Appendix B

VERSION 3.3 Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region; Prepared for MARAMA by AMEC Environment & Infrastructure and SRA International, Inc.;

January 23, 2012

Technical Support Document for the Development of the 2025 Emission Inventory for PM Nonattainment Counties in the MANE-VU Region Version 3.3

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MARAMA Contract Agreement FY2011-004

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About MARAMA

The Mid-Atlantic Regional Air Management Association, Inc. is a voluntary, non-profit association of ten state and local air pollution control agencies. MARAMA's mission is to strengthen the skills and capabilities of member agencies and to help them work together to prevent and reduce air pollution in the Mid-Atlantic Region. MARAMA provides cost-effective approaches to regional collaboration by pooling resources to develop and analyze data, share ideas, and train staff to implement common requirements.

Table of Contents

List of Appendices

List of Exhibits

Acronyms and Abbreviations

Acronym	Description
CAA	Clean Air Act
CAMD	Clean Air Markets Division (USEPA)
CEM	Continuous emission monitoring
CMV	Commercial marine vessel
CO	Carbon monoxide
EGU	Electric generating unit
ERTAC	Eastern Regional Technical Advisory Committee
FIPS	Federal Information Processing Standard
GSE	Ground support equipment
MACT	Maximum achievable control technology
MANE-VU	Mid-Atlantic/Northeast Visibility Union
MANE-VU+VA	MANE-VU states plus Virginia
MAR	Marine, airport, rail
MARAMA	Mid-Atlantic Regional Air Management Association
MOBILE6	USEPA model
MOVES	Motor Vehicle Emissions Simulator model
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System code
NCD	National county database
NEI	National Emission Inventory
NESCAUM	Northeast States for Coordinated Air Use Management
NIF3.0	NEI Input Format Version 3.0
NMIM	National Mobile Input Model
NOF3.0	NEI Output Format Version 3.0
NONROAD	USEPA model
NO_x	Oxides of nitrogen
ORL	One-record-per-line (SMOKE format)
OTAQ	Office of Transportation and Air Quality (USEPA)
PFC	Portable fuel container
PM-CON	Primary PM, condensable portion only (< 1 micron)
PM-FIL	Primary PM, Filterable portion only
PM-PRI	Primary PM, includes filterable and condensable PM-PRI= PM-FIL + PM-CON
PM10-FIL	Primary PM10, filterable portion only
PM10-PRI	Primary PM10, includes filterable and condensable, PM10- PRI = PM0-FIL + PM-CON
PM25-FIL	Primary PM2.5, filterable portion only

Acronym	**Description**
PM25-PRI	Primary PM2.5, includes filterable and condensable PM25-PRI= PM25-FIL + PM-CON
RWC	Residential wood combustion
SEMAP	Southeast Modeling, Analysis and Planning
SIC	Standard Industrial Classification code
SIP	State Implementation Plan
SCC	Source classification code
S/L	State/local
SMOKE	Sparse Matrix Operator Kernel Emissions
SO_2	Sulfur dioxide
TSD	Technical Support Document
USEPA	U.S. Environmental Protection Agency
VISTAS	Visibility Improvement State and Tribal Association of the Southeast
VMT	Vehicle miles traveled
VOC	Volatile organic compounds

1.0 INTRODUCTION

This technical support document (TSD) explains the data sources, methods, and results for preparing emission projections for 2025 for particulate matter (PM) nonattainment areas in the Mid-Atlantic / Northeast Visibility Union (MANE-VU) region. The MANE-VU region includes Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Virginia is not included in the MANE-VU region; however, several cities and counties in northern Virginia were included in this inventory as they are part of a nonattainment area that includes MANE-VU jurisdictions.

1.1 INVENTORY PURPOSE

The Clean Air Act (CAA), as amended, requires each state with areas failing to meet the National Ambient Air Quality Standards (NAAQS) to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standards. The CAA allows states to request nonattainment areas to be re-designated to attainment provided certain criteria are met. For particulate matter, the U.S. Environmental Protections Agency's (USEPA's) re-designation guidance requires the submittal of a comprehensive inventory of direct PM2.5 emissions and emissions of PM precursors representative of the year when the area achieves attainment of the PM2.5 air quality standards. Another emission inventory related requirement includes a projection of the emission inventory to a year at least 10 years following re-designation.

To support state's efforts in developing PM2.5 maintenance plans and re-designation requests, MARAMA issued a contract to AMEC E&I to assemble a comprehensive emission inventory for 2025. A workgroup was formed to guide the 2025 inventory development process. Participants included a member from each state with a PM2.5 nonattainment area, as follows: Paul Bodner (CT), Dave Fees and Jack Sipple (DE), Roger Thunell (MD), Judy Rand and Danny Wong (NJ), Ron Stannard (NY), Arleen Shulman (PA), and Doris McLeod (VA). The committee has met via teleconference on multiple occasions to discuss plans for the 2025 inventory. The 2025 inventory was developed using a combination of MARAMA's in-house resources, support from state agencies and contractor support from AMEC E&I, Inc. and SRA International, Inc.

1.2 SOURCE CATEGORIES

This report documents the development of annual emission projections for 2025 for each of these sectors, as follows:

- **EGU Point Sources** are units that generate electric power and sell most of the power generated to the electrical grid.
- **NonEGU Point Sources** are individual industrial, commercial, and institutional facilities and are further subdivided by stack, emission unit, and emission process.
- **Stationary Area Sources** include sources that in and of themselves are quite small, but in aggregate may contribute significant emissions. Examples include small industrial/commercial facilities, residential heating furnaces, VOCs volatizing from house painting or consumer products, gasoline service stations, and agricultural fertilizer/pesticide application.
- **Non-road Mobile Sources** include internal combustion engines used to propel marine vessels, airplanes, and locomotives, or to operate equipment such as forklifts, lawn and garden equipment, portable generators, etc. For activities other than marine vessels, airplanes, and railroad locomotives (MAR), the inventory was developed using the most current version of USEPA's NONROAD model as embedded in the National Mobile Inventory Model (NMIM). Because the NONROAD model does not include emissions from MAR sources, these emissions were estimated based on data and methodologies used in recent USEPA regulatory impact analyses.
- **On-road Mobile Sources** are sources of air pollution from internal combustion engines used to propel cars, trucks, buses, and other vehicles on public roadways. Emission projections for on-road mobile sources were developed by MARAMA or state staff using USEPA's Motor Vehicle Emission Simulator (MOVES) model.

Biogenic/geogenic emissions are not included in this inventory.

1.3 GEOGRAPHIC AND TEMPORAL RESOLUTION

The geographic area for the 2025 inventory includes only those counties that are classified as nonattainment for the annual (1997) or daily (2006) particulate matter NAAQS. The inventory was developed at the county-level for non-point sources and at the process level for point sources.

Annual inventories are required for re-designation of areas designated as nonattainment for the 1997 and 2006 NAAQS. Other inventory elements required by USEPA (such as interim inventory years) are being addressed by individual states in their SIP submittals.

1.4 POLLUTANTS

The inventory includes emissions for directly emitted PM and PM-precursors (oxides of nitrogen {NO_x}, and sulfur dioxide {SO_2}). The PM species in the inventory are categorized as particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM25-PRI), which includes both condensable particles (PM-CON) and filterable particles (PM25-FIL).

1.5 DATA FORMATS

For each sector, we prepared easy-to-review spreadsheets that provide 2007 emissions and 2025 growth factors, control factors, and emissions. We also prepared county level and nonattainment area summaries for all PM nonattainment counties and areas. The summaries show the 2007 and 2025 emissions, along with the percent change in emissions from 2007 to 2025 for each source sector.

1.6 INVENTORY VERSIONS

The development of base and future year inventories is an iterative process that continually attempts to use the best data available to meet air quality planning needs, given time and resource constraints. The following subsections summarize the work completed to date.

1.6.1 Version 2 Modeling Inventories with Existing Controls

MARAMA developed comprehensive emission inventories to support air quality modeling in the region. MARAMA developed a calendar year 2007 (MARAMA 2011a) inventory for all sectors except the onroad sector. These inventories, completed in February of 2011, are referred to as Version 2 of the MANE-VU+VA 2007 base year inventory. The inventories were provided in formats required for air quality modeling. Under a separate effort, the Northeast States for Coordinated Air Use Management (NESCAUM) developed a 2007 onroad inventory using the MOVES model to support air quality modeling.

MARAMA also prepared emission projections for 2013/2017/2020 (MARAMA 2011b) for all sectors except the electric generation and onroad sectors. These projections reflect a scenario representing the best estimates for the future year, accounting for all in-place controls that are fully adopted into federal or individual state regulations or SIPs. In the past, this inventory is also referred to as the "on-the-books" inventory. Modelers often refer to this scenario as the "future base case".

1.6.2 Version 3 Modeling Inventories with Existing Controls

Beginning in the fall of 2011, MARAMA sponsored development of Version 3_3 of the 2007 base year modeling inventory to incorporate new paved road emission estimates, revised modeling of nonroad and onroad sources, and other state-specific changes (MARAMA2012a). MARAMA developed Version 3_3 of the future year inventory to account for changes to the 2007 base year inventory and selected changes in growth and control factors identified by states (MARAMA2012b). The future year modeling inventories for electric generating units (EGUs) are currently being developed under a separate effort lead by the Eastern Regional Technical Advisory Committee (ERTAC). The future year modeling inventories for onroad sources are currently being developed by NESCAUM, MARAMA or individual states.

1.6.3 Version 3 Modeling Inventories with Potential New Controls

MARAMA also developed annual emission scenario intended to include all 2017/2020 existing controls plus any new state measures that are under consideration. This is a "what if" scenario that assumes that all states adopt certain new control measures by 2017. Modelers sometimes call this the "future control case".

1.6.4 Version 3 2025 Inventory for PM Nonattainment Counties

The 2025 inventory for PM nonattainment counties was developed using Version 3_3 of the modeling inventory, with the following exceptions:

- Growth and control factors for 2025 were developed for the area, nonEGU point, and nonroad MAR sectors, using the same methodologies and data sources that were used to develop the 2017/2020 inventories with existing controls.

- For nonroad sources included in NMIM, Version 2 results were available for 2007, 2017, and 2020. MARAMA and New York made additional NMIM runs for 2025 based on Version 2 inputs. MARAMA made revisions to some of the inputs to NMIM for Version 3_3 of the modeling inventory; however, these revised NMIM runs were not used in the 2025 PM nonattainment county inventory due to time constraints.

- For onroad sources included in the MOVES model, MARAMA and states executed the model in the inventory mode for 2007 and 2025. Version 3_3 of the modeling inventory used results of the MOVES model executed in a manner to support air quality modeling.

- For EGU point sources, the results of the ERTAC EGU projection methodology are not currently available. An alternative methodology for projecting EGU emissions based on growth and control factors was used, as described in Section 4.

- Only counties classified as nonattainment for the PM2.5 annual or 24-hour NAAQS were included.

Exhibit 1-1 shows the data sources used for the 2025 PM nonattainment area inventory. Exhibit 1-2 lists the counties included in the 2025 PM nonattainment area inventory.

1.7 REPORT ORGANIZATION

Sections 2 to 6 describe the emission projection process for the following source sectors: area sources; point sources; nonroad mobile sources included in the NMIM model; other nonroad mobile sources (marine vessels, aircraft, and railroad locomotives); and onroad mobile sources included in the MOVES model. Section 7 provides nonattainment area emission pollutant summaries. Section 8 provides a description of the final deliverables, including the file names for all final deliverable products. References for the TSD are provided in Section 9.

Exhibit 1.1 – Comparison of Data Used for Version 3 of the Modeling Inventory and the 2025 PM Nonattainment Inventory

Sector	Modeling Inventory		2025 PM Nonattainment Inventory	
	2007	2017/2020	2007	2025
Area	Version 3_3	Version 3_3	Version 3_3	Version 3_3
Nonroad-NMIM	Version 3_3	Version 3_3	Version 2	2025 NMIM run based on Version 2 inputs
Nonroad-MAR	Version 3_3	Version 3_3	Version 3_3	Version 3_3
Onroad	MOVES runs by NESCAUM to support AQ modeling	MOVES runs by NESCAUM to support AQ modeling	MOVES runs by MARAMA or states in inventory mode	MOVES runs by MARAMA or states in inventory mode
Point-EGU	Version 3_3	To be developed by ERTAC	Version 3_3	See section 4 for projection methodology
Point-nonEGU	Version 3_3	Version 3_3	Version 3_3	Version 3_3

Exhibit 1.2 – List of PM Nonattainment Areas and Counties

Nonattainment Area	State	FIPS Code	County	PM Nonattainment? 2006 Daily NAAQS	PM Nonattainment? 1997 Annual NAAQS
Allentown, PA	PA	42077	Lehigh	Yes	Yes
	PA	42095	Northampton	Yes	Yes
Baltimore, MD	MD	24003	Anne Arundel	No	Yes
	MD	24005	Baltimore	No	Yes
	MD	24013	Carroll	No	Yes
	MD	24025	Harford	No	Yes
	MD	24027	Howard	No	Yes
	MD	24510	Baltimore City	No	Yes
Hagerstown-Martinsburg, MD-WV	MD	24043	Washington	No	Yes
Harrisburg-Lebanon-Carlisle-York, PA	PA	42041	Cumberland	Yes	Yes
	PA	42043	Dauphin	Yes	Yes
	PA	42075	Lebanon	Yes	Yes
	PA	42133	York*	Yes	No
Johnstown, PA	PA	42021	Cambria	Yes	Yes
	PA	42063	Indiana(P)	Yes	Yes
Lancaster, PA	PA	42071	Lancaster	Yes	Yes
New York-N. New Jersey-Long Island, NY-NJ-CT	CT	09001	Fairfield	Yes	Yes
	CT	09009	New Haven	Yes	Yes
	NJ	34003	Bergen	Yes	Yes
	NJ	34013	Essex	Yes	Yes
	NJ	34017	Hudson	Yes	Yes
	NJ	34021	Mercer	Yes	Yes
	NJ	34023	Middlesex	Yes	Yes
	NJ	34025	Monmouth	Yes	Yes
	NJ	34027	Morris	Yes	Yes
	NJ	34031	Passaic	Yes	Yes
	NJ	34035	Somerset	Yes	Yes
	NJ	34039	Union	Yes	Yes
	NY	36005	Bronx	Yes	Yes
	NY	36047	Kings	Yes	Yes
	NY	36059	Nassau	Yes	Yes
	NY	36061	New York	Yes	Yes
	NY	36071	Orange	Yes	Yes
	NY	36081	Queens	Yes	Yes
	NY	36085	Richmond	Yes	Yes
	NY	36087	Rockland	Yes	Yes
	NY	36103	Suffolk	Yes	Yes
	NY	36119	Westchester	Yes	Yes
Philadelphia-Wilmington, PA-NJ-DE	DE	10003	New Castle	Yes	Yes
	NJ	34005	Burlington	Yes	Yes
	NJ	34007	Camden	Yes	Yes
	NJ	34015	Gloucester	Yes	Yes
	PA	42017	Bucks	Yes	Yes

Nonattainment Area	State	FIPS Code	County	PM Nonattainment?	
				2006 Daily NAAQS	1997 Annual NAAQS
	PA	42029	Chester	Yes	Yes
	PA	42045	Delaware	Yes	Yes
	PA	42091	Montgomery	Yes	Yes
	PA	42101	Philadelphia	Yes	Yes
Pittsburgh-Beaver Valley, PA	PA	42003	Allegheny(P)	Yes	Yes
	PA	42005	Armstrong(P)	Yes	Yes
	PA	42007	Beaver	Yes	Yes
	PA	42019	Butler	Yes	Yes
	PA	42059	Greene(P)	Yes	Yes
	PA	42073	Lawrence(P)*	Yes	Yes
	PA	42125	Washington	Yes	Yes
	PA	42129	Westmoreland	Yes	Yes
Reading, PA	PA	42011	Berks	No	Yes
Washington, DC-MD-VA	DC	11001	Washington	No	Yes
	MD	24017	Charles	No	Yes
	MD	24021	Frederick	No	Yes
	MD	24031	Montgomery	No	Yes
	MD	24033	Prince George	No	Yes
	VA	51013	Arlington	No	Yes
	VA	51059	Fairfax	No	Yes
	VA	51107	Loudoun	No	Yes
	VA	51153	Prince William	No	Yes
	VA	51510	Alexandria	No	Yes
	VA	51600	Fairfax City	No	Yes
	VA	51610	Falls Church	No	Yes
	VA	51683	Manassas City	No	Yes
	VA	51685	Manassas Park	No	Yes
York, PA	PA	42133	York*	No	Yes

* York County, PA, is in one nonattainment area for the 2006 24-hour standard (Harrisburg-Lebanon-Carlisle-York, PA) and another for the 1997 annual standard (York, PA).

(P) indicates that only part of the county is in the nonattainment area; for this inventory, emissions for the entire county are included.

2.0 AREA SOURCES

2.1 AREA SOURCE CATEGORIES

The area source sector contains emissions estimates for sources which individually are too small in magnitude or too numerous to inventory as individual point sources, and which can often be estimated more accurately as a single aggregate source for a county. Examples are emissions from home heating systems, house painting, consumer products usage, and small industrial/commercial operations that are not permitted as point sources. There are 356 individual area source categories in the MANE-VU+VA inventory, categorized by a 10-digit SCC.

2.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 area source inventory were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). The only adjustment to the 2007 Version 3_3 area source inventory was to apply "transport factors" to fugitive dust sources, as described in the following subsection.

2.2.1 Adjustments to the 2007 Inventory Used for the 2025 Projections

Grid air quality models consistently overestimate fugitive dust impacts as compared to ambient samples. USEPA developed a methodology to reduce fugitive dust emissions for use in grid modeling analyses. It is considered a logical step to improve the ability to account for the removal of particles near their emission source by vegetation and surface features and can be useful in grid-based modeling analyses.

In February 2011, MARAMA developed 2007 emission modeling files for area sources which applied the USEPA "transport factor" to reduce fugitive dust emissions to account for the removal of particles near their emission source by vegetation and surface features. The standard transport fractions and SCC assignments from USEPA's CHIEF website (USEPA 2007a) were used to reduce the PM25-PRI emissions in this inventory. Two files were used. Exhibit 2.1 shows the list of nonEGU SCCs for which the transport factor was applied. The major source categories included paved and unpaved roads, construction activity, agricultural crop land tilling, and agricultural livestock operations. Exhibit 2.2 lists the transport fractions for PM nonattainment counties which vary by county. For example, the transport factors ranges from 0.1375 in Camden, New Jersey to 0.80 in Suffolk County, New York. For Virginia, no transport fraction was provided for the City of Fairfax; Fairfax County's transport fraction was used for this jurisdiction.

Exhibit 2.1 Area Source SCCs Affected by PM Transport Fraction

SCC	SCC Description
2294000000	Paved Roads: All Paved Roads: Total: Fugitives
2296000000	Unpaved Roads: All Unpaved Roads: Total: Fugitives
2311000000	Construction: All Processes: Total
2311010000	Construction: General Building Construction: Total
2311020000	Construction: Heavy Construction: Total
2311030000	Construction: Road Construction: Total
2801000000	Miscellaneous Area Sources;Agriculture Production - Crops;Agriculture - Crops;Total
2801000001	Ag crops: Agriculture - Crops: Land Breaking
2801000002	Ag crops: Agriculture - Crops: Planting
2801000003	Ag crops: Agriculture - Crops: Tilling
2801000004	Ag crops: Agriculture - Crops: Defoliation
2801000005	Ag crops: Agriculture - Crops: Harvesting
2801000006	Ag crops: Agriculture - Crops: Drying
2801000007	Ag crops: Agriculture - Crops: Loading
2801000008	Ag crops: Agriculture - Crops: Transport
2805000000	Ag livestock: Agriculture - Livestock: Total
2805001000	Ag livestock: Beef Cattle Feedlots: Total (also see 2805020000)
2805001001	Ag livestock: Beef Cattle Feedlots: Feed Preparation
2805005000	Ag livestock: Poultry Operations: Total
2805010000	Ag livestock: Dairy Operations: Total
2805015000	Ag livestock: Hog Operations: Total
2805020000	Ag livestock: Cattle and Calves Composite: Total
2805025000	Ag livestock: Hogs and Pigs Composite: Total
2805030000	Ag livestock: Poultry and Chickens Composite: Total
2805035000	Ag livestock: Horses and Ponies Composite: Total
2805040000	Ag livestock: Sheep and Lambs Composite: Total
2805045001	Ag livestock: Goats: Total

Exhibit 2.2 PM Transport Fractions for PM Nonattainment Counties

State	FIPS	County	PM Transport Fraction
CT	09001	FAIRFIELD	0.4347
CT	09009	NEW HAVEN	0.4442
DE	10003	NEW CASTLE	0.5087
DC	11001	WASHINGTON	0.3953
MD	24003	ANNE ARUNDEL	0.4874
MD	24005	BALTIMORE	0.4047
MD	24013	CARROLL	0.5641
MD	24017	CHARLES	0.4879
MD	24021	FREDERICK	0.4904
MD	24025	HARFORD	0.5147
MD	24027	HOWARD	0.2798
MD	24031	MONTGOMERY	0.3089
MD	24033	PRINCE GEORGES	0.2950
MD	24043	WASHINGTON	0.4003
MD	24510	BALTIMORE (CITY)	0.4874
NJ	34003	BERGEN	0.2657
NJ	34005	BURLINGTON	0.3008
NJ	34007	CAMDEN	0.1375
NJ	34013	ESSEX	0.3461
NJ	34015	GLOUCESTER	0.4361
NJ	34017	HUDSON	0.5286
NJ	34021	MERCER	0.3472
NJ	34023	MIDDLESEX	0.3273
NJ	34025	MONMOUTH	0.5468
NJ	34027	MORRIS	0.2297
NJ	34031	PASSAIC	0.1971
NJ	34035	SOMERSET	0.3635
NJ	34039	UNION	0.3117
NY	36005	BRONX	0.6145
NY	36059	NASSAU	0.6595
NY	36061	NEW YORK	0.6483
NY	36071	ORANGE	0.3803
NY	36081	QUEENS	0.6505
NY	36085	RICHMOND	0.7159
NY	36087	ROCKLAND	0.3556
NY	36103	SUFFOLK	0.7997
NY	36119	WESTCHESTER	0.3531
PA	42003	ALLEGHENY	0.2308
PA	42005	ARMSTRONG	0.3289
PA	42007	BEAVER	0.3141

State	FIPS	County	PM Transport Fraction
PA	42011	BERKS	0.4682
PA	42017	BUCKS	0.3980
PA	42019	BUTLER	0.3621
PA	42021	CAMBRIA	0.2253
PA	42029	CHESTER	0.4757
PA	42041	CUMBERLAND	0.4649
PA	42043	DAUPHIN	0.3438
PA	42045	DELAWARE	0.3515
PA	42059	GREENE	0.3224
PA	42063	INDIANA	0.2884
PA	42071	LANCASTER	0.6183
PA	42073	LAWRENCE	0.4422
PA	42075	LEBANON	0.4521
PA	42077	LEHIGH	0.4487
PA	42091	MONTGOMERY	0.3729
PA	42095	NORTHAMPTON	0.4306
PA	42101	PHILADELPHIA	0.3471
PA	42125	WASHINGTON	0.3436
PA	42129	WESTMORELAND	0.2875
PA	42133	YORK	0.5134
VA	51013	ARLINGTON	0.3534
VA	51059	FAIRFAX	0.2457
VA	51107	LOUDOUN	0.3345
VA	51153	PRINCE WILLIAM	0.1814
VA	51510	ALEXANDRIA	0.3745
VA	51610	FALLS CHURCH	0.3400
VA	51683	MANASSAS	0.3474
VA	51685	MANASSAS PARK	0.3551

Exhibit 2.3 – Comparison of 2007 Paved Road Dust PM10 Emission Estimates

Nonattainment Area	Without Transport Factor		With Transport Factor	
	Version2	Version 3 New Method	Version2	Version 3 New Method
Allentown	4,228	1,733	1,859	764
Baltimore	15,175	5,412	6,658	2,400
Hagerstown	1,490	263	596	105
Harrisburg-Lebanon-Carlisle-York	9,133	4,124	4,149	1,855
Johnstown	2,663	1,133	673	289
Lancaster	4,339	1,808	2,683	1,118
New York-Northern NJ-Long Island-CT	58,512	28,747	29,128	14,260
Philadelphia-Wilmington	29,379	12,644	11,070	4,801
Pittsburgh-Beaver Valley	14,470	6,173	4,491	1,920
Reading	3,346	1,423	1,567	666
Washington, DC-MD-VA	21,067	9,909	6,846	3,194
York	3,684	1,458	1,891	749

Exhibit 2.4 – Comparison of 2007 Paved Road Dust PM2.5 Emission Estimates

Nonattainment Area	Without Transport Factor		With Transport Factor	
	Version2	Version 3 New Method	Version2	Version 3 New Method
Allentown	264	433	116	191
Baltimore	1,770	1,328	782	589
Hagerstown	196	64	78	26
Harrisburg-Lebanon-Carlisle-York	605	1,031	277	464
Johnstown	198	283	50	72
Lancaster	295	452	182	280
New York-Northern NJ-Long Island-CT	2,400	7,173	1,252	3,547
Philadelphia-Wilmington	1,396	3,165	547	1,202
Pittsburgh-Beaver Valley	942	1,543	299	480
Reading	209	356	98	167
Washington, DC-MD-VA	1,713	2,432	594	784
York	257	365	132	187

2.3 2025 INVENTORY DEVELOPMENT

The general procedures and data used for projecting emissions for the area source sector are summarized in this section. Growth factors were applied to the MANE-VU+VA 2007 inventory to account for changes in fuel use, population, economic activity. Next, control factors were applied to account for future emission reductions from control regulations. The 2025 inventory accounts for post-2007 emission reductions from promulgated federal, State, local, and site-specific control programs and proposed control programs that are reasonably anticipated to result in post-2007 emission reductions.

2.3.1 Area Source Growth Factors

The area and nonEGU point source growth factors were developed using six sets of data:

- The Annual Energy Outlook (AEO) fuel consumption forecasts;
- County-level population projections;
- State-level employment projections by NAICS code;
- County-level vehicle miles travelled (VMT) projections;
- USEPA projections for livestock and residential wood combustion; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If state-supplied data were not provided, then the AEO projection factors were used for fuel consumption sources, and the population/employment/VMT data were used for other source categories.

2.3.1.1 AEO Fuel Use Projection

The AEO is published annually by the U.S. Energy Information Administration (EIA). It presents long-term projections of energy supply, demand, and prices through 2035, based on results from EIA's National Energy Modeling System (NEMS). NEMS projects the production, imports, conversion, consumption, and prices of energy, subject to assumptions on macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, energy technology cost and performance characteristics, and demographics.

AEO provides regional fuel-use forecasts for various fuel types (e.g., coal, residual oil, distillate oil, natural gas) by end use sector (e.g., residential, commercial, industrial, transportation, and electric power). Energy use projections are reported at the Census division level. The census divisions grouped states as follows:

- South Atlantic - DE, DC, MD, VA
- Middle Atlantic – NJ, NY, PA
- New England – CT, ME, MA, NH, RI, VT

Appendices A1, A2, and A3 contain the AEO2010 fuel use projections for each of these three regions. Appendices A4, A5, and A6 contain the AEO2011 fuel use projections

Version 2 of the MANE-VU+VA future year inventories was developed using AEO2010 (EIA2010). After the release of Version 2, AEO2011 was published (EIA2011a). MARAMA reviewed the updated fuel forecasts and compared the AEO2010 and AEO2011 projections. Appendix A7 documents MARAMA's analysis. MARAMA calculated the difference in projected fuel usage between AEO2010 and AEO2011 for the residential, commercial, industrial, transportation, and electric power sector for the distillate fuel oil, residual fuel oil, coal, natural gas, and renewable fuel types. MARAMA identified thresholds for what constitutes a major change as follows:

- An increase or decrease of 1% or less is considered to be no change and did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease of between 1% and 5% is considered to be a minor change, and states agreed that these differences between AEO2010 and AEO2011 did not warrant a change in the growth factors between Versions 2 and 3 of the inventory;
- An increase or decrease above 5% is considered a major change, and warrants a change in the growth factors used in Version 3.

MARAMA recommended that the AEO2010 projections be retained for all residential, commercial, and industrial sector fuel use, except for industrial natural gas usage, where the AEO2011 projections will be used for Version 3 of the future year modeling inventory. New Jersey elected to use the more recent growth factors from AEO2011 instead of the AEO2010 growth factors for all area source fossil fuel use categories.

Exhibits 2.5 to 2.9 summarize the projected fuel use rates by source sector (residential, commercial, industrial, transportation) and AEO geographic area for the years 2007 to 2025. The unusual growth in commercial residual oil use in the South Atlantic region could not be explained; Maryland elected to use employment instead of the AEO2010 growth factor for commercial residual oil combustion, while Virginia and the District chose to assume flat growth in this sector.

2.3.1.2 Population Projections

States provided county-level historic population data and projections for future years. The historical and projection years varied from state to state, so values were interpolated, when necessary, to create population estimates for each year from 2007 to 2025. The population data were then normalized to create growth factors from 2007 for each year future year.

For example, Delaware had a population of 861,087 in 2007, and the projected population in 2017 is 953,204. Thus, the growth factor for 2017 is 953,204 / 861,087 = 1.107.

Exhibit 2.10 summarizes the population growth factors by state and AEO2010 region. Population is projected to grow in every state between 2007 and 2025. The population growth in the New England states varies significantly by state. Population growth in the South Atlantic states is projected to be much higher than in the New England and Mid-Atlantic states. Appendix B contains the data use to develop the population projections.

2.3.1.3 Employment Projections

Every two years, the federal Bureau of Labor Statistics produces long-term industry and occupation forecasts for ten future years, and states are asked to do the same for their respective economies. The most recent projections are from state Departments of Labor for the period 2006 to 2016, most of which were published in 2008. These 10-year forecasts are updated every other year. The next set of state-specific projections will be for the period 2008 to 2018. Only the District of Columbia and Delaware were able to provide employment projections for 2008 to 2017; the 2008 to 2018 projections were not available for other states in time for use on this project. The employment projections are state-wide by 3-digit NAICS code. Exhibit 2.11 summarizes the manufacturing employment (NAICS sector 310) growth factors by state and AEO2010 region. States in the Northeast / Mid-Atlantic region show a marked decrease in manufacturing employment from 2007 forward. Appendix C contains the data that were used to develop the employment projections.

2.3.1.4 VMT Projections

States developed projections of vehicle miles traveled (VMT) for 2007 and 2025 which were used as the growth factor for projecting emissions from re-entrained road dust from travel on paved roads (SCC 22-94-000-000). The 2007 and 2025 VMT are identical to those used in the MOVES modeling discussed in Section 8. Exhibit 2.12 shows the county level VMT for 2007 and 2025, and the growth factor for projecting 2007 emissions to 2025. Growth factors for 2013, 2017, and 2020 were based on a linear interpolation of the 2007 and 2025 VMT. Appendix D contains additional information on the data used to develop the VMT growth factors.

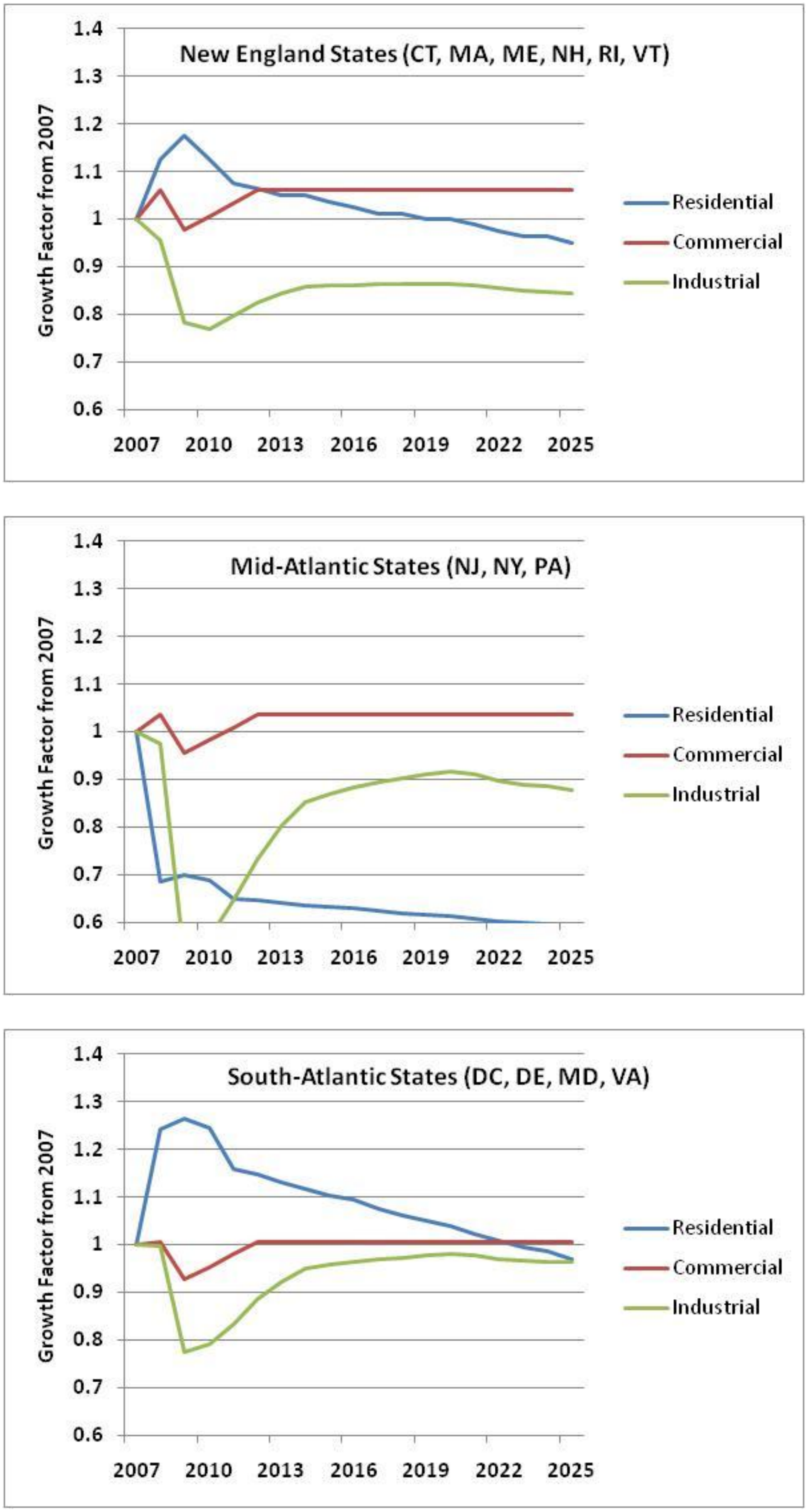
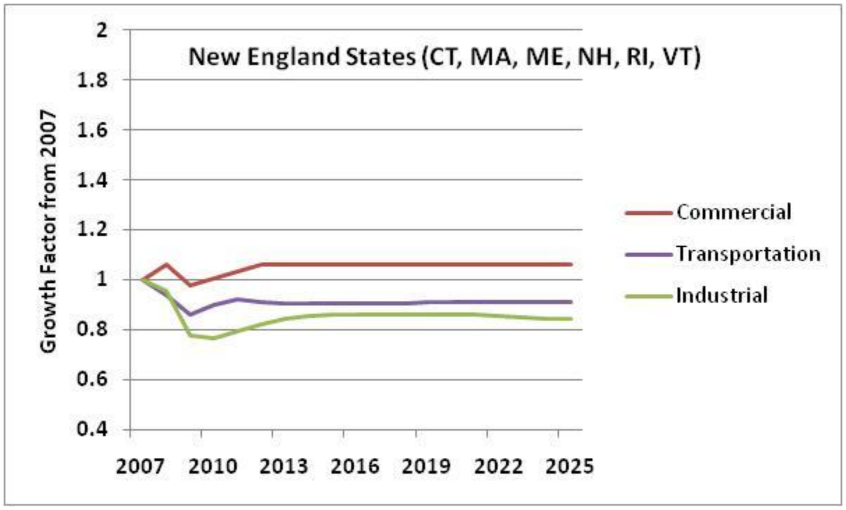
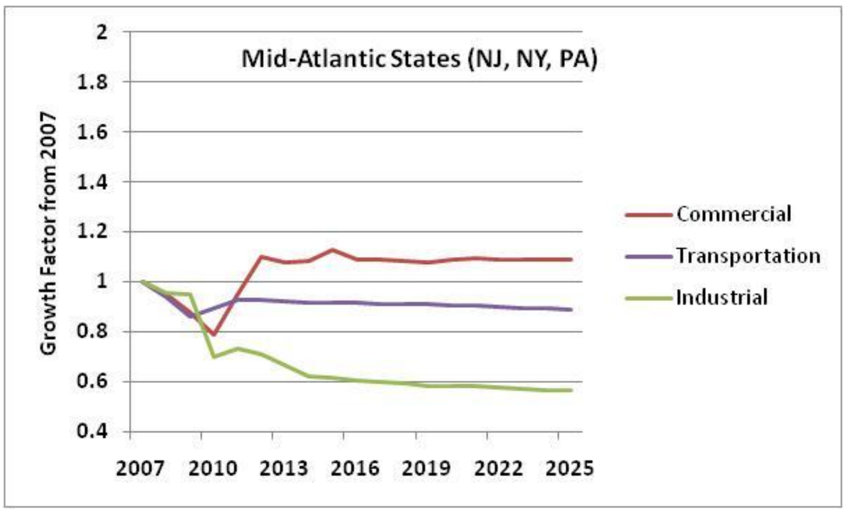


Exhibit 2.5 AEO2010 Growth Factors for Coal by AEO Region 2007 – 2025





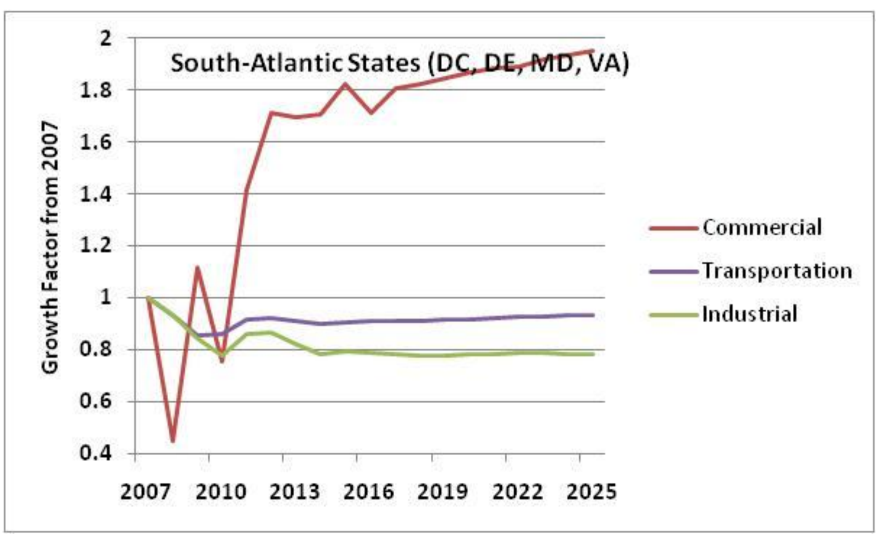


Exhibit 2.6 Growth Factors for Residual Oil by AEO Region 2007 – 2025

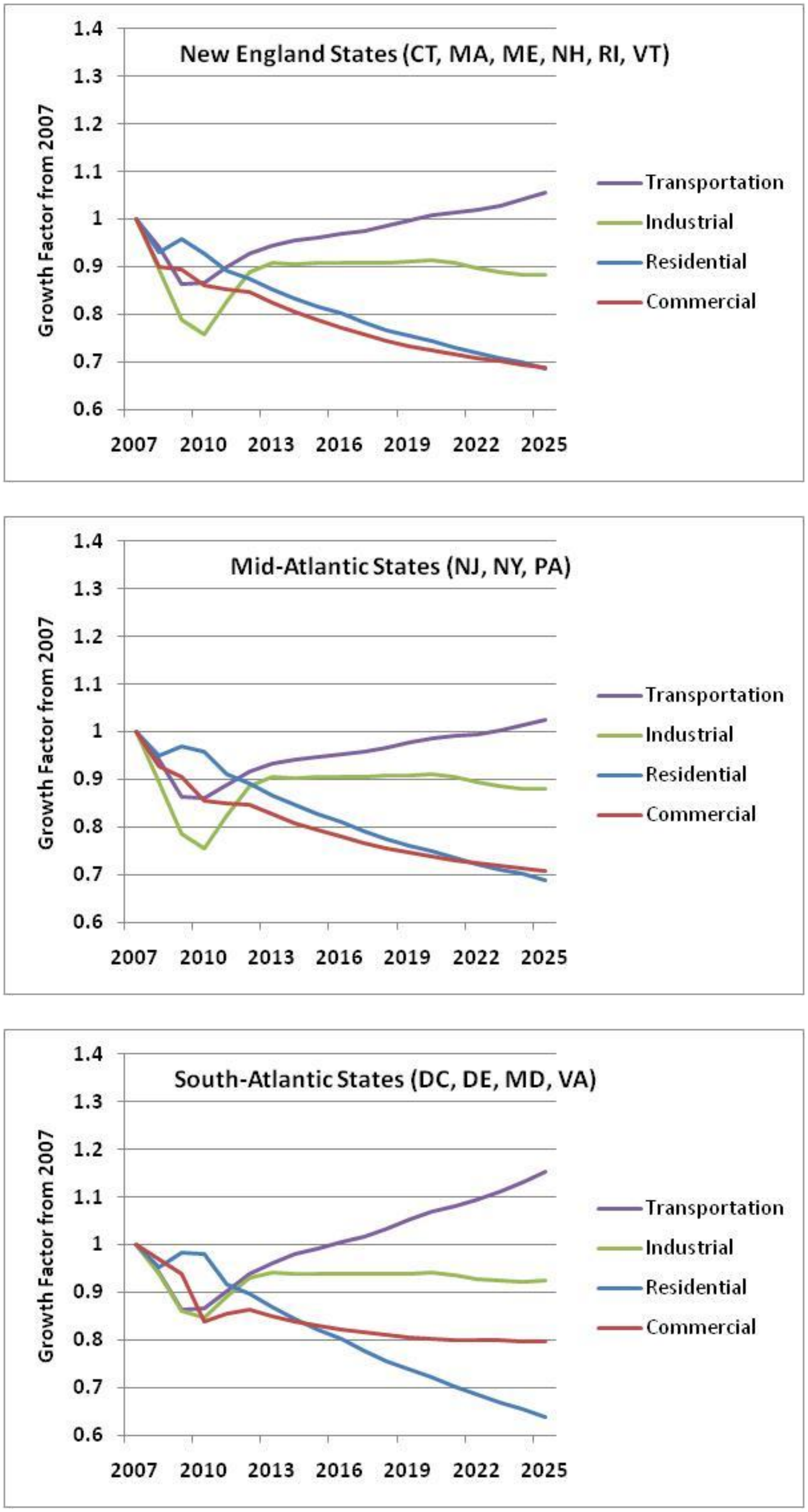
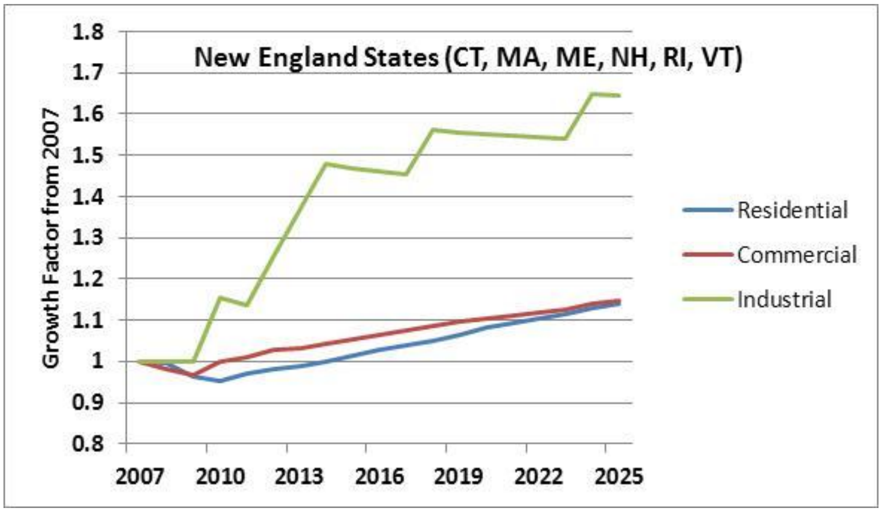
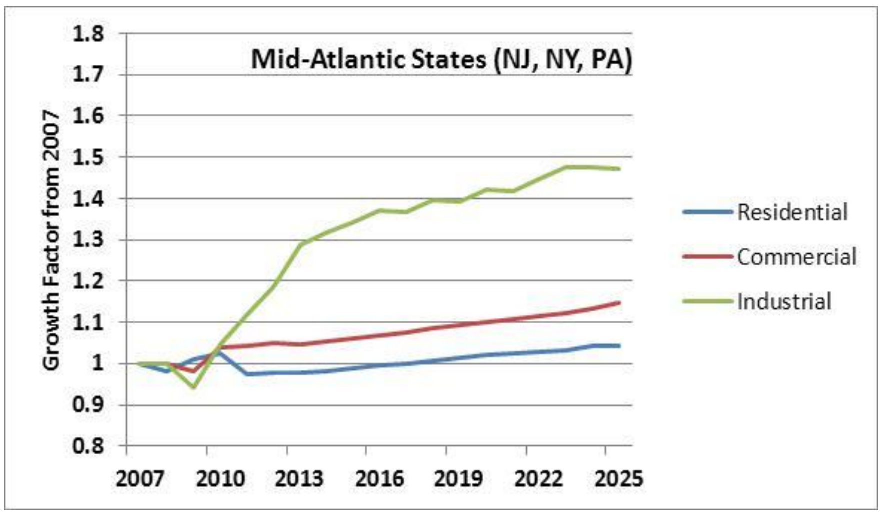


Exhibit 2.7 AEO2010 Growth Factors for Distillate Oil by AEO Region 2007 – 2025





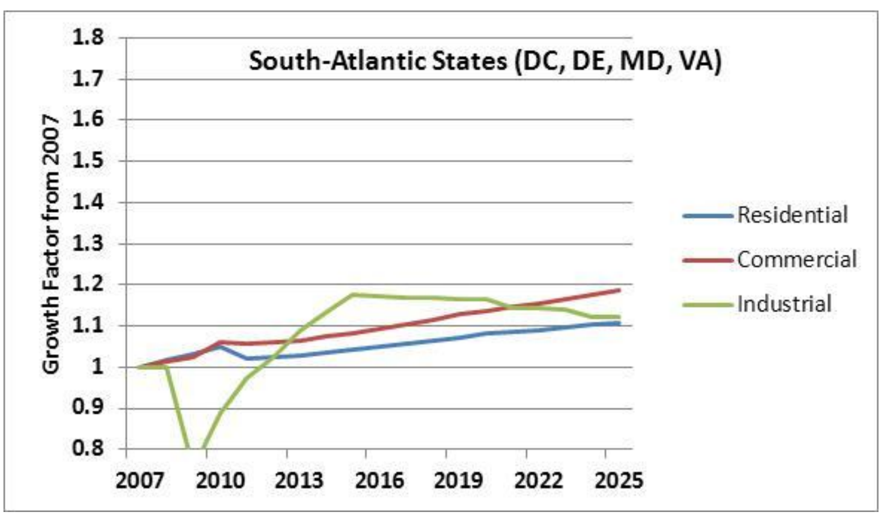
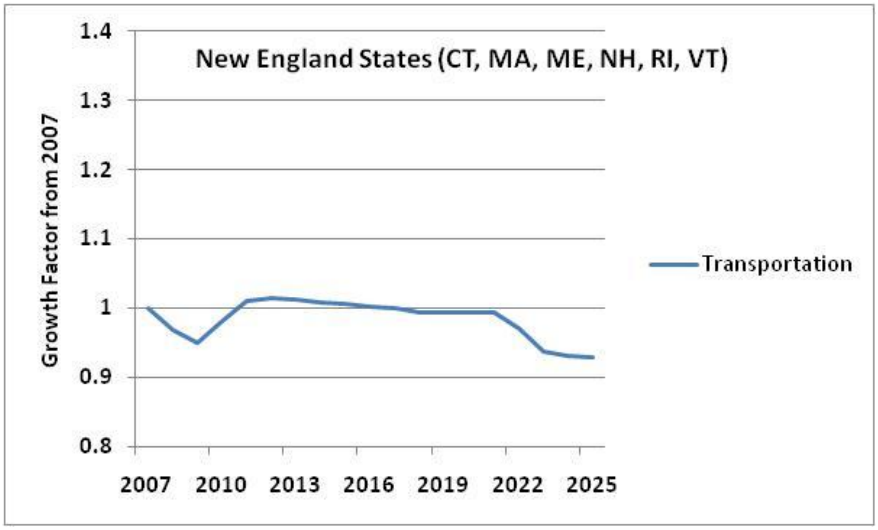
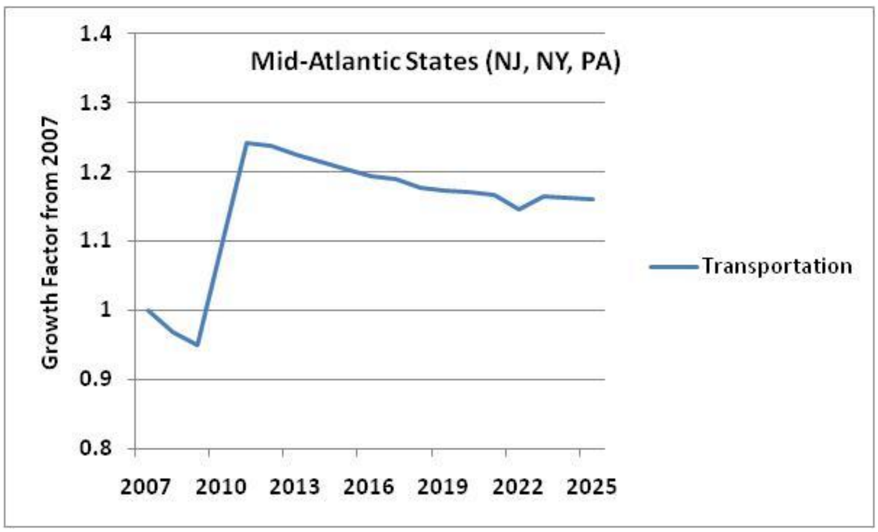


Exhibit 2.8 Growth Factors for Natural Gas by AEO Region 2007 – 2025
AEO2010 for Residential/Commercial, AEO2011 for Industrial





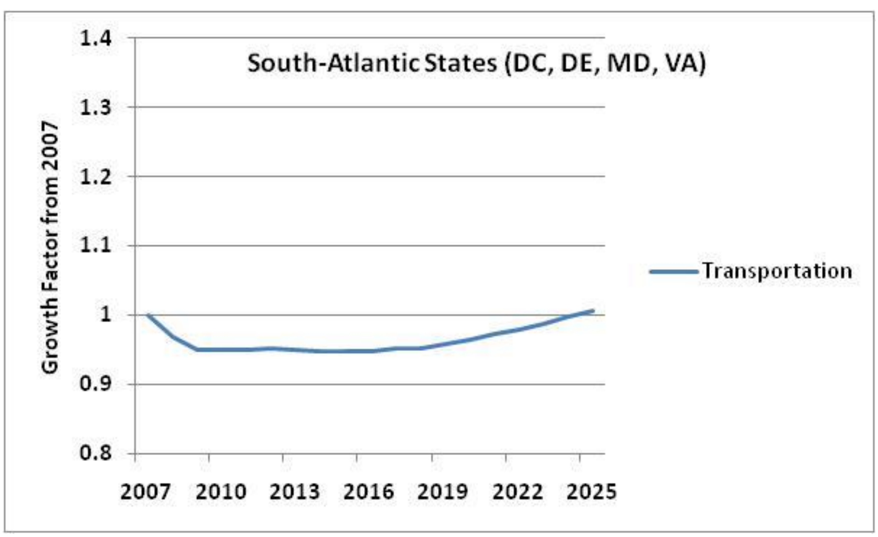
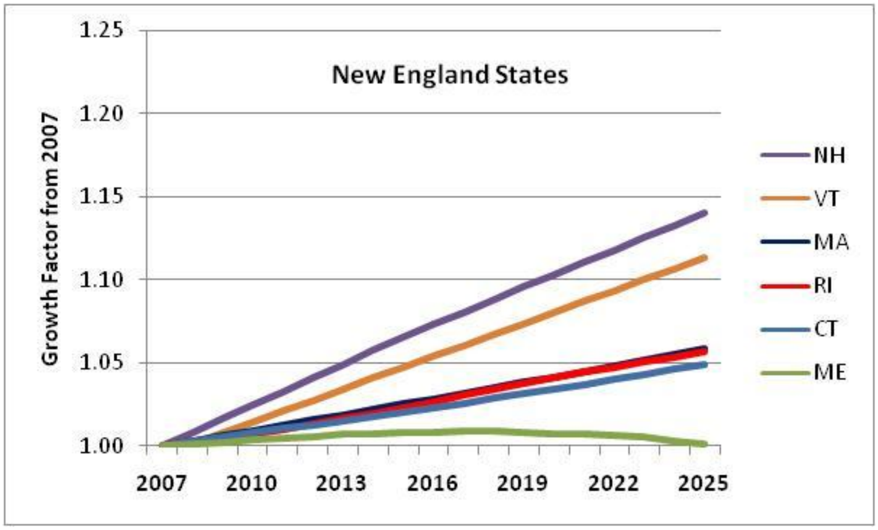
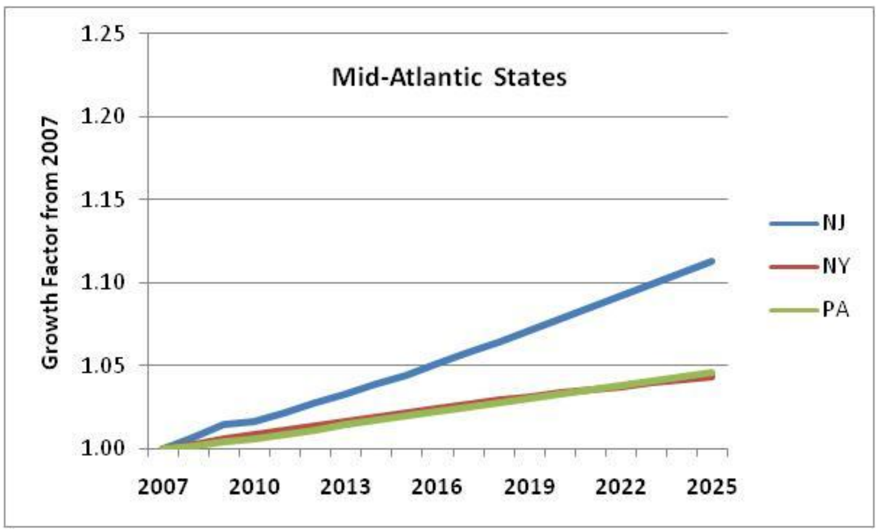


Exhibit 2.9 AEO2010 Growth Factors for Gasoline by AEO Region 2007 – 2025





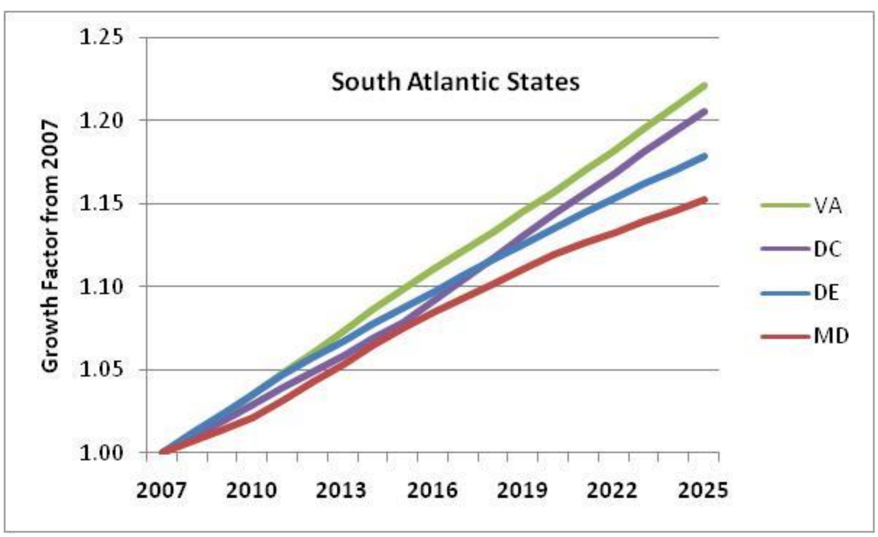


Exhibit 2.10 Population Growth Factors by AEO Region 2007 – 2025

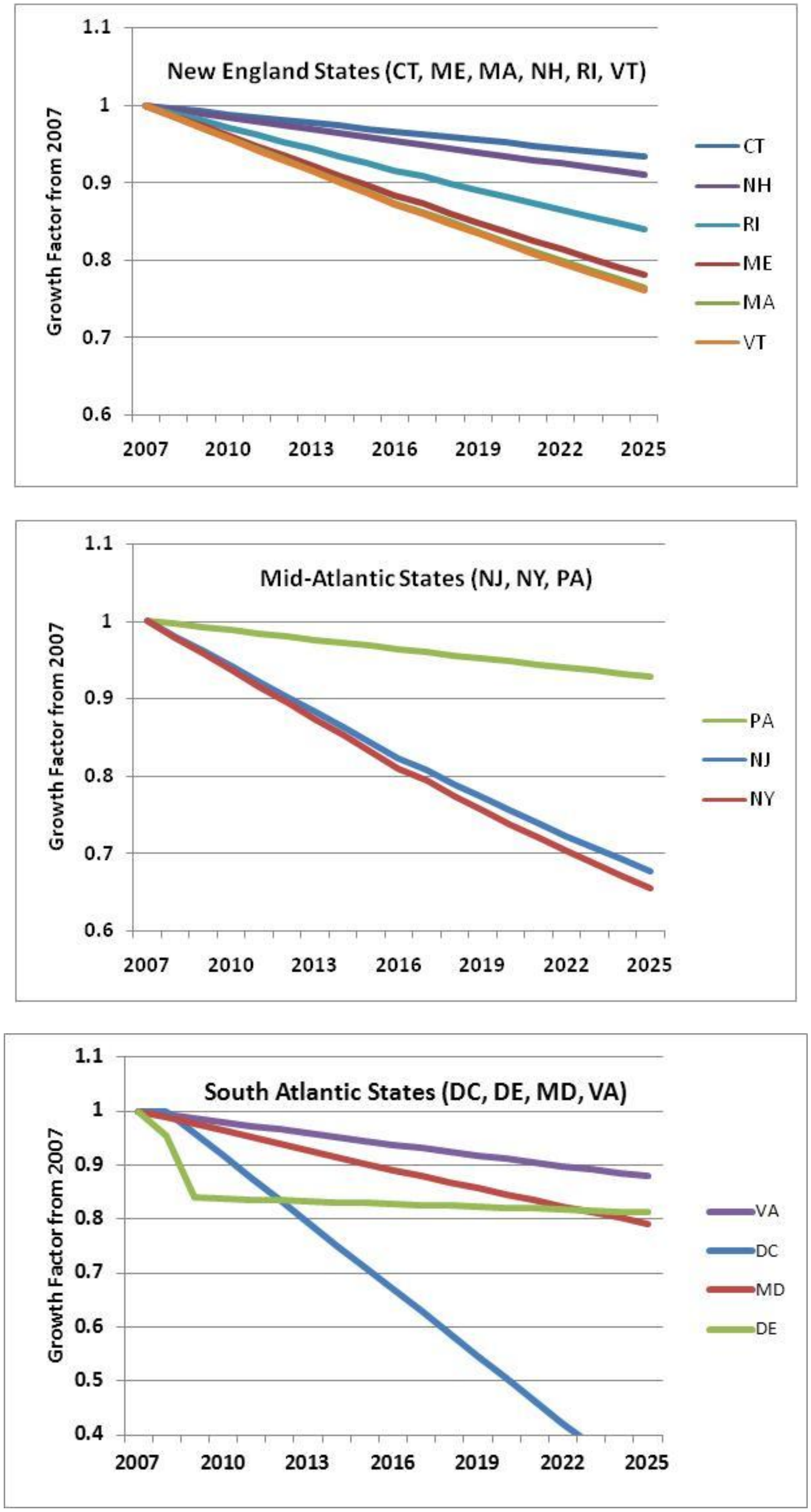


Exhibit 2.11 Manufacturing Employment Growth Factors by Region 2007 - 2025

Exhibit 2.12 2007 and 2025 VMT and the 2007-2025 Growth Factor

Nonattainment Area	County	FIPS	Million VMT		Growth
			2007	2025	2007-2005
Allentown	Lehigh	42077	2,947	3,700	1.256
Allentown	Northampton	42095	2,020	2,629	1.301
Baltimore	Anne Arundel	24003	5,786	7,907	1.367
Baltimore	Baltimore	24005	8,261	10,330	1.251
Baltimore	Carroll	24013	1,296	1,766	1.363
Baltimore	Harford	24025	2,362	3,060	1.296
Baltimore	Howard	24027	3,815	6,059	1.588
Baltimore	Baltimore City	24510	3,626	4,150	1.145
Hagerstown	Washington	24043	2,090	2,940	1.407
Harrisburg-Lebanon-Carlisle-York	Cumberland	42041	2,861	3,704	1.295
Harrisburg-Lebanon-Carlisle-York	Dauphin	42043	3,072	3,689	1.201
Harrisburg-Lebanon-Carlisle-York	Lebanon	42075	1,209	1,507	1.247
Harrisburg-Lebanon-Carlisle-York	York	42133	3,304	4,209	1.274
Johnstown	Cambria	42021	1,157	1,110	0.959
Johnstown	Indiana	42063	844	928	1.100
Lancaster	Lancaster	42071	4,255	5,395	1.268
New York Metro NY/NJ/CT	Fairfield	9001	7,560	8,568	1.133
New York Metro NY/NJ/CT	New Haven	9009	6,856	8,085	1.179
New York Metro NY/NJ/CT	Bergen	34003	7,879	10,464	1.328
New York Metro NY/NJ/CT	Essex	34013	4,895	6,131	1.253
New York Metro NY/NJ/CT	Hudson	34017	2,313	2,801	1.211
New York Metro NY/NJ/CT	Mercer	34021	3,566	3,996	1.121
New York Metro NY/NJ/CT	Middlesex	34023	7,810	9,748	1.248
New York Metro NY/NJ/CT	Monmouth	34025	6,319	8,595	1.360
New York Metro NY/NJ/CT	Morris	34027	5,530	6,523	1.180
New York Metro NY/NJ/CT	Passaic	34031	2,918	3,490	1.196
New York Metro NY/NJ/CT	Somerset	34035	3,230	3,667	1.135
New York Metro NY/NJ/CT	Union	34039	4,623	5,730	1.239
New York Metro NY/NJ/CT	Bronx	36005	3,677	4,830	1.314
New York Metro NY/NJ/CT	Kings	36047	5,461	6,272	1.148
New York Metro NY/NJ/CT	Nassau	36059	11,780	14,705	1.248
New York Metro NY/NJ/CT	New York	36061	3,938	5,203	1.321
New York Metro NY/NJ/CT	Orange	36071	4,431	5,906	1.333
New York Metro NY/NJ/CT	Queens	36081	8,859	10,949	1.236
New York Metro NY/NJ/CT	Richmond	36085	2,152	3,354	1.558
New York Metro NY/NJ/CT	Rockland	36087	2,675	4,060	1.517
New York Metro NY/NJ/CT	Suffolk	36103	13,767	20,514	1.485
New York Metro NY/NJ/CT	Westchester	36119	8,201	11,811	1.490
Philadelphia PA/DE/NJ	New Castle	10003	5,544	6,959	1.255
Philadelphia PA/DE/NJ	Burlington	34005	4,704	5,062	1.076

Nonattainment Area	County	FIPS	Million VMT 2007	Million VMT 2025	Growth 2007-2005
Philadelphia PA/DE/NJ	Camden	34007	4,090	4,267	1.043
Philadelphia PA/DE/NJ	Gloucester	34015	2,723	3,284	1.206
Philadelphia PA/DE/NJ	Bucks	42017	5,047	6,516	1.291
Philadelphia PA/DE/NJ	Chester	42029	4,423	6,201	1.402
Philadelphia PA/DE/NJ	Delaware	42045	3,766	4,371	1.161
Philadelphia PA/DE/NJ	Montgomery	42091	7,075	8,220	1.162
Philadelphia PA/DE/NJ	Philadelphia	42101	5,973	6,337	1.061
Pittsburgh-Beaver Valley	Allegheny	42003	9,345	10,134	1.084
Pittsburgh-Beaver Valley	Armstrong	42005	628	672	1.071
Pittsburgh-Beaver Valley	Beaver	42007	1,487	1,585	1.066
Pittsburgh-Beaver Valley	Butler	42019	1,762	2,173	1.233
Pittsburgh-Beaver Valley	Greene	42059	464	504	1.086
Pittsburgh-Beaver Valley	Lawrence	42073	812	880	1.084
Pittsburgh-Beaver Valley	Washington	42125	2,245	2,531	1.127
Pittsburgh-Beaver Valley	Westmoreland	42129	3,512	3,898	1.110
Reading	Berks	42011	3,341	4,079	1.221
Washington DC/MD/VA	DC	11001	3,666	3,861	1.053
Washington DC/MD/VA	Charles	24017	1,284	1,825	1.421
Washington DC/MD/VA	Frederick	24021	3,009	4,442	1.476
Washington DC/MD/VA	Montgomery	24031	7,471	9,711	1.300
Washington DC/MD/VA	Prince George's	24033	8,754	11,616	1.327
Washington DC/MD/VA	Arlington	51013	1,663	1,917	1.153
Washington DC/MD/VA	Fairfax	51059	10,123	13,880	1.371
Washington DC/MD/VA	Loudoun	51107	2,403	3,741	1.557
Washington DC/MD/VA	Prince William	51153	3,202	4,643	1.450
Washington DC/MD/VA	Alexandria	51510	736	866	1.177
Washington DC/MD/VA	Fairfax	51600	193	220	1.143
Washington DC/MD/VA	Falls Church	51610	64	76	1.186
Washington DC/MD/VA	Manassas	51683	273	360	1.317
Washington DC/MD/VA	Manassas Park	51685	26	30	1.166

2.3.1.5 No Growth Assignment for Certain Area Source Categories

For several area source categories, it seems reasonable that emissions would not change from the 2007 values. No growth was applied to the 2007 emissions for the area source categories shown in Exhibit 2.13.

Exhibit 2.13 Area Source Categories with No Growth Assignment

SCC	SCC Description
2296000000	Unpaved Roads /All Unpaved Roads /Total: Fugitives
2401008000	Surface Coating /Traffic Markings /Total: All Solvent Types
2461020000	Misc Non-industrial: Commercial /Asphalt Application: All Processes /Total: All
2461021000	Misc Non-industrial: Commercial /Cutback Asphalt /Total: All Solvent Types
2461022000	Misc Non-industrial: Commercial /Emulsified Asphalt /Total: All Solvent Types
2461023000	Misc Non-industrial: Commercial /Asphalt Roofing /Total: All Solvent Types
2601000000	On-site Incineration /All Categories /Total
2601010000	On-site Incineration /Industrial /Total
2601010000	On-site Incineration /Industrial /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601020000	On-site Incineration /Commercial/Institutional /Total
2601030000	On-site Incineration /Residential /Total
2610000100	Open Burning /All Categories /Yard Waste - Leaf Species Unspecified
2610000400	Open Burning /All Categories /Yard Waste - Brush Species Unspecified
2610000500	Open Burning /All Categories /Land Clearing Debris (use 28-10-005-000 for Logging
2610030000	Open Burning /Residential /Household Waste (use 26-10-000-xxx for Yard Wastes)
2610040400	Open Burning /Municipal (from residences, parks, other for central burn)
2660000000	Leaking Underground Storage Tanks /Leaking Underground Storage Tanks /Total: All
2680001000	Composting /100% Biosolids (e.g., sewage sludge, manure, mixtures of these matls
2680002000	Composting /Mixed Waste (e.g., a 50:50 mixture of biosolids and green wastes)
2806010000	Domestic Animals Waste Emissions /Cats /Total
2806015000	Domestic Animals Waste Emissions /Dogs /Total
2807020001	Wild Animals Waste Emissions /Bears /Black Bears
2807020002	Wild Animals Waste Emissions /Bears /Grizzly Bears
2807025000	Wild Animals Waste Emissions /Elk /Total
2807030000	Wild Animals Waste Emissions /Deer /Total
2807040000	Wild Animals Waste Emissions /Birds /Total
2810001000	Forest Wildfires - Wildfires – Unspecified
2810003000	Cigarette Smoke /Total
2810005000	Managed Burning, Slash (Logging Debris) /Unspecified Burn Method
2810010000	Human Perspiration and Respiration /Total
2810014000	Prescribed Burning /Generic - Unspecified land cover, ownership, class/purpose

SCC	SCC Description
2810015000	Prescribed Forest Burning /Unspecified
2810020000	Prescribed Rangeland Burning /Unspecified
2810030000	Structure Fires /Unspecified
2810035000	Firefighting Training /Total
2810050000	Motor Vehicle Fires /Unspecified
2810060200	Cremation /Animals
2810090000	Open Fire /Not categorized
2820010000	Cooling Towers /Process Cooling Towers /Total
2830000000	Catastrophic/Accidental Releases /All Catastrophic/Accidental Releases /Total
2830010000	Catastrophic/Accidental Releases /Transportation Accidents /Total

2.3.1.6 USEPA 2020 Projections for Residential Wood

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform. MARAMA decided to use USEPA emission projection parameters for residential wood combustion. USEPA's methodology and data sources are summarized below (USEPA 2010a).

USEPA projected residential wood combustion emissions are based on the expected increase in the number of low-emitting wood stoves and the corresponding decrease in other types of wood stoves. As newer, cleaner woodstoves replace older, more polluting stoves, there will be an overall reduction of emissions from this category. The approach used by USEPA was developed as part of a modeling exercise to estimate the expected benefits of the woodstove change-out program. This methodology uses a combination growth and control factors and is based on activity not pollutant. The growth and control are accounted for in a single factor for each residential wood SCC (certain SCCs represent controlled equipment, while other SCCs represent uncontrolled equipment). Control factors are indirectly incorporated based on which stove is used. The specific assumptions USEPA made were:

- Fireplaces, SCC=2104008001: increase 1%/year;
- Old woodstoves, SCC=2104008002, 2104008010, 2104008051: decrease 2%/year;
- New woodstoves, SCC=2104008003, 2104008004, 2104008030, 2104008050, 2104008052 or 2104008053: increase 2%/year.

For the general woodstoves and fireplaces category (SCC 2104008000) USEPA computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002 Platform emissions for PM2.5. These fractions are based on the fraction of emissions from these processes in the states that did not have the "general woodstoves and fireplaces" SCC in the 2002 NEI. This approach results in an overall decrease of 1.056% per year for this source category. Appendix E contains the residential wood projection data from USEPA.

2.3.1.7 SCC, SIC, NAICS and Growth Parameter Crosswalk

Since the employment projections were based on 3-digit NAICS code, it was necessary to map NAICS codes to SCCs and SIC codes that were used by states. Employment projections at the more specific 4-digit or 6-digit NAICS codes were not available.

The first step for developing a comprehensive crosswalk between the different source classification codes (SCC, SIC, and NAICS codes) and emission activity growth indicators was to compile a complete list of the NAICS codes in the 2007 point source inventory. Some states use the SIC code while other use the NAICS code. Still other states use both the SIC and NAICS codes. When the NAICS code was not available SIC codes were converted to NAICS codes. The 6-digit NAICS code was truncated to a 3-digit code, which represents major industry subsectors of the economy. A U.S. Census Bureau document was used to perform this conversion (CENSUS 2000).

The next step was to review parameters that could be used as the emission activity growth indicator for each SCC or NAICS. We initially relied on two USEPA crosswalks (USEPA 2004a, USEPA 2004b) to match area and nonEGU point source SCCs to AEO2010 categories, employment NAICS codes, and population.

2.3.1.8 Final Version 2 Growth Factors for Area Sources

The previous sections described the initial growth factors recommended to develop projected future year emissions inventories for area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment.

Many of the growth factors used to project emissions for area and non-EGU sources were based on the AEO2010 fuel consumption forecasts and state-level employment projections. The AEO2010 forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors. However, these sectors are not typically associated with significant emissions.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions were initially projected to be lower for the projected future years than for the base year, even before the application of control assumptions (i.e., the future "growth only" emissions are lower than the base year emissions). A conference call was held to discuss the negative growth issue, and states were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others. Some states will supply their own factors or make their own assumptions.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 2.14 shows the state recommendations for area sources.

2.3.1.9 Version 3 Update to New Jersey Growth Factors for Area Sources

New Jersey provided updated growth factors for area source for use in developing the 2025 inventory for PM nonattainment counties. One of the key revisions was to use the more recent data from AEO2011 for energy consumption instead of the AEO2010 projections. New Jersey also provided updated employment, paved road, pesticide and agricultural livestock growth factors.

2.3.1.10 Version 3 Update to Growth Factors for the District of Columbia

The District of Columbia provided updated employment growth factors based on DC Department of Labor forecasts for the period 2008 to 2018.

Exhibit 2-14 State Recommendations to Address Negative Growth and Other Growth Factors for the Area Source Sector

State	AEO2010 Growth Factors	Employment Growth Factors	Population Growth Factors
CT	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
DE	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth	Use county-level population projections
DC	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use DOL employment growth for NAICS 722 for food and kindred product SCC; otherwise use 2008-2018 data	For dry cleaning, use employment growth for NAICS 812 instead of population
MD	Not using AEO2010; used employment for commercial & institutional fuel; used housing units for residential fuel	Provided updated employment projections; changed cross-walk between NAICS code and SCC for selected source categories	Provided updated population projections by county
NJ	NJ submitted state specific growth factors. For fuel combustion categories only, used AEO2011 growth rates except for residual oil (use no growth)	NJ submitted state specific growth factors.	NJ submitted state specific growth factors and provided population projections by county
NY	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
PA	Use AEO2010 growth rates	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections
VA	Use AEO2010 growth rates; no growth for suspect AEO2010 projection for commercial / institutional residual oil	Use state DOL employment projections by 3-digit NAICS	Use county-level population projections

2.3.2 Area Source Control Factors

Control factors were developed to estimate post-2007 emission reductions resulting from on-the-books regulations and other emission reduction measures. Control factors were developed for the following national, regional and state measures:

- Federal Rules Affecting Area Sources
- Federal MACT Rules
- OTC 2001 Model Rules
- OTC 2006 Model Rules
- MANE-VU Sulfur in Fuel Oil Limitations

These control programs, including their impact on PM2.5 and PM precursor emissions, are discussed in the following subsections.

2.3.2.1 Federal Rules Affecting Area Sources

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). USEPA accounted for control strategies for four area source categories, only one of which reduced emissions of PM2.5 or PM2.5 precursors. USEPA developed projection factors to account for the replacement of retired woodstoves that were installed before promulgation of the new source performance standard (NSPS). We used USEPA's latest methodology which uses a combination growth and control factor and is based on activity and not pollutant. The growth and control are accounted for in a single factor for specific SCCs that account for the turnover from pre-NSPS to post-NSPS woodstove.

2.3.2.2 Federal MACT Rules

USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify area source controls associated with the federal maximum achievable control technology (MACT) standards for controlling hazardous air pollutants (HAPs). Although designed to reduce HAPs, many of the MACT standards also provide a reduction in criteria air pollutants. USEPA's guidance document provides an estimate of the percent reduction in VOC and NO_x from each standard, and the compliance date for the standard. The information concerning MACT compliance periods provided was used to determine whether the MACT standard provided post-2007 emission reductions. For example, if a compliance period of a MACT standard was 2007 or earlier, then we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post-2007 credit.

Only one area source category was listed in USEPA's guidance document - municipal solid waste landfills. As the compliance date for this standard was January 2004, no post-2007 reductions were applied because the emission reductions from the MACT standard should be reflected in the 2007 inventory and not as an additional post-2007 credit.

USEPA has or will soon develop MACT standards for about 70 area source categories. We reviewed USEPA's 2020 emissions projections described in the previous section and found that USEPA did not include emission reductions from recent area source MACT standards. We conducted a review of USEPA's air toxic website and found that USEPA determined that many area source MACT standards would result in nationwide reductions in criteria air pollutants in addition to the reductions in HAP emissions. However, many States in the MANE-VU+VA region already have emission standards for many categories that are as stringent as the Federal area source MACT standards. For example, many states in the MANE-VU+VA region already have requirements as stringent as the Gasoline Distribution MACT and GACT (generally achievable control technology) standards, and little additional VOC reductions would be realized in the region. Given the resources allocated to this project, it was beyond the scope to conduct an analysis of the area source MACT requirements and state-by-state emission regulations to determine whether there would be emission reductions resulting from the area source MACT standards.

The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines (RICE). USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 2-15. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

2.3.2.3 OTC Model Rules for VOC Sources

The Ozone Transport Commission (OTC) developed model rules for its member states in 2002 for several area source VOC categories: consumer products, architectural and industrial maintenance (AIM) coatings, portable fuel containers (PFCs), mobile equipment repair and refinishing, and solvent cleaning (OTC 2001). In 2006 the OTC introduced model rules for two additional area source categories (adhesives/sealants and asphalt paving) and more stringent requirements for consumer products and portable fuel containers (OTC 2007). These rules resulted in reductions of VOC emissions. Because VOC emissions are generally not considered to be significant PM precursors, and these rules did not result in reductions in PM2.5 or precursor emissions, no further discussion of the OTC model rules for VOC sources is warranted.

Exhibit 2-15 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	NOx	PM2.5	SCC Description
2101004000		7.57	Electric Utility;Distillate Oil;Total: Boilers and IC Engines
2101004002		11.81	Electric Utility;Distillate Oil;All IC Engine Types
2101006000	7.97		Electric Utility;Natural Gas;Total: Boilers and IC Engines
2101006002	9.87		Electric Utility;Natural Gas;All IC Engine Types
2102004000		7.57	Industrial;Distillate Oil;Total: Boilers and IC Engines
2102006000	7.97		Industrial;Natural Gas;Total: Boilers and IC Engines
2102006002	9.87		Industrial;Natural Gas;All IC Engine Types
2103004000		7.57	Commercial/Institutional;Distillate Oil;Total: Boilers and IC Engines
2103006000	7.97		Commercial/Institutional;Natural Gas;Total: Boilers and IC Engines
2199004000		7.57	Area Source Fuel Combustion;Distillate Oil;Total: Boilers and IC Engines
2199004002		11.81	Area Source Fuel Combustion;Distillate Oil;All IC Engine Types
2199006000	7.97		Area Source Fuel Combustion;Natural Gas;Total: Boilers and IC Engines
2310000000	12.53		Oil and Gas Production: All Processes;Total: All Processes
2310000220	12.53		Oil and Gas Exploration/Production; Drill Rigs
2310000440	12.53		Oil and Gas Exploration/Production; Saltwater Disposal Engines
2310001000	12.53		Oil and Gas Production: SIC 13; On-shore;Total: All Processes
2310002000	12.53		Oil and Gas Production: SIC 13; Off-shore;Total: All Processes
2310020000	12.53		Oil and Gas Production: SIC 13;Natural Gas;Total: All Processes
2310020600	12.53		Oil and Gas Exploration and Production;Natural Gas;Compressor Engines
2310023000	12.53		Oil and Gas Exploration and Production;Natural Gas;Cbm Gas Well - Dewatering Pump Engines

2.3.2.4 OTC Model Rule for ICI Boilers

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods to achieve NO_x emission reduction for industrial, commercial, and institutional (ICI) boilers based on guidelines that varied by boiler size and fuel type. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, and 2020.

All but one state, New Jersey, indicated that they have not adopted rules for area sources equivalent to the 2006 OTC recommendations. New Jersey specified that the state has post-2007 ICI boiler rules that reduce NO_x emissions and provided the estimates of the reductions in NO_x emissions by SCC resulting from boiler tune-up requirements, as shown in Exhibit 2.16:

Exhibit 2.16 Area Source Emission Reductions from New Jersey ICI Boiler NO_x Rules

SCC	SOURCE CATEGORY	Percent Reduction from Tune-ups 2007-2013	Rule Effectiveness	Rule Penetration	Overall Percent Reduction 2007-2013
2102004000	Industrial: Distillate	25%	80%	30%	6%
2102005000	Industrial: Residual	25%	80%	30%	6%
2102006000	Industrial: Nat Gas	25%	80%	30%	6%
2102007000	Industrial: LPG	25%	80%	30%	6%
2103004000	Comm/Inst: Distillate	25%	80%	30%	6%
2103005000	Comm/Inst: Residual	25%	80%	30%	6%
2103006000	Comm/Inst: Nat Gas	25%	80%	30%	6%
2103007000	Comm/Inst - LPG	25%	80%	30%	6%

2.3.2.5 MANE-VU Fuel Oil Sulfur Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE_VU 2007). The sulfur in fuel oil recommendations are shown in Exhibit 2.17 and vary by state, type of fuel oil, and year of implementation.

Exhibit 2.17 MANE-VU Low Sulfur Fuel Oil Strategy

Inner Zone States (DE, NJ, NY, PA)		
Fuel Oil Type	**Sulfur Content 2012**	**Sulfur Content 2016**
Distillate	500 ppm	15 ppm
#4 Residual	0.25 %	0.25 %
#6 Residual	0.3 to 0.5 %	0.3 to 0.5 %
Outer Zone States (CT, DC, MD)		
Fuel Oil Type	**Sulfur Content 2014**	**Sulfur Content 2018**
Distillate	500 ppm	15 ppm
#4 Residual	n/a	0.25 to 0.5 %
#6 Residual	n/a	0.5 %

Each state was polled and asked to provide guidance as to when, if at all, the MANE-VU strategy would be incorporated into their state rules. States were also asked to provide the 2007 sulfur contents for each fuel type by county in order to calculate the percent reduction in emissions for the future years. Three states (MD, NJ, NY) have adopted or are committed to adopting the strategy into their rules. Four jurisdictions (CT, DC, DE, PA) indicated that not enough regulatory development progress has been made to include the reductions in future years with absolute certainty. One state (VA) has no plans to adopt the low sulfur fuel oil strategy. The response from each jurisdiction is summarized below:

- **Connecticut** will not include the reductions from MANE-VU low sulfur fuel oil strategy at this time for official SIP inventories used for the PM2.5 redesignation effort. Section 16a-21a of the Connecticut General Statutes (as amended by PA 10-74) conditions implementation of number two heating oil sulfur limitation (50 ppm beginning 7/1/2011 and 15 ppm beginning 7/1/2014) on similar implementation in NY, MA and RI. NY has taken action, but the other states have not done so yet. CTDEP expects that 15ppm residential heating oil will be in place in CT by the "MANE-VU Ask" 2018 target date. However, until the other states act, SIP emission inventories will not be approvable with the 15 ppm value. Therefore, at this time CT elects to retain the 2007 sulfur value through 2025. For residual oil, Section 22a-174-19a of the Regulations of CT State Agencies (RCSA) limits sources >=15MW and boilers >=250 mmBtu/hr to 0.5% and further limits any of those sources that are also Title IV acid rain sources to 0.3%. For affected sources, these limits are consistent with the "MANE-VU Ask", and should be reflected in the actual emissions incorporated into the 2007 point source inventory. Other sources (including most area sources) not otherwise restricted by permit/order are limited to 1.0% by RCSA 22a-174-19. As both of these regulations have not changed after 2007, there are no new controls (i.e., post 2007 control factors are 1.0) for residual oil.
- The **District of Columbia** does not have a low sulfur rule in place yet. They do have a draft, and anticipate adopting a rule by 2014, but are inclined not to take credit for reductions at this point in time.
- **Delaware's** low-sulfur fuel regulation development is running behind schedule and will not be promulgated done in time to include in the re-designation requests/maintenance plans. Emission reductions from MANE-VU low sulfur fuel oil strategy are not included in the 2025 inventory at this time.
- **Maryland** expects to revise COMAR 26.11.09.07 (Sulfur Content Limitations for Fuel) by 2014 to adopt the limits in the MANE-VU low sulfur fuel oil strategy.

- **New Jersey** has revised N.J.A.C. 7:27-9.2 (Sulfur content standards) to adopt the 2016 sulfur content limits and schedule shown in Exhibit 2.19. All of the PM nonattainment counties in New Jersey already meet the MANE-VU limits for residual oil.
- **New York** adopted a law that limits the sulfur content of No. 2 heating oil to no more than 15 parts per million starting in July 2012, down from the current range of 2,000 to 15,000 parts per million. New York expects to revise 6 NYCRR Subpart 225-1 (Fuel Composition and Use - Sulfur Limitations) to lower the sulfur content of distillate fuel oil for all stationary sources (including home heating) and stationary internal combustion engines. Nearly all of the PM nonattainment counties in New York already meet the MANE-VU limits for residual oil. For the two counties (Orange and Suffolk), compliance with the MANE-VU limits is expected by 2017.
- **Pennsylvania** low-sulfur fuel regulation development is running behind schedule and will not be promulgated done in time to include in the re-designation requests/maintenance plans. Emission reductions from MANE-VU low sulfur fuel oil strategy are not included in the 2025 inventory at this time.
- **Virginia** will not include the emission reductions from low sulfur fuel oil, as it is not part of MANE-VU and has no plans to adopt the low sulfur fuel oil strategy.

The state responses regarding the currently adopted sulfur contents for home heating oil, distillate oil, and residual oil are summarized in Exhibits 2.18, 2.19 and 2.20, respectively. For the purposes of developing the 2025 inventory that will be used for re-designations and maintenance plans, the sulfur contents and control factors shown in the Exhibits were used on a county-by-county basis to account for the emission reductions from the MANE-VU low sulfur fuel oil strategy. There are separate columns in the detailed area source inventory spreadsheet that specify SO_2 control factors and emissions for each projection year for a "currently adopted" scenario that includes reductions for states (MD, NJ, NY) that have or are committed to having rules in place. No emission reductions are applied for the other states (CT, DC, DE, PA, VA) in the "currently adopted" scenario.

For other air quality planning purposes, we accounted separately for emission reductions that would occur assuming all states fully adopt the MANE-VU low sulfur fuel limits by 2025. There are separate columns for SO_2 control factors and emissions for a "fully adopted" scenario where all states (except Virginia) have the MANE-VU low sulfur fuel oil limits in place.

Exhibit 2.18 Currently Adopted Sulfur Content and Control Factors for Residential Fuel Oil Combustion

			Sulfur Content (ppm)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
CT	09001	Fairfield	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
CT	09009	New Haven	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DE	10003	New Castle	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DC	11001	Washington	1000	1000	1000	1000	1000	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24005	Baltimore	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24013	Carroll	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24017	Charles	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24021	Frederick	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24025	Harford	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24027	Howard	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24031	Montgomery	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24033	Prince Georges	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24043	Washington	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24510	Baltimore City	3000	3000	15	15	15	1.000	0.005	0.005	0.005
NJ	34003	Bergen	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34005	Burlington	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34007	Camden	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34013	Essex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34015	Gloucester	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34017	Hudson	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34021	Mercer	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34023	Middlesex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34025	Monmouth	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34027	Morris	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34031	Passaic	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075

			Sulfur Content (ppm)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34039	Union	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NY	36005	Bronx	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36047	Kings	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36059	Nassau	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36061	New York	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36071	Orange	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36081	Queens	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36085	Richmond	2000	15	15	15	15	0.007	0.007	0.007	0.007
NY	36087	Rockland	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36103	Suffolk	3700	15	15	15	15	0.004	0.004	0.004	0.004
NY	36119	Westchester	3700	15	15	15	15	0.004	0.004	0.004	0.004
PA	42003	Allegheny	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42005	Armstrong	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42007	Beaver	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42011	Berks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42017	Bucks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42019	Butler	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42021	Cambria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42029	Chester	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42041	Cumberland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42043	Dauphin	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42045	Delaware	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42059	Greene	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42063	Indiana	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42071	Lancaster	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42073	Lawrence	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42075	Lebanon	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

			Sulfur Content (ppm)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42091	Montgomery	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42095	Northampton	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42125	Washington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42133	York	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51013	Arlington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51059	Fairfax	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51107	Loudoun	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51153	Prince William	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51510	Alexandria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51610	Falls Church	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51683	Manassas City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

Exhibit 2.19 Currently Adopted Sulfur Content and Control Factors for Distillate Fuel Oil Combustion

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
CT	09001	Fairfield	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
CT	09009	New Haven	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DE	10003	New Castle	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
DC	11001	Washington	1000	1000	1000	1000	1000	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24005	Baltimore	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24013	Carroll	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24017	Charles	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24021	Frederick	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24025	Harford	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24027	Howard	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24031	Montgomery	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24033	Prince Georges	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24043	Washington	3000	3000	15	15	15	1.000	0.005	0.005	0.005
MD	24510	Baltimore City	3000	3000	15	15	15	1.000	0.005	0.005	0.005
NJ	34003	Bergen	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34005	Burlington	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34007	Camden	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34013	Essex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34015	Gloucester	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34017	Hudson	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34021	Mercer	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34023	Middlesex	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34025	Monmouth	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34027	Morris	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34031	Passaic	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NJ	34039	Union	2000	2000	15	15	15	1.000	0.0075	0.0075	0.0075
NY	36005	Bronx	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36047	Kings	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36059	Nassau	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36061	New York	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36071	Orange	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36081	Queens	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36085	Richmond	2000	2000	15	15	15	1.000	0.007	0.007	0.007
NY	36087	Rockland	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36103	Suffolk	3700	3700	15	15	15	1.000	0.004	0.004	0.004
NY	36119	Westchester	3700	3700	15	15	15	1.000	0.004	0.004	0.004
PA	42003	Allegheny	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42005	Armstrong	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42007	Beaver	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42011	Berks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42017	Bucks	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42019	Butler	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42021	Cambria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42029	Chester	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42041	Cumberland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42043	Dauphin	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42045	Delaware	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42059	Greene	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42063	Indiana	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42071	Lancaster	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42073	Lawrence	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42075	Lebanon	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42091	Montgomery	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42095	Northampton	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42125	Washington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
PA	42133	York	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51013	Arlington	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51059	Fairfax	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51107	Loudoun	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51153	Prince William	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51510	Alexandria	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51610	Falls Church	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51683	Manassas City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	3000	3000	3000	3000	3000	1.000	1.000	1.000	1.000

Exhibit 2.20 Currently Adopted Sulfur Content and Control Factors for Residual Fuel Oil Combustion

			Sulfur Content (% S)					Control Factor			
STATE	FIPS	CNTY_NAME	2007	2013	2017	2020	2025	CF_07_13	CF_07_17	CF_07_20	CF_07_25
CT	09001	Fairfield	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
CT	09009	New Haven	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
DE	10003	New Castle	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
DC	11001	Washington	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
MD	24003	Anne Arundel	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24005	Baltimore	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24013	Carroll	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24017	Charles	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24021	Frederick	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24025	Harford	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24027	Howard	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24031	Montgomery	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24033	Prince Georges	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
MD	24043	Washington	2.0	2.0	0.5	0.5	0.5	1.000	0.250	0.250	0.250
MD	24510	Baltimore City	1.0	1.0	0.5	0.5	0.5	1.000	0.500	0.500	0.500
NJ	34003	Bergen	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34005	Burlington	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34007	Camden	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34013	Essex	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34015	Gloucester	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34017	Hudson	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34021	Mercer	0.5	0.5	0.5	0.5	0.5	1.000	1.000	1.000	1.000
NJ	34023	Middlesex	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34025	Monmouth	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34027	Morris	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34031	Passaic	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
NJ	34035	Somerset	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NJ	34039	Union	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36005	Bronx	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36047	Kings	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36059	Nassau	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
NY	36061	New York	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36071	Orange	1.5	1.5	0.5	0.5	0.5	1.000	0.333	0.333	0.333
NY	36081	Queens	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36085	Richmond	0.3	0.3	0.3	0.3	0.3	1.000	1.000	1.000	1.000
NY	36087	Rockland	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
NY	36103	Suffolk	1	1	0.5	0.5	0.5	1.000	0.500	0.500	0.500
NY	36119	Westchester	0.37	0.37	0.37	0.37	0.37	1.000	1.000	1.000	1.000
PA	42003	Allegheny	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42005	Armstrong	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42007	Beaver	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42011	Berks	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42017	Bucks	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42019	Butler	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42021	Cambria	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42029	Chester	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42041	Cumberland	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42043	Dauphin	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42045	Delaware	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42059	Greene	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42063	Indiana	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42071	Lancaster	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42073	Lawrence	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42075	Lebanon	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000

			Sulfur Content (% S)					Control Factor			
STATE	**FIPS**	**CNTY_NAME**	**2007**	**2013**	**2017**	**2020**	**2025**	**CF_07_13**	**CF_07_17**	**CF_07_20**	**CF_07_25**
PA	42077	Lehigh	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42091	Montgomery	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42095	Northampton	2.0	2.0	2.0	2.0	2.0	1.000	1.000	1.000	1.000
PA	42101	Philadelphia	1.0	1.0	1.0	1.0	1.0	1.000	1.000	1.000	1.000
PA	42125	Washington	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42129	Westmoreland	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
PA	42133	York	2.8	2.8	2.8	2.8	2.8	1.000	1.000	1.000	1.000
VA	51013	Arlington	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51059	Fairfax	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51107	Loudoun	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51153	Prince William	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51510	Alexandria	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51600	Fairfax City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51610	Falls Church	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51683	Manassas City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000
VA	51685	Manassas Park City	2.25	2.25	2.25	2.25	2.25	1.000	1.000	1.000	1.000

3.0 POINT SOURCES

3.1 POINT SOURCE CATEGORIES

States were asked to classify units in the 2007 MANE-VU+VA point source emissions inventory as either EGU or nonEGU. Most, but not all, units that report hourly emissions to USEPA's Clean Air Markets Division (CAMD) are classified as EGUs.

CAMD implements USEPA's rule found in Volume 40 Part 75 of the Code of Federal Regulations (CFR), which requires an hourly accounting of emissions from each affected unit - i.e., sources participating in an emissions cap and trade program under the Acid Rain Control Program, the NO_x Budget Trading Program, or the Clean Air Interstate Rule. Most of the CAMD sources are traditional power plants that sell electricity to the electrical grid. However, there are other types of sources that report to CAMD that are not considered to be EGUs, such as petroleum refineries and cement kilns.

The following criteria was provided to states to classify a unit as an EGU:

- An EGU sells most of the power generated to the electrical grid;
- An EGU burns mostly commercial fuel. Commercial fuel in this case means natural gas, oil, and coal. Wood is not considered a commercial fuel because some states identify wood as renewable. Therefore, to avoid double counting, units that burn wood and other renewable sources (depending on each state's own definition) should not be considered as an EGU (unless it is already in the CAMD database).

The following units were <u>not</u> considered EGUs for emission projections: (1) a unit that generates power for a facility but occasionally sells to the grid; (2) emergency generators; or (3) distributed generation units.

The emission projection methodology for units classified as nonEGUs is discussed in Section 3.3. The emission projection methodology for EGUs is discussed in Section 3.4.

3.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 point source were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). The only adjustment to the 2007 Version 3_3 point source source inventory was to apply "transport factors" to fugitive dust sources, as described in the following subsection.

3.2.1 Adjustments to the 2007 Inventory Used for the 2025 Projections

As described previously in Section 2.2.1.1, PM2.5 emissions for point sources were adjusted using the USEPA PM transport fractions for fugitive dust sources. Exhibit 3.1 shows the list of nonEGU SCCs for which the transport factor was applied. The major source categories included various operations in the mineral products and construction industries. Exhibit 2.2 in the previous Section 2 shows the transport fractions for each PM nonattainment county.

Exhibit 3.1 NonEGU Point Source SCCs Affected by PM Transport Fraction

SCC	SCC Description
30300519	Prim Metal Prod: Primary Copper Smelting: Unpaved Road Traffic: Fug Emiss
30300831	Prim Metal Prod: Iron Production: Unpaved Roads: Light Duty Vehicles
30300832	Prim Metal Prod: Iron Production: Unpaved Roads: Med Duty Vehicles
30300833	Prim Metal Prod: Iron Production: Unpaved Roads: Heavy Duty Vehicles
30300834	Prim Metal Prod: Iron Production: Paved Roads: All Vehicle Types
30302321	Prim Metal Prod: Taconite Iron Ore Processing: Haul Road: Rock
30302322	Prim Metal Prod: Taconite Iron Ore Processing: Haul Road: Taconite
30500290	Industrial Processes;Mineral Products;Asphalt Concrete;Haul Roads: General
30501024	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Hauling
30501030	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Tops
30501031	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Scrapers: Travel Mode
30501039	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Hauling: Haul Trucks
30501045	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Bulldozing: Overburden
30501046	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Bulldozing: Coal
30501047	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Grading
30501048	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Over
30501049	Industrial Processes;Mineral Products;Coal Mining, Cleaning, and Material Handling (See 305310);Wind
30501050	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Vehicle Traffic: Light/Medium Vehicles
30501090	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Haul Roads: General
30501640	Mineral Products: Lime Manufacture: Vehicle Traffic
30502011	Mineral Products: Stone Quarrying - Processing: Hauling
30502504	Mineral Products: Construction Sand and Gravel: Hauling
30531090	Mineral Products: Coal Mining, Cleaning, & Mat'l Handling: Haul Roads: General
31100101	Building Const: Construction: Building Contractors: Site Preparation: Topsoil Removal
31100102	Building Const: Construction: Building Contractors: Site Prep: Earth Moving (Cut and Fill)

SCC	SCC Description
31100103	Building Const: Construction: Building Contractors: Site Prep: Aggregate Hauling (On Dirt)
31100205	Building Const: Demolitions/Special Trade Contracts: On-site Truck Traffic
31100206	Building Const: Demolitions/Special Trade Contracts: On-site Truck Traffic
50100401	Waste Disposal;Solid Waste Disposal - Government;Landfill Dump;Unpaved Road Traffic

3.3 2025 NONEGU INVENTORY DEVELOPMENT

3.3.1 NonEGU Growth Factors

NonEGU point source growth factors were developed using three sets of data:

- Annual Energy Outlook fuel consumption forecasts;
- State-level employment projections by NAICS code; and
- Other state-specific emission projection data.

The priority for applying these growth factors was to first use the state-supplied projection data (if available). If no state-supplied data are available, then we used AEO projection factors for fuel consumption sources and employment data for other source categories. The AEO fuel consumption forecasts and employment projections by NAICS code used for area sources were also used for nonEGU point sources. See Section 2.3.1 of this report for a description of these data sets.

Section 2 described the growth factors used to develop projected future year emissions inventories for both area and non-EGU sources. Draft growth and control factors, and a draft technical support document, were circulated for review by MARAMA and state agencies. During the review, it was noted that several emissions categories show negative growth into the future, particularly categories related to fossil fuel combustion and manufacturing employment. The AEO forecasts show declining trends for many fuel consumption sectors, especially industrial, residential, and commercial distillate fuel oil use. Similarly, the employment projections show declines in the predicted number of employees for many sectors of the economy. This is particularly true for the manufacturing sector, which is of interest because this sector is often associated with higher emissions than those for other sectors. By contrast, the employment projections show increasing trends in retail and service-related sectors.

Predicted declines in fuel use and employment resulted in growth factors less than unity (i.e., represent negative growth) for many area and non-EGU point source categories. Consequently, for some categories, emissions are lower for the projected future years than for the base year, even before the application of control assumptions (i.e., the future "growth only" emissions are lower than the base year emissions). The MARAMA emissions inventory workgroup met on several occasions via conference calls and email exchanges to discuss whether the negative growth projections were realistic, and what additional assumptions should be made. A topic of particular concern is negative growth for non-EGU point sources versus the treatment of Emissions Reduction Credits (ERCs) in the future year inventories.

A few states cited the importance of the negative growth issue for non-EGUs and how it relates to their ERC programs which are critical to new businesses being able to locate in those states. Because businesses could apply for and sell ERCs at the level of the base year inventory, it would not be realistic to show negative growth for non-EGU point sources. During an economic downturn, a facility could shut down and sell its ERCs, making the effective level of future year emissions equal to (i.e., no lower than) the base year. Therefore, a recommended conservative approach for addressing negative growth for non-EGU point sources is to set a minimum growth rate of 1 (no growth).

During the conference call held on July 23, 2010 to discuss the negative growth issue, state agency representatives were polled as to whether or not they felt that the current set of proposed growth factors - including the negative growth factors - were realistic for their state or district. In reply, some representatives mentioned that they have observed historic state-specific data that supports the trends displayed by the proposed growth factors. Other representatives mentioned that they feel comfortable with the growth factors and don't have a technical basis to change them or suggest others. Some states will supply their own factors or make their own assumptions.

As a result of these discussions, each state provided guidance on how to handle projections when negative growth is indicated. Exhibit 3.2 shows the state recommendations for nonEGU point sources.

Exhibit 3.2 State Recommendations to Address Negative Growth for the NonEGU Point Source Sector

State	AEO2010 Growth Factors	Employment Growth Factors
CT	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use state DOL employment projections by 3-digit NAICS
DE	Use AEO2010 growth rates	For 2013, use state DOL employment projections by 3-digit NAICS; For 2017 and 2020, use no growth (growth factor=1) when employment growth is

State	AEO2010 Growth Factors	Employment Growth Factors
		negative; otherwise use employment if positive growth
DC	Use AEO2010 growth rates	Use state 2008-2018 DOL employment projections by 3-digit NAICS; no growth when employment is projected to decrease
MD	Not using AEO2010 growth factors (except for the electric power generation SCCs); Use MD DOL employment projections for industrial and commercial fuel use SCCs, unless employment growth rate is negative, in which case use no growth (growth factor=1)	Use updated state DOL employment projections by 3-digit NAICS; For DoD facilities, account for impacts of Base Realignment and Closure; For source that have closed, account for emission reduction credits
NJ	New Jersey submitted state specific growth factors. Used either state specific growth factors, no growth (growth factor=1) when state AEO growth is negative or AEO if positive growth	NJ submitted state specific growth factors. Used either state specific factors, no growth (growth factor=1) when state DOL employment growth is negative or employment if positive growth
NY	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
PA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth
VA	Use no growth (growth factor=1) when AEO growth is negative; otherwise use AEO2010 if positive growth	Use no growth (growth factor=1) when employment growth is negative; otherwise use employment if positive growth

3.3.2 Emission Reduction Credits

Mulitple states (Connecticut, Maryland, and New Jersey) added county level records account for account emission reduction credits (ERCs) issued to stationary sources pursuant to state regulations. States provided ERCs on a county-by-county basis. Fictitious facilities with an identifier of "OFFSET99999" were created for each county using SCC 23-99-000-000 (miscellaneous industrial processes: not elsewhere classified). Stack data were developed that assumed that emissions were released at the county centroid with an assumed release height of 10 feet. For the 2017 and 2020 inventories, ERC emissions were set to the amount of banked emissions available in 2007.

Delaware included the banked credits at the specific locations that they were generated. New York and Pennsylvania did not explicitly provide any information on ERCs.

The District of Columbia and Virginia do not have a formal banking and trading program. They used growth rates of 1 for those SCCs in the point source emissions inventory that showed a negative growth. In addition, for units that have or are projected to have shut down, they preserved the 2007 emissions in the inventory to account for potential use as offsets or credits.

3.3.3 NonEGU Control Factors

Control factors were developed for both on-the-books regulations and proposed regulations and other actions to estimate emission reductions in future years. Control factors were considered for the following national or regional control measures:

- Federal Rules Affecting NonEGU Point Sources
- OTC 2001 Model Rules
- OTC 2006 Model Rules
- MANE-VU Sulfur in Fuel Oil Strategy

These control programs are discussed in the following subsections.

3.3.3.1 Federal Actions Affecting NonEGU Point Sources

USEPA made available its 2020 emissions projections associated with its 2005-based v4 modeling platform (USEPA 2010a). These categories, and how they were accounted for in the MANE-VU+VA emission projection inventories, are described below:

- MACT Standards - USEPA developed guidance for estimating VOC and NO_x emission changes from MACT Rules (USEPA 2007b). We reviewed the guidance to identify nonEGU source controls associated with MACT standards for controlling HAPs. The information concerning MACT compliance periods was used to determine whether the MACT standard resulted in post-2007 emission reductions. Because major source categories had a compliance period of 2007 or earlier, we assumed that the emission reductions from the MACT standard should be reflected in the baseline year and not as an additional post- 2007 credit. The only exception to the above discussion of area source MACT standards pertains to the recently promulgated rules for reciprocating internal combustion engines. USEPA made available an estimate of the percent reduction in emissions attributable to the RICE MACT rule in 2012 and 2014 (USEPA 2010b). These reductions by SCC are shown in Exhibit 3.3. The USEPA 2014 estimates were used for the MANE-VU+VA 2017, 2020 and 2025 inventories.

- Industrial, Commercial, and Institutional Boilers and Process Heaters MACT Standard - USEPA' s 2020 control factor file identified a number of solid fuel-burning SCCs for which they estimated an 87% reduction in both PM10 and PM2.5. These were used for 2025 also for the affected SCCs.

- Petroleum refinery enforcement settlements - For the facilities identified by USEPA located in New Jersey and Pennsylvania we applied post-2007 estimated reductions for NO_x, PM10, PM2.5, and SO_2 to affected units.

Exhibit 3.3 USEPA Estimated Percent Reductions for RICE MACT Standard

SCC	NOx	PM2.5	SCC Description
20100102		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating
20100105		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20100107		15.14	Electric Generation;Distillate Oil (Diesel);Reciprocating: Exhaust
20100202	12.53		Electric Generation;Natural Gas;Reciprocating
20100207	12.53		Electric Generation;Natural Gas;Reciprocating: Exhaust
20200102		15.14	Industrial;Distillate Oil (Diesel);Reciprocating
20200104		15.14	Industrial;Distillate Oil (Diesel);Reciprocating: Cogeneration
20200107		15.14	Industrial;Distillate Oil (Diesel);Reciprocating: Exhaust
20200202	12.53		Industrial;Natural Gas;Reciprocating
20200204	12.53		Industrial;Natural Gas;Reciprocating: Cogeneration
20200207	12.53		Industrial;Natural Gas;Reciprocating: Exhaust
20200253	37.96		Industrial;Natural Gas;4-cycle Rich Burn
20200301	37.96		Industrial;Gasoline;Reciprocating
20200307	37.96		Industrial;Gasoline;Reciprocating: Exhaust
20201001	12.53		Industrial;Liquified Petroleum Gas (LPG);Propane
20201002	12.53		Industrial;Liquified Petroleum Gas (LPG);Butane
20201702	37.96		Industrial;Gasoline;Reciprocating Engine
20201707	37.96		Industrial;Gasoline;Reciprocating: Exhaust
20300101		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating
20300105		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Crankcase Blowby
20300106		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Evaporative Losses
20300107		15.14	Commercial/Institutional;Distillate Oil (Diesel);Reciprocating: Exhaust
20300201	12.53		Commercial/Institutional;Natural Gas;Reciprocating
20300204	12.53		Commercial/Institutional;Natural Gas;Cogeneration
20300207	12.53		Commercial/Institutional;Natural Gas;Reciprocating: Exhaust
20300301	37.96		Commercial/Institutional;Gasoline;Reciprocating
20300307	37.96		Commercial/Institutional;Gasoline;Reciprocating: Exhaust
20301001	12.53		Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane
20301002	12.53		Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane
20400401	37.96		Engine Testing;Reciprocating Engine;Gasoline

SCC	NOx	PM2.5	SCC Description
20400402		15.14	Engine Testing;Reciprocating Engine;Diesel/Kerosene
20400403		15.14	Engine Testing;Reciprocating Engine;Distillate Oil: CI: CI: VOC 2005cr = 0
31000203	12.53		Oil and Gas Production;Natural Gas Production;Compressors
50100421	12.53		Solid Waste Disposal;Landfill Dump;Waste Gas Recovery: Internal Combustion Device

3.3.3.2 OTC 2001 Model Rules for NonEGUs

The OTC developed NO_x control measures for industrial, commercial, and institutional (ICI) boilers and distributed generation units in 2001 (OTC 2001). We reviewed the OTC's status reports to identify states status in adopting the OTC 2001 model rules (OTC 2009a). Most states have adopted the OTC model rules with compliance dates in 2007 or earlier. As a result, we assumed that the emission reductions from the 2001 OTC model rules for nonEGUs are already reflected in the 2007 inventory and no post- 2007 reductions were applied.

3.3.3.3 OTC 2006 Model Rules for NonEGUs

In 2006, the OTC introduced model rules (OTC 2007) for one nonEGU VOC source category (adhesives/sealants) and new/more stringent requirements for several NO_x source categories (asphalt production plants, cement kilns, glass/fiberglass furnaces, and industrial, commercial, and institutional {ICI} boilers). We reviewed the OTC's status reports to identify where state status in adopting the OTC 2006 model rules (OTC 2009b). To obtain further clarification of each state's status, states were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the OTC model rule, whether credit for each rule was already accounted for in the 2007 inventory, and whether the estimated reduction in emissions should be applied in 2013, 2017, 2020 and 2025. The following paragraphs describe the control factors applied for each rule by state and future year.

3.3.3.3.1 OTC 2006 Model Rule for Asphalt Production Plants

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods that would achieve a 35 percent reduction in NO_x emissions. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC model rule and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, 2020 and 2025. Only New Jersey indicated that the reductions should be applied. New York did not provide guidance, and it was assumed that the NO_x reductions should be applied in New York for three future years. All other states indicated that the NO_x reductions should not be applied in the future years. For those states that indicated they wanted to include the reductions, a 35 percent reduction in NO_x emissions was applied for SCC 3-05-002-xx.

3.3.3.3.2 OTC 2006 Model Rule for Cement Manufacturing Plants

Cement kilns are located in Maryland, New York, and Pennsylvania. Virginia has one cement kiln, which is not located in a PM nonattainment county. The OTC recommended state-specific rulemakings or other implementation methods that would result in about a 60 percent reduction in uncontrolled levels NO_x emissions. This emission reduction for cement kilns was calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Cement kilns are already subject to NO_x controls as part of Phase I of the NO_x SIP call. Emission reductions resulting from the NO_x SIP call are already accounted for in the 2007 inventory.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated controls will become effective in 2011 for the two facilities in the state. Maryland specified a 25 percent reduction for the Holcim facility and a 40 percent reduction for the Lehigh facility. No reductions were specified for the two kilns at the Essroc facility.
- New York did not provide guidance regarding cement kilns. We used the percent reductions previously developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 40 percent was used for New York cement kilns in that inventory.
- Pennsylvania provided kiln-specific projected future year NO_x emissions for 2013, 2017, and 2020. The 2020 controlled emissions were also used for 2025. A kiln-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions.

3.3.3.3.3 OTC 2006 Model Rule for Glass and Fiberglass Furnaces

The OTC recommended state-specific rulemakings or other implementation methods to achieve an approximately 85 percent reduction in NO_x emissions from uncontrolled levels. Emission reductions for glass and fiberglass furnaces were calculated using the methodology previously developed and documented in the OTC report (OTC 2007). Glass and fiberglass furnaces are located in Maryland, New Jersey, New York, and Pennsylvania. There are no other States with facilities in a PM nonattainment county.

The following methods were used to calculate the additional reductions from the OTC 2006 Control Measure in each state:

- Maryland indicated that a 48 percent reduction should be applied to the single glass manufacturing facility in Maryland.
- New Jersey indicated that a 50 percent reduction in NO_x emissions should be applied to glass and fiberglass furnaces in 2013, 2017, 2020 and 2025.
- New York did not provide guidance regarding glass or fiberglass furnaces. We used the percent reductions developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 70 percent was used for New York glass and fiberglass furnaces in that inventory.
- Pennsylvania provided furnace-specific projected future year NO_x emissions for 2017 and 2020 for all facilities, including those in Allegheny County. The 2020 controlled emissions were also used for 2025. A furnace-specific control factor was calculated based on the ratio of the future year emissions to the 2007 emissions.
- For the three glass manufacturing facilities in Allegheny County, we used the percent reductions previously developed and documented in the previous round of emission projections developed for MARAMA (MARAMA 2007). An incremental control efficiency of 86 percent was used for Allegheny County glass and fiberglass furnaces in that inventory.

3.3.3.3.4 OTC 2006 Model Rule for ICI Boilers

The OTC recommended that member states pursue state-specific rulemakings or other implementation methods to achieve NO_x emission reduction for industrial, commercial, and institutional (ICI) boilers based on guidelines that varied by boiler size and fuel type. States were polled to determine whether they have adopted a rule that would achieve reductions equivalent to the 2006 OTC recommendations and whether the estimated reduction in NO_x emissions should be applied in 2013, 2017, 2020, and 2025.

Most states have not adopted rules equivalent to the 2006 OTC recommendations. These states indicated that they will likely depend on a USEPA national rule for possible inclusion in the BOTW inventory. Specifically, the OTC Resolution 10-01 (June, 2010) called on USEPA for national regulations for ICI boilers.

New Jersey provided NO_x percent reductions that varied by heat input rate and fuel/boiler type and included an 80 percent rule effectiveness adjustment, as shown in Exhibit 3.4.

Exhibit 3.4 NonEGU Point Source Emission Reductions from New Jersey ICI Boiler NO_x Rules

Heat Input Rate (mmBtu/hr)	Fuel/Boiler Type	Overall % Reduction 2007-2025
at least 5 but < 10	All	20%
at least 10 but < 20	All	20%
at least 25 but < 50	Natural gas only	40%
	No. 2 Fuel oil only	40%
	Refinery fuel gas and other gaseous fuels	40%
	Other liquid fuels	40%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 50 but < 100	Natural gas only	40%
	No. 2 Fuel oil only	27%
	Other liquid fuels	27%
	Duel Fuel using fuel oil and/or natural gas	40%
at least 100 or greater	No. 2 Fuel oil only	40%

The NIF file submitted by New Jersey for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity.

New York specified that a 50 percent reduction should be applied in the existing controls inventory for all boilers with greater than 25 mmBtu/hour design capacity. The NIF file submitted by New York for this project did not include the boiler design capacity. This data gap was filled using the boiler design capacities previously developed for the OTC study in 2006, if available; otherwise the SCC description was used to assign a default boiler design capacity.

3.3.3.4 MANE-VU Fuel Oil Sulfur Strategy

MANE-VU developed a low sulfur fuel oil strategy to help states develop Regional Haze SIPs (MANE-VU 2007). The sulfur in fuel oil recommendations were previously shown in Section 2.3.2.5 and vary by state, fuel oil type, and implementation year.

3.3.3.5 State-specific NonEGU Control Factors

The following state-specific nonEGU control factors were provided:

- **Bellefield Boiler Plant, Allegheny County.** Allegheny County indicated that this facility changed their fuel source from coal to natural gas in July 2009 and future year emissions were changed to reflect the fuel switch.
- **USS Clairton Works**, **Allegheny County.** The facility will remove Batteries 7-9 and have Battery C operational by 2013, resulting in a change in PM emissions in 2013. Also, USS Clairton Works will remove Batteries 1-3 and have Battery D operational in 2015, resulting in a change in PM emissions in 2017, 2020 and 2025.
- **Chrysler, Delaware.** The Chrysler facility (ID 1000300128) shut down in 2009. Delaware specified that only a 25 percent reduction should be taken for all pollutants as some emissions will be banked for future use by other sources.
- **OSG Ship Management (ID 1000500093), Delaware.** Delaware provided source-specific growth factors and percent reductions in VOC emissions for 2013, 2017, and 2020 from the lightering operations at OSG Ship Management (ID 1000500093). The 2025 emissions were expected to be the same as the 2020 emissions.
- **Control Technology Guidance (CTG) Documents, Delaware.** Delaware determined that VOC emission reductions from new CTG recommendations would be very small. Although the new CTGs set up new recommendations for higher control efficiencies, the actual VOC reductions would be minimum, if not none, because most DE's existing facilities are not affected by the new requirements and emissions from those facilities are relatively small (based on 2002 inventory).
- **Unit Shutdowns, Delaware.** Delaware identified several emission units that have shut down at the following facilities: Dow Reichhold Specialty latex (ID 1000100016), SPI Poly-Ols (ID 1000300426), and Invistas (ID 1000500002). Emissions for all pollutants were set to zero for these units.
- **Premcor Refinery** NO_x **Plantwide Cap, Delaware.** The refinery was sold to the Delaware City Refining Company and an agreement was reached with DNREC's Secretary that allows plant-wide applicability limit (cap) for NO_x. Delaware decided to devide the NO_x -cap to each stack equally. Delaware estimated a plantwide reduction of 10.05 percent in 2013 and 41.22 percent in 2017, 2020 and 2025.
- **PEPCO Benning Road, District of Columbia.** This facility is scheduled for deactivation in 2012. All emissions were set to zero in the projection inventories.

- **2009 New Jersey Rule for NO_x for Municipal Solid Waste Incinerators.** This rule will achieve a 27 percent reduction from one facility - Camden County Energy Recovery Associates, L.P. (ID 3400751614).
- **New Jersey Rule for VOC Storage Tanks.** New Jersey provided expected VOC emission reductions resulting from post-2007 rules for VOC storage tanks. For refinery floating roof storage tanks (SCC 4-03-011-xx), the reductions are 75 percent for 2013, 82 percent for 2017, and 85 percent for 2020. For bulk terminal tanks (SCC 4-04-001-xx), the reductions are 20 percent for 2013, 40 percent for 2017, and 50 percent for 2020. For pipeline breakout stations (SCCs 4-04-002-xx and 4-06-005-xx), the reductions are 26 percent for 2013, 52 percent for 2017, and 65 percent for 2020 and 2025.

3.4 2025 EGU INVENTORY DEVELOPMENT

An emission projection methodology for EGUs is being developed as part of an inter-RPO coordination effort under the direction of ERTAC. The computer code to implement the ERTAC methodology will not be available in time for use in state's re-designation requests or maintenance plans. An interim approach for projecting EGU emissions is discussed in the following paragraph.

Annual 2007 EGU point emissions were grown to 2025 based on electricity generation projections that are delineated by region and fuel. Growth factors are based on AEO2011 Table 96 - Electricity Generation by Electricity Market Module Region and Fuel Source (see Appendix F). The 2007 emissions were extracted for those units flagged as EGUs in the MANE-VU+VA 2007 inventory. The appropriate AEO2011 growth factor was applied to the 2007 emissions to calculate a "growth only" emission value for 2025. The following key assumptions were made:

- Growth beyond unit capacity or permit limits was not considered (e.g., fuel consumption was allowed to grow beyond a unit's physical capacity or permit limit);
- Generation from specific new units that are anticipated to operate in 2025 but did not in 2007 is not explicitly accounted for, but instead is assumed to be accounted for in the AEO2011 growth forecasts;
- Similarly, generation from specific units that have or are anticipated to shut down after 2007 is not explicitly accounted for, but instead are assumed to be accounted for in the AEO2011 growth forecasts.

- States indicated where post-2007 controls or shut downs were to be applied on a unit by unit basis. The control factors were applied to the grown emissions to calculate a "growth and control" emission value for 2025.

Details on the growth and control factors are provided in the following sections.

3.4.1 EGU Growth Factors

Table 96 of the AEO2011 provides electricity generation projections by electricity market module region and fuel source for the years 2007 to 2035 (EIA 2011b). AEO2011 disaggregates generation to 22 sub-regions for electricity planning and dispatch This is a new approach started in AEO2011. Disaggregation of the Electricity Market Module (EMM) is intended to reduce errors that result from aggregation and averaging, to better represent environmental and regional issues, and thus to improve the projections of capacity additions and fuels consumed for generation. Exhibit 4.1 identifies the 22 sub-regions.

1.	ERCT	ERCOT All	12.	SRDA	SERC Delta
2.	FRCC	FRCC All	13.	SRGW	SERC Gateway
3.	MROE	MRO East	14.	SRSE	SERC Southeastern
4.	MROW	MRO West	15.	SRCE	SERC Central
5.	NEWE	NPCC New England	16.	SRVC	SERC VACAR
6.	NYCW	NPCC NYC/Westchester	17.	SPNO	SPP North
7.	NYLI	NPCC Long Island	18.	SPSO	SPP South
8.	NYUP	NPCC Upstate NY	19.	AZNM	WECC Southwest
9.	RFCE	RFC East	20.	CAMX	WECC California
10.	RFCM	RFC Michigan	21.	NWPP	WECC Northwest
11.	RFCW	RFC West	22.	RMPA	WECC Rockies

Exhibit 3.5 Electricity Market Module Regions

The EIA provided a file that assigns each EGU to an EMM region. Units in the PM nonattainment counties included in this analysis reside in one of the following seven EMM regions:

- Northeast Power Coordinating Council / Northeast (NEWE)
- Northeast Power Coordinating Council / NYC Westchester (NYCW)
- Northeast Power Coordinating Council / Long Island (NYLI)
- Northeast Power Coordinating Council / Upstate New York (NYUP)
- Reliability First Corporation / East (RFCE)
- Reliability First Corporation / West (RFCW)
- SERC Reliability Corporation / Virginia Carolina (SRVC)

Exhibit 3.6 shows the growth factors for electricity generation for coal. The AEO2011 shows zero generation from coal in the NYC Westchester and Long Island regions. Generation from coal is projected to decline significantly in the Northeast and Upstate New York regions. Generation from coal is expected to decline slightly in the RFC East, RFC West, and SERC Virginia-Carolina regions.

Exhibit 3.7 shows the growth factors for electricity generation for petroleum. The AEO2011 shows that the growth factors vary widely by EMM region. A positive growth rate (e.g., growth factor > 1) from 2007 to 2025 is projected for the RFC East and SERC Virginia-Carolina regions. In all other EMM regions in the study area, generation from petroleum is projected to decline (e.g., growth factor < 1).

Exhibit 3.8 shows the growth factors for electricity generation for natural gas. The AEO2011 shows that the growth factors vary widely by EMM region. A negative growth rate (e.g., growth factor < 1) from 2007 to 2025 is projected for the NYC Westchester and SERC Virginia-Carolina regions. In all other EMM regions in the study area, generation from natural gas is projected to increase (e.g., growth factor > 1).

Exhibit 3.9 shows the growth factors for electricity generation for renewables. The AEO2011 shows that the growth factors vary widely by EMM region. A large increase in generation from renewables from 2007 to 2025 is projected for the RFC East, RFC West and SERC Virginia-Carolina regions. A more modest increase in renewable is projected for the Northeast and Upstate New York regions. A slight decline is projected for the NYC Westchester and Long Island regions.

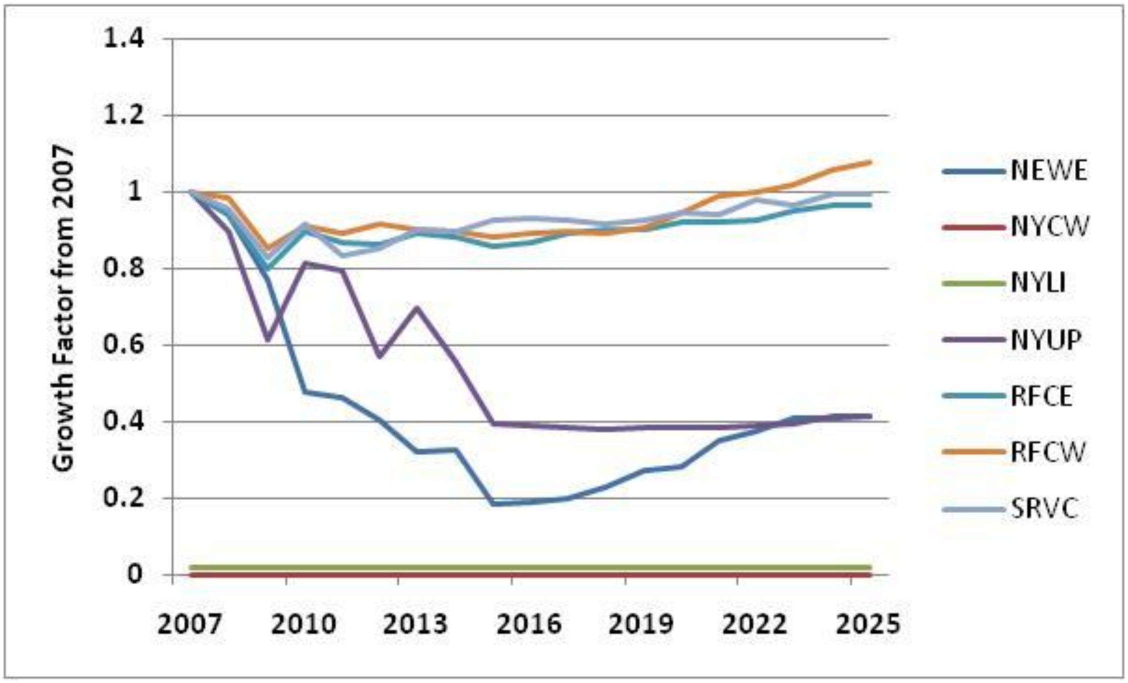


Exhibit 3.6 Electricity Generation Growth Factors for Coal

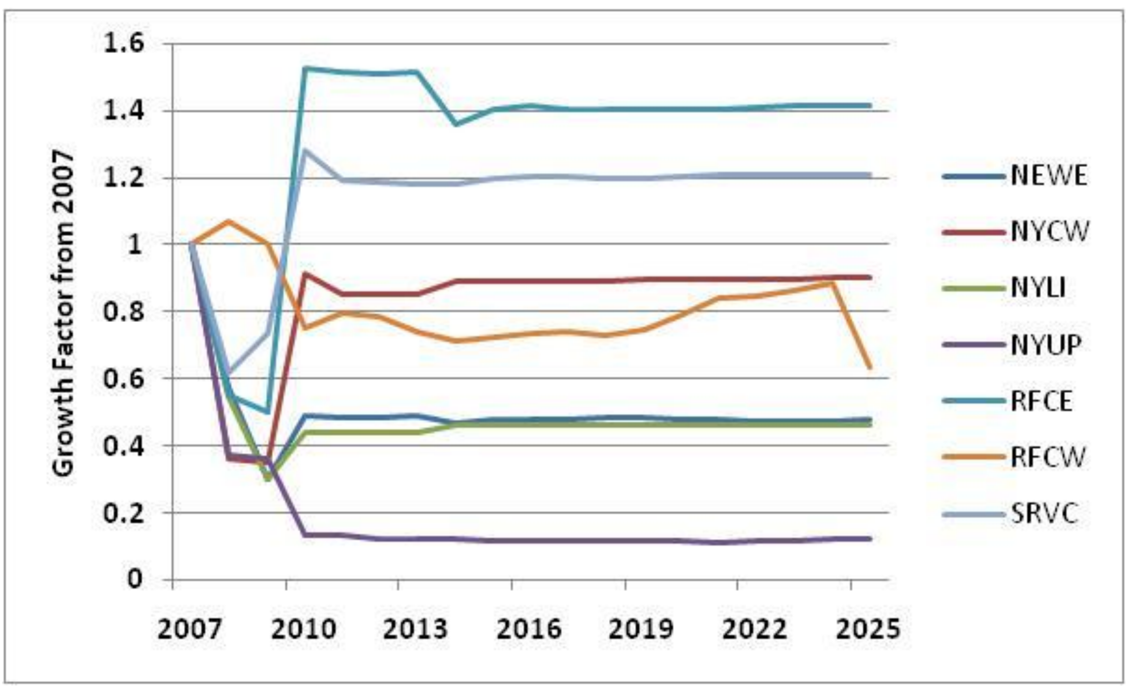


Exhibit 3.7 Electricity Generation Growth Factors for Petroleum

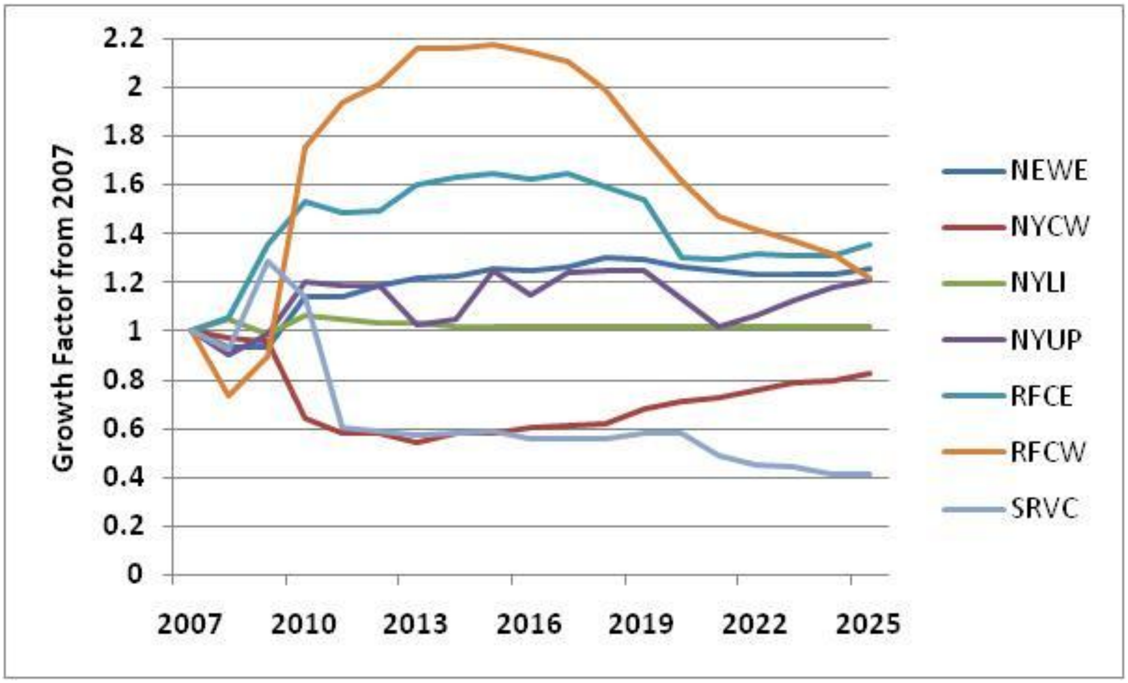


Exhibit 3.8 Electricity Generation Growth Factors for Natural Gas

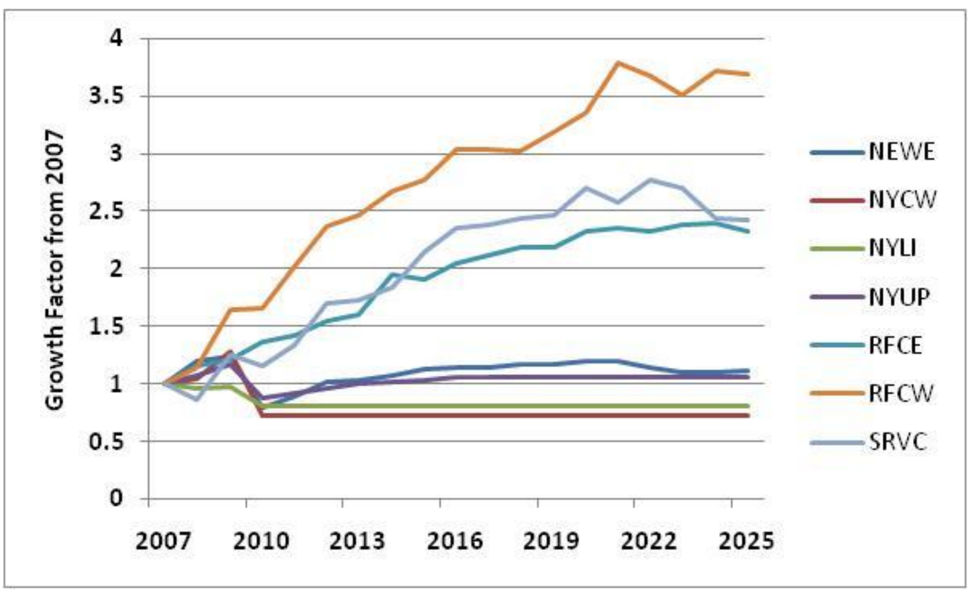


Exhibit 3.9 Electricity Generation Growth Factors for Renewables

After reviewing the AEO growth factors, New York had doubts about the AEO projections. To be conservative, New York specified that a growth factor of 1.0 should be used for any unit where AEO growth was projected to be negative.

3.4.2 EGU Control Factors

States provided information on post-2007 controls or shut downs to be applied on a unit by unit basis for the 2025 inventory. This control information was provided in a format that is being used by the ERTAC EGU Projection Methodology (Appendix G UAF NEEDS Control FileMASTER92211.xls).

In addition to the ERTAC control file, the following comments were received:

- Delaware – The Edge Moor facility (ORIS=593) plans to switch from coal to natural gas/# 6 oil. However, the Title V permit is not yet approved. Delaware made the decision to assume the facility still is burning coal in 2025 for the purposes of this PM re-designation inventory. Delaware may change the EGU estimates at a future date when the SIP submittal is written.

- District of Columbia – The PEPCO Benning Road facility (ORIS=603) is scheduled to shut down permanently in 2012 and all future year emissions have been set to zero.

- Maryland – The Healthy Air Act sets unit-specific emission caps (tons/year) for SO_2 and NO_x. Maryland provided unit specific control factors to ensure that the future year emissions were equal to the Healthy Air Act emission caps. Affected facilities include CP Crane, Herbert A Wagner, R. Paul Smith, Chalk Point, Dickerson, Morgantown, and Brandon Shores.

- New Jersey – Control factors for SO_2 and NO_x for each unit were calculated based on the ratio of the future controlled emission rate (lbs/mmBtu) to the 2007 actual emission rate (lbs/mmBtu). Large reductions in SO_2 emissions are expected from the installation of control equipment at the Hudson and Mercer generating stations. NO_x controls were also installed at the Hudson generating station in 2010.

- Pennsylvania – RRI's Portland Generating Station is under a USEPA Order to reduce SO_2 emissions. SO_2emissions beyond 013 were reduced by 95 percent to address the ordered emission reductions. SO_2 controls were installed at RRI Keystone, PPL Brunner Island, and Allegheny Energy Hatfields Ferry in 2010. SO_2 controls at the Cheswick Station were installed in 2011. Units 1 and 2 at PPL Martins Creek, Units 1 and 2 at Exelon Cromby, and Units 1 and 2 at Exelon

Eddystone are or will be permanently shut down by 2013 and the emissions for all pollutants were set to zero for 2017/2020/2025. The future operation of Unit 1 at Exelon Schuylkill are projected to be about 250 hours, compared to 1,037 hours in 2007. Future emissions for this unit were reduced by 75 percent to reflect this lowered operating capacity.

- Virginia – Dry scrubbers at the Potomac River Generating Station were installed in 2008. In 2008, the facility received a federally enforceable facility-wide permit that placed limits on the facility's annual potential to emit of both NO_X and SO_2.

3.4.3 Consideration of CSAPR Emission Allowances

On July 6, 2011, the USEPS finalized the Cross-State Air Pollution Rule (CSAPR) that requires 27 states to reduce power plant emissions that contribute to ozone and/or fine particle pollution in other states. This final rule replaces the 2005 Clean Air Interstate Rule (CAIR). Under the final rule, USEPA distributes a annual SO2 and NOx emission allowances to covered units in each state, the sum of which equals the annual SO2 and NOx budgets for those states (allowing for a two percent set-aside for new units).

USEPA provided allocations for each affected unit. States initially considered whether these unit-level allocations for SO2 and NOx provided a more realistic estimate of future year emissions than the growth and control methodology described in Sections 4.3.1 and 4.3.2 of this report. However, the United States Court of Appeals for the District of Columbia issued an order staying CSAPR on December 31, 2011, pending the resolution of an appeal of the rule. Because of the uncertainty regarding implementation of CSAPR, states decided to use the growth and control methodology described in Sections 4.3.1 and 4.3.2 rather than the proposed CSAPR caps for SO2 and NOx.

4.0 NONROAD MOBILE SOURCES INCLUDED IN NMIM

4.1 NONROAD MODEL CATEGORIES

USEPA's NONROAD model estimates emissions from equipment such as recreational marine vessels, recreational land-based vehicles, farm and construction machinery, lawn and garden equipment, aircraft ground support equipment (GSE) and rail maintenance equipment. This equipment is powered by diesel, gasoline, compressed natural gas (CNG) or liquefied petroleum gas (LPG) engines.

NMIM was developed by USEPA to develop county-level emission estimates for certain types of nonroad equipment. NMIM uses the current version the NONROAD model to develop emission estimates and was used to develop the projection inventories discussed here. The NMIM national county database contains monthly input data to reflect county specific fuel parameters and temperatures. Most of the work associated with executing NMIM involved updating the NMIM county database with state-specific information.

4.2 2007 INVENTORY DEVELOPMENT

MARAMA used the NMIM model to develop county level emission estimates by SCC for 2007 (see {MARAMA 2011a} for complete documentation). For this analysis, the NMIM2008 software (version NMIM20090504), the NMIM County Database (version NCD20090531), and NONROAD2008a (July 2009 version) were used as starting points (USEPA 2009a). Changes were made to the NCD20090531 based on state review and comment.

A summary of the major adjustments to the default NMIM County Database for the 2007 NMIM model runs includes:

- State review and adjustments to fuel characteristics (Reid Vapor Pressure, sulfur and oxygenate fractions) to better represent county-specific fuel characteristics in 2007; and

- States identified discrepancies in the housing and population data contained in the NONROAD model and these data were updated using 2007 housing information and updated 2007 population estimates.

Two states – New York and Virginia – provided their independent NONROAD modeling results which were used instead of the MARAMA modeling results.

4.3 2025 INVENTORY DEVELOPMENT

MARAMA ran the NMIM model for 2025 for six jurisdictions (CT, DE, DC, MD, PA). Two states, New York and Virginia, did their own NONROAD modeling and provided 2025 NMIM results for the affected counties.

4.4 REMOVAL OF AIRPORT GROUND SUPPORT EQUIPMENT

The NMIM/NONROAD model includes emissions from airport ground support equipment. Emissions from airport ground support equipment is also included in USEPA's aircraft inventory that was prepared using the Federal Aviation Administration's Emissions and Dispersion Modeling System (EDMS). Correspondence with USEPA indicated that USEPA considers the emissions calculated by EDMS to be better than those calculated by NONROAD. For this reason, all emissions calculated by NMIM/ NONROAD for airport ground support equipment were removed from both the 2007 and 2025 inventories to avoid double counting emissions.

4.5 NMIM/NONROAD GROWTH AND CONTROL INFORMATION

In estimating future year emissions, the NMIM/NONROAD model includes growth and scrappage rates for equipment in addition to a variety of control programs. It is not possible to separate out the future year emissions due to "growth only" or "control only" in a single run. That is, the model run provides a single future year estimate that is a "growth and control" scenario.

The growth data used in the NMIM/NONROAD model is documented in a USEPA report (USEPA 2004c). The GROWTH packet of the NONROAD model cross-references each SCC to a growth indicator code. The indicator code is an arbitrary code that identifies an actual predicted value such as human population or employment that is used to estimate the future year equipment population. The GROWTH packet also defines the scrappage curves used to estimate the future year model year distribution.

The NMIM/NONROAD model also accounts for all USEPA emission standards for nonroad equipment. There are multiple standards that vary by equipment type, rated power, model year, and pollutant. Exhibit 4.1 is a summary of the emission control programs accounted for in the NMIM/NONROAD model. A complete summary of the nonroad equipment emission standards can be found on USEPA's nonroad emission standards reference guide website (USEPA 2011).

Exhibit 4.1 Control Programs Included in the NMIM/NONROAD Model

Regulation	Description
Control of Air Pollution; Determination of Significance for Nonroad Sources and Emission Standards for New Nonroad Compression Ignition Engines At or Above 37 Kilowatts 59 FR 31036 June 17, 1994	This rule establishes Tier 1 exhaust emission standards for HC, NO_x, CO, and PM for nonroad compression-ignition (CI) engines ≥37kW (≥50hp). Marine engines are not included in this rule. The start dates and pollutants affected vary by hp category as follows: 50-100 hp: Tier 1,1998; NO_x only 100-175 hp: Tier 1, 1997; NO_x only 175-750 hp: Tier 1, 1996; HC, CO, NO_x, PM >750 hp: Tier 1, 2000; HC, CO, NO_x, PM
Emissions for New Nonroad Spark-Ignition Engines At or Below 19 Kilowatts; Final Rule 60 FR 34581 July 3, 1995	This rule establishes Phase 1 exhaust emission standards for HC, N NO_x Ox, and CO for nonroad spark-ignition engines ≤19kW (≤25hp). This rule includes both handheld (HH) and non-hand-held (NHH) engines. The Phase 1 standards become effective in 1997 for : Class I NHH engines (<225cc), Class II NHH engines (≥225cc), Class III HH engines (<20cc), and Class IV HH engines (≥20cc and <50cc). The Phase 1 standards become effective in 1998 for: Class V HH engines (≥50cc)
Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts 61 FR 52088 October 4, 1996	This rule establishes exhaust emission standards for HC+ NO_x for personal watercraft and outboard (PWC/OB) marine SI engines. The standards are phased in from 1998-2006.
Control of Emissions of Air Pollution From Nonroad Diesel Engines 63 FR 56967 October 23, 1998	This final rule sets Tier 1 standards for engines under 50 hp, phasing in from 1999 to 2000. It also phases in more stringent Tier 2 standards for all engine sizes from 2001 to 2006, and yet more stringent Tier 3 standards for engines rated over 50 hp from 2006 to 2008. The Tier 2 standards apply to NMHC+ NO_x, CO, and PM, whereas the Tier 3 standards apply to NMHC+ NO_x and CO. The start dates by hp category and tier are as follows: hp<25: Tier 1,2000; Tier 2, 2005; no Tier 3 25-50 hp: Tier 1, 1999; Tier 2, 2004; no Tier 3 50-100 hp: Tier 2, 2004; Tier 3, 2008 100-175 hp: Tier 2, 2003; Tier 3, 2007 175-300 hp: Tier 2, 2003; Tier 3, 2006 300-600 hp: Tier 2, 2001, Tier 3, 2006 600-750 hp: Tier 2, 2002; Tier 3, 2006 >750 hp: Tier 2, 2006, no Tier 3 This rule does not apply to marine diesel engines above 50 hp.

Regulation	**Description**
Phase 2: Emission Standards for New Nonroad Nonhandheld Spark Ignition Engines At or Below 19 Kilowatts 64 FR 15207 March 30, 1999	This rule establishes Phase 2 exhaust emission standards for HC+ NO_x for nonroad nonhandheld (NHH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards for Class I NHH engines (<225cc) become effective on August 1, 2007 (or August 1, 2003 for any engine initially produced on or after that date). The Phase 2 standards for Class II NHH engines (≥225cc) are phased in from 2001-2005.
Phase 2: Emission Standards for New Nonroad Spark-Ignition Handheld Engines At or Below 19 Kilowatts and Minor Amendments to Emission Requirements Applicable to Small Spark-Ignition Engines and Marine Spark-Ignition Engines; Final Rule 65 FR 24268 April 25, 2000	This rule establishes Phase 2 exhaust emission standards for HC+ NO_x for nonroad handheld (HH) spark-ignition engines ≤19kW (≤25hp). The Phase 2 standards are phased in from 2002-2005 for Class III and Class IV engines and are phased in from 2004-2007 for Class V engines.
Control of Emissions From Nonroad Large Spark-Ignition Engines and Recreational Engines (Marine and Land-Based); Final Rule 67 FR 68241 November 8, 2002	This rule establishes exhaust and evaporative standards for several nonroad categories: 1) Two tiers of emission standards are established for large spark-ignition engines over 19 kW. Tier 1 includes exhaust standards for HC+ NO_x and CO and is phased in from 2004-2006. Tier 2 becomes effective in 2007 and includes exhaust standards for HC+ NO_x and CO, as along with evaporative controls affecting fuel line permeation, diurnal emissions and running loss emissions. 2) Exhaust and evaporative emission standards are established for recreational vehicles, which include snowmobiles, off-highway motorcycles, and all-terrain vehicles (ATVs). For snowmobiles, HC and CO exhaust standards are phased-in from 2006-2012. For off-highway motorcycles, HC+ NO_x and CO exhaust emission standards are phased in from 2006-2007. For ATVs, HC+NO_x and CO exhaust emission standards are phased in from 2006-2007. Evaporative emission standards for fuel tank and hose permeation apply to all recreational vehicles beginning in 2008. 3) Exhaust emission standards for HC+ NO_x, CO, and PM for recreational marine diesel engines over 50 hp begin in 2006-2009, depending on the engine displacement. These are “Tier 2” equivalent standards.
Control of Emissions of Air Pollution From Nonroad Diesel Engines and Fuel; Final Rule (Clean Air Nonroad Diesel Rule – Tier 4) 69 FR 38958 June 29, 2004	This final rule sets Tier 4 exhaust standards for CI engines covering all hp categories (except marine and locomotives), and also regulates nonroad diesel fuel sulfur content. 1) The Tier 4 start dates and pollutants affected vary by hp and tier as follows: hp<25: 2008, PM only 25-50 hp: Tier 4 transitional, 2008, PM only; Tier 4 final, 2013, NMHC+ NO_x and PM

Regulation	**Description**
	50-75 hp: Tier 4 transitional, 2008; PM only; Tier 4 final, 2013, NMHC+ NO_x and PM 75-175 hp: Tier 4 transitional, 2012, HC, NO_x, and PM; Tier 4 final, 2014, HC, NO_x,PM 175-750 hp:Tier 4 transitional, 2011, HC, NO_x, and PM; Tier 4 final, 2014, HC, NO_x,PM >750 hp: Tier 4 transitional, 2011, HC, NO_x, and PM; Tier 4 final, 2015, HC, NO_x,PM 2) This rule will reduce nonroad diesel fuel sulfur levels in two steps. First, starting in 2007, fuel sulfur levels in nonroad diesel fuel will be limited to a maximum of 500 ppm, the same as for current highway diesel fuel. Second, starting in 2010, fuel sulfur levels in most nonroad diesel fuel will be reduced to 15 ppm.
Control of Emissions From Nonroad Spark-Ignition Engines and Equipment; Final Rule (Bond Rule) 73 FR 59034 October 8, 2008	This rule establishes exhaust and evaporative standards for small SI engines and marine SI engines: 1) Phase 3 HC+ NO_x exhaust emission standards are established for Class I NHH engines starting in 2012 and for Class II NHH engines starting in 2011. There are no new exhaust emission standards for handheld engines. New evaporative standards are adopted for both handheld and nonhandheld equipment. The new evaporative standards control fuel tank permeation, fuel hose permeation, and diffusion losses. The evaporative standards begin in 2012 for Class I NHH engines and 2011 for Class II NHH engines. For handheld engines, the evaporative standards are phased-in from 2012-2016. 2) More stringent HC+ NO_x and CO standards are established for marine SI PWC/OB engines beginning in 2010. In addition, new exhaust HC+ NO_x and CO standards are established for sterndrive and inboard (SD/I) marine SI engines also beginning in 2010. High performance SD/I engines are subject to separate HC+ NO_x and CO exhaust standards that are phased-in from 2010-2011. New evaporative standards were also adopted for all marine SI engines that control fuel hose permeation, diurnal emissions, and fuel tank permeation emissions. The hose permeation, diurnal, and tank permeation standards take effect in 2009, 2010, and 2011, respectively.

Source: USEPA 2010c

5.0 MARINE VESSELS, AIRPORTS, AND RAILROADS

5.1 MAR INVENTORY CATEGORIES

This category of sources is collectively referred to as the MAR (marine, airports, railroads) sector. It includes nonroad engines associated with the following activities:

- **Marine Vessels** - The Commercial Marine Vehicle (CMV) sector includes all boats and ships used either directly or indirectly in the conduct of commerce or military activity. The majority of these vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of this inventory it is assumed that Category 3 vessels primarily use residual blends, while Category 1 and 2 vessels typically used distillate fuels.

- **Airports -** The aircraft sector includes all aircraft types used for public, private, and military purposes. This includes four types of aircraft 1) Commercial; 2) Air Taxis; 3) General Aviation; and 4) Military. Ground support equipment (GSE) and auxiliary power units (APU) are also included.

- **Railroads** - The railroad sector includes railroad locomotives powered by diesel-electric engines. Locomotives are divided into Class I line haul, Class II/III line haul, commuter/passenger and Class I yard.

5.2 2007 INVENTORY DEVELOPMENT

The emission projections for the 2025 point source were based on Version 3_3 of the 2007 MANE-VU+VA inventory and are fully documented in the TSD for that effort (MARAMA 2012a). There were no adjustment to the 2007 Version 3_3 MAR inventory for this analysis.

5.3 2025 INVENTORY DEVELOPMENT

Appendix H contains the data that were used to develop growth and control factors for the commercial marine vessel, airport, and railroad sectors.

5.3.1 Commercial Marine Vessels

For the purpose of emission calculations, marine vessel engines are divided into three categories based on displacement (swept volume) per cylinder. Category 1 and Category 2 marine diesel engines typically range in size from about 500 to 8,000 kW (700 to 11,000 hp). These engines are used to provide propulsion power on many kinds of vessels including tugboats, pushboats, supply vessels, fishing vessels, and other commercial vessels in and around ports. They are also used as stand-alone generators for auxiliary electrical power on vessels. Category 3 marine diesel engines typically range in size from 2,500 to 70,000 kW (3,000 to 100,000 hp). These are very large marine diesel engines used for propulsion power on ocean-going vessels such as container ships, oil tankers, bulk carriers, and cruise ships.

The majority of marine vessels are powered by diesel engines that are either fueled with distillate or residual fuel oil blends. For the purpose of emission inventories, USEPA has assumed that Category 3 vessels primarily use residual blends, while Category 1 and 2 vessels typically use distillate fuels.

USEPA developed national emission inventories for Category 1 and 2 vessels and Category 3 vessels for calendar years 2002 through 2040 as part of its effort to develop emission standards for these vessels. The methodologies used to develop the emission projections (for both a baseline and controlled scenario) are documented in three regulatory impact assessments (USEPA 2008b, USEPA 2009c, USEPA 2009d). The USEPA data and methodologies from these RIAs were used to develop separate growth and control factors for Category 1 and 2 vessels (diesel) and Category 3 vessels (residual).

5.3.1.1 CMV Diesel Growth Factors

For Category 1 and 2 diesel vessels, USEPA used projection data for domestic shipping from the AEO2006 (EIA 2006). The annual growth rate reported in the RIA is 0.9%. More recent growth data for domestic shipping is available in the AEO2010 (EIA 2010). Because Category 1 and 2 vessels primarily account for activity data for ships that carry domestic cargo, we decided to use the recent growth data for domestic shipping available in the AEO2010. We used Table A-7 of the AEO2010 for domestic shipping to calculate the growth factor for 2007-2025 to be 1.064. This growth factor was used for CMV diesel port emissions (SCC 22-80-002-100) and CMV diesel underway emissions (SCC 22-80-002-200).

5.3.1.2 CMV Diesel Control Factors

In developing their emission projections, USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel marine vessel rule:

- USEPA's baseline (pre-control) inventory accounted for:
    1. the 0.9 percent annual growth in fuel use based on AEO2006,
    2. the impact of existing engine regulations that took effect in 2008,
    3. the 2004 Clean Air Nonroad Diesel Rule that will decrease the allowable levels of sulfur in fuel beginning in 2012, and
    4. fleet turnover.

- USEPA's controlled inventory accounted for:

    1. the 0.9 percent annual growth in fuel use based on AEO2006;
    2. the reductions included in the baseline inventory, and the reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines;
    3. The 2008 final rule that includes the first-ever national emission standards for existing marine diesel engines, applying to engines larger than 600kW when they are remanufactured. The rule also sets Tier 3 emissions standards for newly-built engines that are phasing in from 2009. Finally, the rule establishes Tier 4 standards for newly-built commercial marine diesel engines above 600kW, phasing in beginning in 2014.

To calculate a control factor that accounts for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 0.9 percent annual growth rate to the 2007 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions. Exhibit 5.1 shows the control factors for 2013, 2017, 2020, and 2025 for diesel commercial marine vessels.

Exhibit 5.1 CMV Diesel Control Factors by Year and Pollutant

Year	NOx	PM2.5	SO2
2013	0.787	0.747	0.464
2017	0.642	0.550	0.076
2020	0.537	0.460	0.032
2025	0.401	0.353	0.031

5.3.1.3 CMV Residual Oil Growth Factors

For Category 3 residual oil vessels, data from a USEPA-sponsored study was used to develop an annualized growth factor of 4.5 percent for the region. A few states considered the growth rate to be extremely high and not reflective of recent economic conditions. Because USEPA's Category 3 vessel inventory is primarily based on activity data for ships that carry foreign cargo, we decided to use the recent growth data for international shipping available in the AEO2010. We used data from Table A-7 of the AEO2010 for international shipping to calculate the growth factor for 2007-2025 to be 0.956. These growth factors were used for CMV residual oil port emissions (SCC 22-80-003-100) and CMV residual oil underway emissions (SCC 22-80-003-200).

5.3.1.4 CMV Residual Oil Control Factors

On December 22, 2009, USEPA announced final emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters (called Category 3 marine diesel engines) installed on U.S.-flagged vessels. The final engine standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (a treaty called "MARPOL"). The emission standards apply in two stages: near-term standards for newly-built engines will apply beginning in 2011, and long-term standards requiring an 80 percent reduction in NO_x will begin in 2016. USEPA also adopted changes to the diesel fuel program to allow for the production and sale of diesel fuel with no more than 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters, unless operators achieve equivalent emission reductions in other ways.

On March 26, 2010, the International Maritime Organization (IMO) officially designated waters off North American coasts as an emissions control area (ECA) in which stringent international emission standards will apply to ships. In practice, implementation of the ECA means that ships entering the designated area would need to use compliant fuel for the duration of their voyage that is within that area, including time in port and voyages whose routes pass through the area without calling on a port. The North American ECA includes waters adjacent the Atlantic extending up to 200 nautical miles from east coast of the US. The quality of fuel that complies with the ECA standard will change over time. From the effective date in 2012 until 2015, fuel used by vessels operating in designated areas cannot exceed 1.0 percent sulfur (10,000 ppm). Beginning in 2015, fuel used by vessels operating in these areas cannot exceed 0.1 percent sulfur (1000 ppm). Beginning in 2016, NO_x after treatment requirements become applicable.

To calculate a control factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a “growth only” scenario applying USEPA’s 4.5 percent annual growth rate to the 2007 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year “growth only” emissions.

Exhibit 5.2 shows the control factors for 2013, 2017, and 2020 for residual oil commercial marine vessels.

Exhibit 5.2 CMV Residual Oil Control Factors by Year and Pollutant

Year	NOx	PM2.5	SO2
2013	0.736	0.353	0.270
2017	0.654	0.216	0.120
2020	0.597	0.137	0.036
2025	0.480	0.137	0.036

5.3.1.5 Military Vessels Growth and Control Factors

Virginia reported emissions for military vessels, but did not distinguish between diesel or residual fuels. An assumption of “no growth” for military vessel activity and emissions in Virginia was made so that emissions remain at 2007 levels in 2025. Virginia was the only state to report emission from military vessels.

5.3.1.6 State-specific CMV Updates for 2025

New Jersey provided updated CMV emission estimates for 2007, 2013, 2017, 2020, and 2025, and growth and control factors for 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

5.3.2 Airports

Aircraft emissions in the 2007 MANE-VU+VA inventory are available on either a county-by-county or airport-by-airport basis for six types of aircraft operations:

- Air carrier operations represent landings and take-offs (LTOs) of commercial aircraft with seating capacity of more than 60 seats;
- Commuter/air taxi operations are one category. Commuter operations include LTOs by aircraft with 60 or fewer seats that transport regional passengers on scheduled commercial flights. Air taxi operations include LTOs by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights;
- General aviation represents all civil aviation LTOs not classified as commercial;
- Military operations represent LTOs by military aircraft;
- Ground Support Equipment (GSE) typically includes aircraft refueling and baggage handling vehicles and equipment, aircraft towing vehicles, and passenger buses;
- Auxiliary power units (APUs) provide power to start the main engines and run the heating, cooling, and ventilation systems prior to starting the main engines.

5.3.2.1 Airport Growth Factors

Aircraft operations were projected to future years by applying activity growth using data on itinerant (ITN) operations at airports as reported in the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System for 2009-2030 (FAA 2010). The ITN operations are defined as aircraft take-offs or landings. This information is available for approximately 3300 individual airports. Actual LTOs are reported for 2007 and projected LTOs are provided for all years up to 2030.

The data was aggregated and applied at the county level for the four operation types: commercial, general, air taxi, military. A growth factor was computed for each operation type by dividing future-year ITN by 2007-year ITN. Inventory SCCs were assigned factors based on the operation type, as shown in Exhibit 5.3.

Exhibit 5.3 Crosswalk between SCC and FAA Operations Type

SCC	SCC Description	FAA Operation Type Used for Growth Factor
2265008005	Airport Ground Support Equipment, 4-Stroke Gas	Total Itinerant Operations
2267008005	Airport Ground Support Equipment, LPG	Total Itinerant Operations
2268008005	Airport Ground Support Equipment, CNG	Total Itinerant Operations
2270008000	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2270008005	Airport Ground Support Equipment, Diesel	Total Itinerant Operations
2275001000	Aircraft /Military Aircraft /Total	Itinerant Military Operations
2275020000	Aircraft /Commercial Aircraft /Total: All Types	Itinerant Air Carrier Operations
2275050000	Aircraft /General Aviation /Total	Itinerant General Aviation Operations
2275050011	Aircraft /General Aviation /Piston	Itinerant General Aviation Operations
2275050012	Aircraft /General Aviation /Turbine	Itinerant General Aviation Operations
2275060000	Aircraft /Air Taxi /Total	Itinerant Air Taxi Operations
2275060011	Aircraft /Air Taxi /Piston	Itinerant Air Taxi Operations
2275060012	Aircraft /Air Taxi /Turbine	Itinerant Air Taxi Operations
2275070000	Aircraft /Aircraft Auxiliary Power Units /Total	Total Itinerant Operations

Exhibit 5.4 summarizes the region-wide growth factors by FAA operation type. The growth factor for individual airports/counties may deviate substantially from these region-wide growth factors.

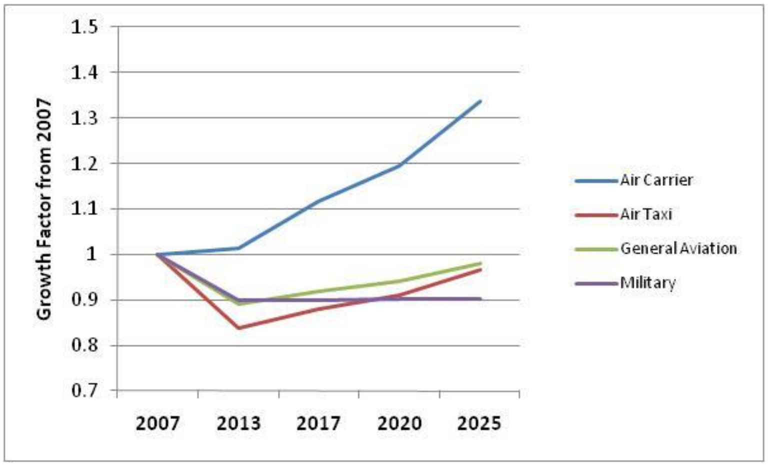


Exhibit 5.4 Region-wide Growth Factors from 2007 by FAA Operations Type

5.3.2.2 Aircraft Control Factors

The NO_x aircraft engine emissions standards adopted by USEPA in November 2005 (USEPA 2005) were reviewed. The standards are equivalent to the NO_x emission standards (adopted in 1999 for implementation beginning in 2004) of the United Nations International Civil Aviation Organization (ICAO), and will bring the US aircraft standards into alignment with the international standards. The standards apply to new aircraft engines used on commercial aircraft including small regional jets, single-aisle and twin-aisle aircraft, and 747s and larger aircraft. The standards also apply to general aviation and military aircraft, which sometimes use commercial engines. For example, small regional jet engines are used in executive general aviation aircraft, and larger commercial aircraft engines may be used in military transport aircraft.

Nearly all previously certified or in-production engine models currently meet or perform better than the standards USEPA adopted in the November 2005 rule. In addition, manufacturers have already been developing improved technology in response to the ICAO standards. According to USEPA's recent analysis for the proposed transport rule (USEPA 2010b), this rule is expected to reduce NO_x emissions by approximately 2 percent in 2015 and 3 percent in 2020. Because of the relatively small amount of NO_x reductions, our aircraft emission projections do not account for this control program.

USEPA has also issued an Advance Notice of Proposed Rulemaking (ANPR) on lead emissions from piston-engine aircraft using leaded aviation gasoline (USEPA 2010c). However, this rule has not yet been adopted and co-benefits for criteria air pollutants are likely to be small. Therefore, the effects of this rule were not included in the future-year emissions projections.

5.3.2.3 State-specific Airport Updates for 2025

After reviewing the growth factors described in the previous section, Connecticut provided state-specific growth factors for 2025 by SCC and county. These state-specific factors were used instead of the factors described in the previous section.

New Jersey provided updated aircraft growth factors and emission estimates for 2007, 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

5.3.3 Railroad Locomotives

Railroad locomotive engine emissions in the 2007 MARAMA inventory are classified into the following categories:

- Class I line haul locomotives are operated by large freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-006);
- Class II/III line haul locomotives are operated by smaller freight railroad companies and are used to power freight train operations over long distances (SCC 22-85-002-007);
- Inter-city passenger train locomotives are operated primarily by Amtrak to provide inter-city passenger transport (SCC 22-85-002-008);
- Independent commuter rail systems operate locomotives that provide passenger transport within a metropolitan area (SCC 22-85-002-009); and
- Yard/switch locomotives are used in freight yards to assemble and disassemble trains, or for short hauls of trains that are made up of only a few cars (SCC 22-85-002-010).

5.3.3.1 Railroad Growth Factors

In March 2008, USEPA finalized a three part program that will dramatically reduce emissions from diesel locomotives of all types -- line-haul, switch, and passenger rail. As part of this work USEPA developed a national emission inventory for calendar years 2002 through 2040. Emission projections methodologies for a baseline and controlled scenario were developed and documented (USEPA 2008b). USEPA used projection data from the AEO2006 (EIA 2006). Table A-7 of AEO2006 showed that freight rail energy use will grow 1.6 percent annually.

More recent growth data is available in the AEO2010 which was published in May 2010. There are separate projections for passenger rail and freight rail energy use. For the MANE VU+VA inventory the more recent AEO2010 growth projections were used.

Passenger rail data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2025 to be 1.241. These growth factors were applied to inter-city passenger train locomotives (SCC 22-85-002-008) and independent commuter rail systems (SCC 22-85-002-009).

For freight rail, the data from AEO2010 Table A-7 was used to calculate the growth factor for 2007-2025 to be 1.098. The freight rail annual growth factors for Class I line haul (SCC 22-85-002-006), Class II/III line haul (SCC 22-85-002-007), and yard switch (SCC 22-85-002-010) locomotives were used.

5.3.3.2 Railroad Control Factors

USEPA developed two scenarios that accounted for both the 2004 nonroad diesel rule and the 2008 diesel locomotive rule:

- USEPA's baseline (pre-control) inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. The impact of existing regulations for Tier 0, 1, and 2 locomotive engines that take effect in 2008,
    3. The 2004 Clean Air Nonroad Diesel Rule that will decrease allowable levels of sulfur in locomotives fuel beginning in 2012, and
    4. Fleet turnover.

- USEPA's controlled inventory accounted for

    1. AEO2006 annual growth in fuel use,
    2. Reductions included in the baseline inventory, and
    3. Reductions from USEPA's 2008 rule Final Locomotive-Marine rule for Tier 3 and 4 engines. This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives.
    4. Voluntary retrofits under the National Clean Diesel Campaign are not included in our projections.

To calculate a factor that accounted for reductions included in the USEPA controlled inventory, it was necessary to first calculate a "growth only" scenario applying USEPA's 1.6% annual growth rate to the 2006 base emissions. Once the growth rate was applied, then a control factor for each pollutant was calculated by dividing the future year controlled emissions by the future year "growth only" emissions.

Exhibit 5.5 shows the control factors for 2013, 2017, 2020, and 2025 for the five locomotive classifications and pollutants.

5.3.3.3 State-specific Railroad Updates for 2025

New Jersey provided updated railroad growth factors, control factors, and emission estimates for 2007, 2013, 2017, 2020, and 2025. These data were used to replace the emission estimates previously used for the 2007 MANE-VU+VA base year inventory and the MANE-VU+VA future year inventories.

Exhibit 5.5 Rail Control Factors by Year, Pollutant, and SCC

Year	NOx	PM2.5	SO2
SCC 22-85-002-006 Line Haul Class I Operations			
2013	0.771	0.595	0.003
2017	0.633	0.449	0.003
2020	0.547	0.364	0.003
2025	0.412	0.252	0.003
SCC 22-85-002-007 Line Haul Class II / III Operations			
2013	1.000	0.829	0.003
2017	0.960	0.791	0.003
2020	0.920	0.752	0.003
2025	0.852	0.688	0.003
SCC 22-85-002-008 Inter-City Passenger			
2013	0.571	0.566	0.003
2017	0.421	0.402	0.003
2020	0.340	0.294	0.003
2025	0.241	0.180	0.003
SCC 22-85-002-009 Commuter Rail			
2013	0.571	0.566	0.003
2017	0.421	0.402	0.003
2020	0.340	0.294	0.003
2025	0.241	0.180	0.003
SCC 22-85-002-010 Yard / Switch			
2013	0.912	0.777	0.003
2017	0.843	0.712	0.003
2020	0.771	0.650	0.003
2025	0.634	0.534	0.003

6.0 ONROAD MOBILE SOURCES INCLUDED IN MOVES

6.1 MOVES MODEL CATEGORIES

USEPA's MOVES model estimates emissions from vehicles travel such as cars, trucks, buses and motorcycles. These vehicles are powered by diesel, gasoline, and alternative fuel formulations. MOVES2010 includes the capability to estimate both vehicle exhaust and evaporative emissions (including vehicle refueling emissions) and brake wear and tire wear emissions for criteria pollutants and precursors. However, MOVES2010 does not include the capability to estimate emissions of re-entrained road dust. Estimates of emissions from re-entrained road dust are included in the area source inventory.

6.2 2007 MOVES MODEL INVENTORY

MARAMA provided county-level MOVES results for 2007 for CT, DE, DC, and MD. Other states (NJ, NY, PA, VA) provided results for affected counties in their states.

6.3 2025 MOVES MODEL INVENTORY

MARAMA provided county-level MOVES results for 2025 for CT, DE, DC, and MD. Other states (NJ, NY, PA, VA) provided results for affected counties in their states.

7.0 EMISSION SUMMARIES

Exhibits 7.1 to 7.12 summarize PM2.5 and PM precursor emissions by PM nonattainment area and source sector for 2007 and 2025. Some general observations by pollutant include:

- PM2.5 emissions are projection to decrease between 2007and 2025 in all PM nonattainment areas. The reductions are due to the turnover to cleaner onroad vehicles, nonroad engines, and residential wood combustion equipment. The PM2.5 emissions shown account for the application of the PM transport factor (see discussion in Section 2.2.1.1 of this TSD).

- NO_x emissions decline in all PM nonattainment areas between 2007 and 2025 and by more than 50 percent in a few areas. Most of the decline results from the turnover of the onroad vehicle fleet to vehicles with improved emission controls and fuel efficiency. Reductions in nonroad sources are also substantial. Three areas (Baltimore, NY/NJ/CT, and Washington DC/MD/VA) also show substantial reductions due to controls on EGUs.

- SO_2 emissions decrease in all PM nonattainment areas. All areas are showing reductions due to the lower sulfur contents of fuels used by onroad vehicles and nonroad equipment. Additional reductions in areas located in Maryland, New Jersey, and New York are due to the lower sulfur content regulations in those state for home heating, distillate oil, and residual oil. Connecticut, Delaware, the District of Columbia, Pennsylvania, and Virginia did not take credit for any reductions for low sulfur fuel oils since they have not adopted the MANE-VU recommendations into their regulations (see discussion in Section 2.3.2.5 of the TSD). Especially large reductions are found in areas where controls are projected to be in place on EGUs (Allentown, Baltimore, Harrisburg, Metro New York, Philadelphia, Pittsburgh, Washington DC/MD/VA, and York, PA).

County-by-county emissions for 2007 and 2025 are available on the MARAMA ftp site.

Exhibit 7.1 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Allentown, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) from 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,987	1,936	-51	-2.6%
Nonroad MAR	516	277	-239	-46.3%
Nonroad NMIM	2,661	1,007	-1,654	-62.1%
Onroad MOVES	15,652	4,190	-11,462	-73.2%
Point EGU	7,763	5,837	-1,927	-24.8%
Point nonEGU	5,900	2,114	-3,786	-64.2%
	34,480	**15,362**	**-19,117**	**-55.4%**
Direct PM2.5				
Area	2,150	1,958	-192	-8.9%
Nonroad MAR	26	15	-11	-42.3%
Nonroad NMIM	229	113	-117	-51.0%
Onroad MOVES	528	190	-338	-64.0%
Point EGU	2,264	2,138	-125	-5.5%
Point nonEGU	1,301	1,227	-75	-5.7%
	6,498	**5,640**	**-858**	**-13.2%**
Sulfur Dioxide (SO2)				
Area	2,552	1,118	-1,434	-56.2%
Nonroad MAR	12	4	-8	-70.4%
Nonroad NMIM	147	4	-143	-97.3%
Onroad MOVES	118	43	-75	-63.2%
Point EGU	48,203	3,962	-44,241	-91.8%
Point nonEGU	5,868	5,875	7	0.1%
	56,900	**11,005**	**-45,895**	**-80.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.2 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Baltimore, MD

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	4,732	5,167	435	9.2%
Nonroad MAR	16,703	8,521	-8,182	-49.0%
Nonroad NMIM	10,466	4,265	-6,201	-59.2%
Onroad MOVES	43,939	15,900	-28,038	-63.8%
Point EGU	23,572	8,939	-14,634	-62.1%
Point nonEGU	11,981	13,362	1,380	11.5%
	111,394	**56,154**	**-55,240**	**-49.6%**
Direct PM2.5				
Area	5,004	5,197	193	3.9%
Nonroad MAR	572	201	-371	-64.8%
Nonroad NMIM	969	519	-450	-46.4%
Onroad MOVES	1,503	749	-755	-50.2%
Point EGU	6,677	7,134	456	6.8%
Point nonEGU	2,296	2,366	71	3.1%
	17,022	**16,166**	**-855**	**-5.0%**
Sulfur Dioxide (SO2)				
Area	2,316	315	-2,001	-86.4%
Nonroad MAR	1,803	268	-1,535	-85.1%
Nonroad NMIM	581	15	-566	-97.4%
Onroad MOVES	375	380	5	1.3%
Point EGU	93,665	18,922	-74,744	-79.8%
Point nonEGU	4,759	4,867	108	2.3%
	103,499	**24,766**	**-78,733**	**-76.1%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.3 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Hagerstown Martinsburg, MD-WV

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) from 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	296	339	43	14.5%
Nonroad MAR	289	144	-145	-50.2%
Nonroad NMIM	793	301	-492	-62.0%
Onroad MOVES	5,124	1,966	-3,158	-61.6%
Point EGU	1,398	1,390	-8	-0.6%
Point nonEGU	1,982	1,518	-465	-23.4%
	9,883	**5,657**	**-4,225**	**-42.8%**
Direct PM2.5				
Area	501	538	37	7.3%
Nonroad MAR	10	3	-7	-68.6%
Nonroad NMIM	74	33	-41	-55.6%
Onroad MOVES	185	69	-117	-62.8%
Point EGU	310	299	-11	-3.5%
Point nonEGU	188	188	0	0.1%
	1,269	**1,131**	**-138**	**-10.9%**
Sulfur Dioxide (SO2)				
Area	274	83	-191	-69.7%
Nonroad MAR	5	2	-4	-69.4%
Nonroad NMIM	45	1	-44	-97.6%
Onroad MOVES	44	47	3	6.4%
Point EGU	5,536	4,590	-946	-17.1%
Point nonEGU	1,277	1,271	-6	-0.5%
	7,182	**5,993**	**-1,189**	**-16.5%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: only includes emissions for Washington County, MD; emissions for West Virginia portion of the nonattainment area will be provided by Maryland in their SIP submittal.

Exhibit 7.4 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Harrisburg-Lebanon-Carlisle-York, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	3,874	3,705	-169	-4.4%
Nonroad MAR	1,775	981	-793	-44.7%
Nonroad NMIM	5,329	2,055	-3,274	-61.4%
Onroad MOVES	36,440	9,338	-27,102	-74.4%
Point EGU	15,985	15,531	-454	-2.8%
Point nonEGU	10,965	9,646	-1,319	-12.0%
	74,368	**41,255**	**-33,113**	**-44.5%**
Direct PM2.5				
Area	5,452	5,201	-251	-4.6%
Nonroad MAR	74	35	-39	-52.3%
Nonroad NMIM	474	211	-263	-55.4%
Onroad MOVES	1,225	346	-879	-71.8%
Point EGU	2,123	2,060	-63	-3.0%
Point nonEGU	923	915	-8	-0.9%
	10,272	**8,769**	**-1,503**	**-14.6%**
Sulfur Dioxide (SO2)				
Area	4,900	2,763	-2,136	-43.6%
Nonroad MAR	30	15	-15	-50.2%
Nonroad NMIM	293	8	-285	-97.3%
Onroad MOVES	255	89	-165	-64.9%
Point EGU	106,189	5,179	-101,010	-95.1%
Point nonEGU	11,520	11,539	19	0.2%
	123,186	**19,593**	**-103,593**	**-84.1%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.5 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Johnstown, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	861	822	-39	-4.5%
Nonroad MAR	1,132	568	-564	-49.8%
Nonroad NMIM	909	366	-543	-59.7%
Onroad MOVES	6,017	1,217	-4,800	-79.8%
Point EGU	41,440	40,004	-1,435	-3.5%
Point nonEGU	932	1,097	165	17.7%
	51,291	**44,074**	**-7,216**	**-14.1%**
Direct PM2.5				
Area	1,198	1,114	-84	-7.0%
Nonroad MAR	45	18	-27	-60.6%
Nonroad NMIM	84	36	-48	-56.9%
Onroad MOVES	195	43	-152	-78.2%
Point EGU	2,867	2,768	-99	-3.4%
Point nonEGU	231	234	3	1.4%
	4,619	**4,212**	**-407**	**-8.8%**
Sulfur Dioxide (SO2)				
Area	1,179	593	-586	-49.7%
Nonroad MAR	13	1	-12	-95.9%
Nonroad NMIM	51	1	-50	-97.4%
Onroad MOVES	45	12	-32	-72.3%
Point EGU	143,303	141,481	-1,821	-1.3%
Point nonEGU	30	35	4	14.7%
	144,621	**142,123**	**-2,498**	**-1.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: summary includes emissions for all of Indiana County; however, only part of the county is in the nonattainment area.

Exhibit 7.6 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Lancaster, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,827	1,704	-122	-6.7%
Nonroad MAR	293	140	-153	-52.1%
Nonroad NMIM	2,880	1,170	-1,710	-59.4%
Onroad MOVES	14,163	3,779	-10,384	-73.3%
Point EGU	0	0	0	0.0%
Point nonEGU	1,147	1,383	236	20.5%
	20,310	**8,177**	**-12,133**	**-59.7%**
Direct PM2.5				
Area	1,827	1,704	-122	-6.7%
Nonroad MAR	293	140	-153	-52.1%
Nonroad NMIM	2,880	1,170	-1,710	-59.4%
Onroad MOVES	14,163	3,779	-10,384	-73.3%
Point EGU	0	0	0	0.0%
Point nonEGU	1,147	1,383	236	20.5%
	20,310	**8,177**	**-12,133**	**-59.7%**
Sulfur Dioxide (SO2)				
Area	3,030	1,766	-1,264	-41.7%
Nonroad MAR	4	0	-3	-87.6%
Nonroad NMIM	144	5	-139	-96.8%
Onroad MOVES	104	38	-66	-63.4%
Point EGU	0	0	0	0.0%
Point nonEGU	102	120	18	17.5%
	3,384	**1,929**	**-1,454**	**-43.0%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.7 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Metro New York/Northern New Jersey/Long Island NY/NJ/CT

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) from 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	64,044	56,873	-7,170	-11.2%
Nonroad MAR	46,842	31,820	-15,023	-32.1%
Nonroad NMIM	71,021	13,771	-57,250	-80.6%
Onroad MOVES	252,723	74,474	-178,249	-70.5%
Point EGU	36,928	34,378	-2,550	-6.9%
Point nonEGU	20,117	20,881	765	3.8%
	491,675	**232,198**	**-259,477**	**-52.8%**
Direct PM2.5				
Area	18,512	19,318	805	4.4%
Nonroad MAR	1,705	755	-950	-55.7%
Nonroad NMIM	5,926	1,528	-4,398	-74.2%
Onroad MOVES	10,189	4,878	-5,311	-52.1%
Point EGU	6,267	4,660	-1,607	-25.6%
Point nonEGU	1,530	1,704	174	11.4%
	44,131	**32,844**	**-11,287**	**-25.6%**
Sulfur Dioxide (SO2)				
Area	42,122	10,353	-31,768	-75.4%
Nonroad MAR	11,823	1,957	-9,865	-83.4%
Nonroad NMIM	2,204	56	-2,148	-97.5%
Onroad MOVES	1,750	1,564	-186	-10.6%
Point EGU	63,236	44,867	-18,370	-29.0%
Point nonEGU	5,293	5,351	59	1.1%
	126,427	**64,149**	**-62,279**	**-49.3%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: 2025 NMIM emissions for New York counties are missing from the above summaries.

Exhibit 7.8 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Philadelphia-Wilmington, PA/DE/NJ

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	18,043	17,741	-302	-1.7%
Nonroad MAR	12,271	9,357	-2,913	-23.7%
Nonroad NMIM	19,579	8,305	-11,274	-57.6%
Onroad MOVES	106,315	26,648	-79,668	-74.9%
Point EGU	12,616	4,873	-7,743	-61.4%
Point nonEGU	19,143	14,944	-4,199	-21.9%
	187,967	**81,869**	**-106,099**	**-56.4%**
Direct PM2.5				
Area	13,811	12,983	-829	-6.0%
Nonroad MAR	658	299	-360	-54.7%
Nonroad NMIM	1,808	1,059	-749	-41.4%
Onroad MOVES	3,795	1,443	-2,352	-62.0%
Point EGU	1,048	813	-236	-22.5%
Point nonEGU	3,524	3,062	-462	-13.1%
	24,644	**19,657**	**-4,987**	**-20.2%**
Sulfur Dioxide (SO2)				
Area	16,763	9,756	-7,007	-41.8%
Nonroad MAR	5,136	677	-4,459	-86.8%
Nonroad NMIM	998	32	-966	-96.7%
Onroad MOVES	773	422	-351	-45.4%
Point EGU	20,665	4,563	-16,102	-77.9%
Point nonEGU	14,370	8,990	-5,380	-37.4%
	58,705	**24,440**	**-34,265**	**-58.4%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.9 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Pittsburgh-Beaver Valley, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	8,608	8,613	5	0.1%
Nonroad MAR	14,258	7,116	-7,142	-50.1%
Nonroad NMIM	9,827	4,223	-5,605	-57.0%
Onroad MOVES	56,652	12,725	-43,927	-77.5%
Point EGU	82,657	84,453	1,795	2.2%
Point nonEGU	20,217	18,760	-1,456	-7.2%
	192,219	**135,890**	**-56,330**	**-29.3%**
Direct PM2.5				
Area	7,562	6,835	-728	-9.6%
Nonroad MAR	467	196	-271	-58.1%
Nonroad NMIM	880	432	-448	-50.9%
Onroad MOVES	1,905	531	-1,374	-72.1%
Point EGU	6,293	6,348	55	0.9%
Point nonEGU	5,108	5,109	1	0.0%
	22,216	**19,450**	**-2,766**	**-12.4%**
Sulfur Dioxide (SO2)				
Area	13,589	10,791	-2,798	-20.6%
Nonroad MAR	260	95	-165	-63.4%
Nonroad NMIM	529	15	-514	-97.2%
Onroad MOVES	419	141	-278	-66.4%
Point EGU	429,186	93,130	-336,056	-78.3%
Point nonEGU	13,247	13,699	451	3.4%
	457,230	**117,871**	**-339,359**	**-74.2%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA’s NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA’s MOVES model

Note: summary includes emissions for all of Allegheny, Armstrong, Greene and Lawrence counties; however, only parts of those counties are in the nonattainment area.

Exhibit 7.10 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Reading, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,289	1,114	-175	-13.6%
Nonroad MAR	621	307	-314	-50.5%
Nonroad NMIM	1,911	696	-1,215	-63.6%
Onroad MOVES	11,370	2,831	-8,538	-75.1%
Point EGU	2,506	2,432	-74	-2.9%
Point nonEGU	3,288	1,919	-1,369	-41.6%
	20,983	**9,298**	**-11,685**	**-55.7%**
Direct PM2.5				
Area	1,859	1,727	-132	-7.1%
Nonroad MAR	30	15	-15	-51.5%
Nonroad NMIM	161	72	-88	-54.9%
Onroad MOVES	379	96	-284	-74.7%
Point EGU	947	921	-26	-2.7%
Point nonEGU	325	331	6	1.8%
	3,701	**3,161**	**-540**	**-14.6%**
Sulfur Dioxide (SO2)				
Area	2,389	1,223	-1,166	-48.8%
Nonroad MAR	7	1	-7	-92.6%
Nonroad NMIM	99	3	-96	-97.1%
Onroad MOVES	81	27	-53	-66.3%
Point EGU	14,491	13,990	-501	-3.5%
Point nonEGU	649	660	11	1.7%
	17,716	**15,903**	**-1,812**	**-10.2%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Exhibit 7.11 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: Washington DC/MD/VA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	8,936	9,342	406	4.5%
Nonroad MAR	6,700	6,711	11	0.2%
Nonroad NMIM	20,181	8,003	-12,179	-60.3%
Onroad MOVES	42,971	14,067	-28,904	-67.3%
Point EGU	29,029	13,919	-15,109	-52.0%
Point nonEGU	8,826	11,253	2,427	27.5%
	116,643	**63,295**	**-53,348**	**-45.7%**
Direct PM2.5				
Area	9,528	9,725	198	2.1%
Nonroad MAR	201	160	-40	-20.2%
Nonroad NMIM	2,003	1,112	-891	-44.5%
Onroad MOVES	1,467	728	-739	-50.4%
Point EGU	4,984	4,996	12	0.2%
Point nonEGU	563	594	32	5.6%
	18,746	**17,316**	**-1,430**	**-7.6%**
Sulfur Dioxide (SO2)				
Area	5,733	3,862	-1,871	-32.6%
Nonroad MAR	416	488	72	17.3%
Nonroad NMIM	1,230	30	-1,201	-97.6%
Onroad MOVES	387	347	-40	-10.4%
Point EGU	179,243	24,694	-154,549	-86.2%
Point nonEGU	4,206	3,570	-636	-15.1%
	191,215	**32,990**	**-158,225**	**-82.7%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

Note: 2007 and 2025 MOVES onroad emissions for Virginia counties are missing from the above summaries.

Exhibit 7.12 Comparison of 2007 and 2025 PM2.5 and PM Precursor Emissions Nonattainment Area: York, PA

SECTOR	Annual (tons) 2007	Annual (tons) 2025	Change (tpy) from 2007 to 2025	Change (%) From 2007 to 2025
Oxides of Nitrogen (NOx)				
Area	1,680	1,678	-2	-0.1%
Nonroad MAR	198	104	-93	-47.2%
Nonroad NMIM	2,463	836	-1,627	-66.1%
Onroad MOVES	10,519	2,740	-7,779	-74.0%
Point EGU	15,760	15,226	-534	-3.4%
Point nonEGU	6,404	6,431	28	0.4%
	37,024	**27,015**	**-10,008**	**-27.0%**
Direct PM2.5				
Area	2,394	2,325	-69	-2.9%
Nonroad MAR	13	7	-6	-48.7%
Nonroad NMIM	189	77	-112	-59.4%
Onroad MOVES	348	121	-227	-65.2%
Point EGU	2,098	2,026	-72	-3.4%
Point nonEGU	364	365	1	0.3%
	5,407	**4,921**	**-486**	**-9.0%**
Sulfur Dioxide (SO2)				
Area	1,684	1,059	-625	-37.1%
Nonroad MAR	2	0	-2	-88.4%
Nonroad NMIM	132	3	-129	-97.5%
Onroad MOVES	79	28	-50	-63.8%
Point EGU	106,158	5,136	-101,021	-95.2%
Point nonEGU	9,743	9,749	6	0.1%
	117,798	**15,977**	**-101,821**	**-86.4%**

Nonroad MAR – includes commercial marine vessels, airports, and railroad locomotives
Nonroad NMIM – includes equipment included in USEPA's NMIM/NONROAD model
Onroad MOVES – includes emissions calculated by USEPA's MOVES model

8.0 DELIVERABLES

Files are stored on MARAMA ftp site:

Address: ftp.marama.org

Login ID: regionalei

Password: marama2007

Folder: /2025/Final 2025 (Version 3_3)

Exhibit 8.1 lists the file names for all final deliverables.

Exhibit 8.1 Final Deliverables

File Name	Description
TSD V3_3 MANE-VU 2025 Inventory PM Nonattainment Counties.docx	Technical Support Document for 2025 emission inventory for PM nonattainment counties
Appendix A1 AEO2010 New England.xls	AEO2010 Energy Consumption by Sector and Source for New England Region (CT, MA, ME, NH, RI, VT) and calculated growth factors
Appendix A2 AEO2010 Mid Atlantic.xls	AEO2010 Energy Consumption by Sector and Source for Mid-Atlantic Region (NJ, NY, PA) and calculated growth factors
Appendix A3 AEO2010 South Atlantic.xls	AEO2010 Energy Consumption by Sector and Source for South Atlantic Region (DC, DE, MD, VA) and calculated growth factors
Appendix A4 AEO2011 New England.xls	AEO2011 Energy Consumption by Sector and Source for New England Region (CT, MA, ME, NH, RI, VT) and calculated growth factors
Appendix A5 AEO2011 Mid Atlantic.xls	AEO2011 Energy Consumption by Sector and Source for Mid-Atlantic Region (NJ, NY, PA) and calculated growth factors
Appendix A6 AEO2011 South Atlantic.xls	AEO2011 Energy Consumption by Sector and Source for South Atlantic Region (DC, DE, MD, VA) and calculated growth factors
Appendix A7 AEO2010 vs AEO2011 Comparison.docx	Technical Memorandum comparing AEO2010 and AEO2011 energy consumption projections
Appendix B Population_Factors.xls	County-level population growth factors as provided by states

File Name	Description
Appendix C Employment_Factors.xls	State-level employment growth factors provided by states
Appendix D VMT GF Nonattainment Counties.xls	County-level VMT for 2007 and 2025
Appendix E EPA2020 Res Wood.xls	USEPA growth factor formulas by SCC for residential wood combustion
Appendix F AEO2011-Electricity Generation by EMM.xlsx	AEO 2011 Electricity Generation by Electricity Market Module Region and Source, Reference case, and associated growth factors
Appendix G UAF NEEDS Control FileMASTER92211.xls	State information on future EGU controls and emission rates
Appendix H MAR Growth and Control.xls	USEPA and FAA data used to develop growth and control factors for commercial marine vessels, airports, and railroads
V3_3 Area_07_25 PM Nonattainment.xlsx	County and SCC-level emissions and growth/control factors for area sources
V3_3 EGU_07_25 PM Nonattainment.xlsx	Unit level emissions and growth/control factors for EGUs
V3_3 MAR_07_25 PM Nonattainment.xlsx	County and SCC-level emissions and growth/control factors for commercial marine vessels, airports, and railroad locomotives
V3_3 MOVES_07_25 PM Nonattainment.xlsx	County level emissions for onroad vehicles included in USEPA's MOVES model
V3_3 NMIM_07_25 PM Nonattainment.xlsx	County and SCC-level emissions for nonroad equipment included in USEPA's NMIM/NONROAD model
V3_3 NonEGU_07_25 PM Nonattainment.xlsx	Unit level emissions and growth/control factors for nonEGUs
V3_3 Summaries_ 07_25 PM Nonattainment.xlsx	Emission summaries by county and nonattainment area

9.0 REFERENCES

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