3804	5	00002	5	O/G Steam	None	No Operation	None	No Operation	None	No Operation	None	No Operation
51153	DOMINION - POSSUM POINT	3804	6	00002		Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle	Combined Cycle
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	1	00003	1	Coal Steam	None	None	SNCR	SCR	None	None	Emission Cap	Scrubber
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	2	00003	2	Coal Steam	None	None	SNCR	SCR	None	None	Emission Cap	Scrubber
51167	AMERICAN ELECTRIC POWER CLINCH RIVER PLANT	3775	3	00003	3	Coal Steam	None	None	SNCR	SCR	None	None	Emission Cap	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
51175	LG&E Westmoreland Southampton	10774	GEN1	00051	1	Coal Steam	None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
51175	LG&E Westmoreland Southampton			00051	2		None	None	None	None	0	0	0	0
51175	LG&E Westmoreland Southampton			00051	4		None	None	None	None	0	0	0	0
51199	DOMINION - YORKTOWN POWER STATION	3809	3	00001	3	O/G Steam	SNCR	No Operation	SNCR	No Operation	None	No Operation	Scrubber	No Operation
51199	DOMINION - YORKTOWN POWER STATION	3809	2	00001	5	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51199	DOMINION - YORKTOWN POWER STATION	3809	1	00001	6	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	None
51510	POTOMAC RIVER GENERATING STATION	3788	1	00003	1	Coal Steam	SNCR	Coal Early Retirement	SNCR	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement
51510	POTOMAC RIVER GENERATING STATION	3788	2	00003	2	Coal Steam	SNCR	Coal Early Retirement	SNCR	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement
51510	POTOMAC RIVER GENERATING STATION	3788	3	00003	3	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51510	POTOMAC RIVER GENERATING STATION	3788	4	00003	4	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51510	POTOMAC RIVER GENERATING STATION	3788	5	00003	5	Coal Steam	SNCR	None	SNCR	None	None	None	None	None
51550	DOMINION - CHESAPEAKE	3803	1	00026	1	Coal Steam	SNCR	SNCR	SNCR	SNCR	Low S Coal	None	Scrubber	None
51550	DOMINION - CHESAPEAKE	3803	2	00026	2	Coal Steam	SNCR	SNCR	SNCR	SNCR	Low S Coal	None	Scrubber	None
51550	DOMINION - CHESAPEAKE	3803	3	00026	3	Coal Steam	SCR	None	SCR	SCR	Low S Coal	None	Scrubber	Scrubber
51550	DOMINION - CHESAPEAKE	3803	4	00026	4	Coal Steam	SCR	None	SCR	SCR	Low S Coal	None	Scrubber	Scrubber
51159	GENERIC UNIT	900151	GSC51	ORIS900151	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber

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FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
51167	GENERIC UNIT	900251	GSC51	ORIS900251	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
51195	GENERIC UNIT	900251	GSC51	ORIS900251	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
51175	GENERIC UNIT	900351	GSC51	ORIS900351	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
51175	GENERIC UNIT	900451	GSC51	ORIS900451	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
51181	GENERIC UNIT	900551	GSC51	ORIS900551	GSC51	Coal Steam	No Operation	No Operation	SCR	SCR	No Operation	No Operation	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	1	0003	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	2	0003	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	MOUNT STORM POWER PLANT	3954	3	0003	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54023	NORTH BRANCH POWER STATION	7537	1A	0014	001	Coal Steam	None	None	None	None	None	None	None	None
54023	NORTH BRANCH POWER STATION	7537	1B	0014	002	Coal Steam	None	None	None	None	None	None	None	None
54025	WESTERN GREENBRIER			00066	GEN1	Coal Steam	No Operation	No Operation	SCR	No Operation	No Operation	No Operation	SCR	No Operation
54033	MONONGAHELA POWER CO HARRISON	3944	1	0015	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54033	MONONGAHELA POWER CO HARRISON	3944	2	0015	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54033	MONONGAHELA POWER CO HARRISON	3944	3	0015	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54039	APPALACHIAN POWER KANAWHA RIVER PLANT	3936	1	0006	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54039	APPALACHIAN POWER KANAWHA RIVER PLANT	3936	2	0006	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54049	MONONGAHELA POWER CO. RIVESVILLE POWER	3945	7	0009	001	Coal Steam	None	Coal Early	None	Coal Early	None	Coal Early	Coal Early	Coal Early

APPENDIX I: EGU CONTROLS FOR COAL AND OIL/GAS UNITS FOR THE B&F INVENTORY

FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	Post-Combustion Controls							
							VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
								Retirement		Retirement		Retirement	Retirement	Retirement
54049	MONONGAHELA POWER CO. RIVESVILLE POWER	3945	8	0009	002	Coal Steam	None	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54049	AMERICAN BITUMINOUS POWER GRANT TOWN PLT	10151		0026	001		None	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
54049	GRANT TOWN POWER PLANT	10151	GEN1	ORIS10151	GEN1	Coal Steam	SNCR	None	None	None	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER MITCHELL PLANT	3948	1	0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER MITCHELL PLANT	3948	2	0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	1	0006	001	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	2	0006	002	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54051	OHIO POWER KAMMER PLANT	3947	3	0006	003	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	11	0001	001	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	21	0001	002	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	31	0001	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	41	0001	004	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER CO. PHILIP SPORN PLANT	3938	51	0001	005	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54053	APPALACHIAN POWER MOUNTAINEER PLANT	6264	1	0009		Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54061	MONONGAHELA POWER CO. FORT MARTIN POWER	3943	1	0001	001	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber

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							Post-Combustion Controls							
FIPS	Facility Name	ORIS ID	BLR ID	SITE ID	UNIT ID	Plant Type	VISTAS NOx 2009 Controls	IPM NOx 2009 Controls	VISTAS NOx 2018 Controls	IPM NOx 2018 Controls	VISTAS SO2 2009 Controls	IPM SO2 2009 Controls	VISTAS SO2 2018 Controls	IPM SO2 2018 Controls
54061	MONONGAHELA POWER CO. FORT MARTIN POWER	3943	2	0001	002	Coal Steam	SNCR	SNCR	SNCR	SNCR	None	None	Scrubber	Scrubber
54061	MORGANTOWN ENERGY ASSOCIATES			0027	043		None	None	None	None	None	None	None	None
54061	MORGANTOWN ENERGY FACILITY	10743	GEN1	ORIS10743	GEN1	Coal Steam	None	None	None	None	None	None	None	None
54061	LONGVIEW			00134	GEN1	Coal Steam	No Operation	No Operation	SCR	No Operation	No Operation	No Operation	Scrubber	No Operation
54061	GENERIC UNIT	900154	GSC54	ORIS900154	GSC54	Coal Steam	No Operation	No Operation	No Operation	SCR	No Operation	No Operation	No Operation	Scrubber
54073	MONONGAHELA POWER CO. WILLOW ISLAND	3946	1	0004	001	Coal Steam	None	Coal Early Retirement	None	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54073	MONONGAHELA POWER CO. WILLOW ISLAND	3946	2	0004	002	Coal Steam	None	SCR	SCR	SCR	None	Scrubber	Scrubber	Scrubber
54073	MONONGAHELA POWER CO PLEASANTS POWER STATION	6004	1	0005	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
54073	MONONGAHELA POWER CO PLEASANTS POWER STATION	6004	2	0005	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber Upgrade	Scrubber	Scrubber Upgrade	Scrubber
54077	MONONGAHELA POWER CO ALBRIGHT	3942	1	0001	001	Coal Steam	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54077	MONONGAHELA POWER CO ALBRIGHT	3942	2	0001	002	Coal Steam	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement	None	Coal Early Retirement	Coal Early Retirement	Coal Early Retirement
54077	MONONGAHELA POWER CO ALBRIGHT	3942	3	0001	003	Coal Steam	None	None	SCR	SCR	None	None	Scrubber	Scrubber
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	1	0006	001	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	2	0006	002	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber
54079	APPALACHIAN POWER JOHN E AMOS PLANT	3935	3	0006	003	Coal Steam	SCR	SCR	SCR	SCR	Scrubber	Scrubber	Scrubber	Scrubber