Appendix 4-5:
2017 Projection Emissions Inventory
Introduction, Point and Area Source Emissions Inventories

1.0 Projection Emissions Inventory Introduction

In order to determine future inventory trends it is necessary to first grow the base inventory to the year of interest and then account for the reductions achieved from any control measures, Federal or State, which were applicable prior to or in that year. The starting inventory for the projections is the 2011 emission inventories for emissions in summer tons per day for volatile organic compounds (VOC), oxides of nitrogen (NO_x), and carbon monoxide (CO). The projected emission inventories are "grown" from the 2011 actual emission inventory and then "controlled".

In order to project future year emissions, it is necessary to determine appropriate growth factors and the applicable control efficiencies. The projected emission inventories for 2011 were calculated by first estimating growth in each source category, in each of the inventory sectors (point, area, nonroad, onroad). As appropriate, the 2011 actual emission inventories were used as the base for applying factors to account for inventory growth. The United States Environmental Protection Agency (USEPA) preferred approach for projecting emissions growth incorporates locality-specific estimates such as population, employment, historical averaging or other category specific activity such as fuel consumption, product output, vehicle miles traveled, equipment populations.[1]

Annual growth rates were evaluated for each of the emission categories, in each of the four emission sectors (point, area, nonroad, onroad). In three of the emission sectors (point, area, MAR (nonroad marine, air and rail)) growth factors were calculated for a specific range of years and used in spreadsheets or databases to calculate future year emissions. Nonroad equipment growth was projected utilizing the USEPA National NONROAD Emissions Model and other Federal and state specific data. Onroad growth was projected using travel demand models. Once the emission inventories are grown, the next step is to determine which control measures within each of the various emission sectors would be in place during or prior to that year, and includes the emission reduction benefits from those control measures at that time. The combined effect of growth and controls represents the inventory projection. Post-2011 control measure benefits (including benefits from pre-2011 measures that have future effective dates or fleet and/or equipment turnover) were applied to each emission sector as appropriate.

The 2017 projection emissions inventory was prepared with the support of the Mid-Atlantic Regional Air Management Association (MARAMA) and its contractor, CSRA International, Inc. A copy of the Technical Support Document[2] prepared by MARAMA and CSRA International, Inc. (MARAMA 2011/2017 TSD) is included as Appendix 4-3.

[1] Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations, U.S. Environmental Protection Agency, July 2017.

[2] MARAMA and CSRA International, Inc. Technical Support Document Emission Inventory Development for 2011 and 2017 for the Northeastern U.S. Beta 2 Version. Mid-Atlantic Regional Air Management Association (MARAMA) and CSRA International, Inc., July 12, 2017.

1.1 Changes to the 2011 Base Inventory

New Jersey's 2011 emission inventory is included in the State Implementation Plan dated June 11, 2015.[3] The USEPA approved the 2011 inventory portion of this SIP on April 10, 2017.[4] The USEPA issued a final approval for the SIP on September 21, 2017.[5] The following updates have been made to the 2011 emission inventory since it was submitted:

New Jersey was required to update its estimate of the 2011 onroad summer day inventories for this SIP from the previous 2011 onroad inventories submitted in the 2011 Periodic Emission Inventory SIP dated June 2015. The 2011 onroad inventories needed to be updated because the USEPA released a new version of the MOVES model subsequent to New Jersey's preparation of the 2011 Periodic Emission Inventory SIP. Emission inventories for both the 2011 and 2017 inventories in this Attainment Demonstration SIP are estimated using the latest and consistent version of the MOVES model. These changes are incorporated into the modeling inventories, the RFP calculations and the inventory summaries. Inputs were also updated and submitted to USEPA as a part of their modeling platform development. Therefore, these changes are consistent with USEPA's 2011 modeling platform. The major updates to the 2011 onroad inventories are:

- MOVES model updated from MOVES2010b, Version 2012/04/10 to MOVES2014a, Version 20151201;
- Age distribution and vehicle population inputs updated using additional New Jersey motor vehicle registration data;
- Fuel inputs updated;
- VMT by vehicle type inputs updated and converted to MOVES2014 format; and
- Hoteling activity input tables were updated from MOVES defaults to New Jersey-specific inputs that include New Jersey's idling restriction statute.

Emissions for Stage II gasoline refueling (SCC 250106011000) in the area source inventory have also been updated. This piece was revised to account for more accurate emission calculations based on current methodology and factors and the known incompatibility with ORVR systems and certain Stage II vapor recovery systems, which MOVES does not account for, per USEPA Technical Guidance – Guidance on Removing Stage II Gasoline Vapor Control Programs from State Implementation Plans and Assessing Comparable Measures, EPA-457/B12-001, August 07, 2012

2.0 Point Sources

2.1 EGU Point Source Growth and Control

2.1.1 ERTAC EGU Tool

For EGUs, projected future emissions are estimated using the Eastern Regional Technical Advisory Committee (ERTAC) EGU Forecast Tool. The ERTAC tool is designed to estimate future EGU activity and emissions using user-supplied, unit-specific information, USEPA Clean Air Markets Division (CAMD) hourly emissions data, and United States Department of Energy

[3] State Implementation Plan for the 75 ppb 8-Hour Ozone National Ambient Air Quality Standard (NAAQS) Reasonably Available Control Technology (RACT) Determination, 2011 Periodic Emission Inventory, and 8-Hour Carbon Monoxide NAAQS Maintenance and Monitoring Plan, New Jersey Department of Environmental Protection, June 11, 2015.
[4] 82 Fed. Reg. 17166 (April 10, 2017)
[5] 82 Fed. Reg. 44099 (September 21, 2017)

(DOE) Annual Energy Outlook (AEO) energy projections and the North American Electric Reliability Corporation (NERC) growth forecasts.

Growth factors are calculated based on projected electrical generation by fuel type and region. Annual growth rates are calculated based on data provided by DOE in their AEO. Annual average regional growth factors are calculated by dividing AEO future year electrical generation by base year electrical generation. Peak growth rates are calculated using the data provided by NERC. The NERC peak growth rates are not delineated by fuel so each fuel has the same peak growth factor. Nonpeak growth rates are calculated by the ERTAC EGU Tool, which adjusts the annual average growth rate to account for the peak hours. The ERTAC inventory used for this SIP (CONUS 2.5 and 2.5L2) are based on growth factors from the DOE AEO 2015 High Oil and Gas Scenario (US Energy Information Administration, April 2015).

Anticipated new units and unit closures are included in future year inventories. State specific control measures are also input in the model by either setting a specific emission rate in a specific year or applying a specific control efficiency.

The ERTAC tool is used to grow base year hourly EGU air emissions based on CAMD data into future projection year hourly EGU air emissions inventories for NO_x, and sulfur dioxide (SO_2). The hourly outputs from the ERTAC EGU tool are converted to FF10 format for preparation as inputs to the Sparse Matrix Operator Kernel Emissions/Inventory Data Analyzer (SMOKE) tool using the ERTAC to SMOKE tool. The ERTAC to SMOKE tool also adds additional grown hourly emissions for VOC, CO, Particles with diameter less than or equal to 10 micrometers (PM10), Particles with diameter less than or equal to 2.5 micrometers (PM2.5) and Ammonia (NH_3). In order to prepare the files for input into the photochemical air quality modeling, the files are than processed through SMOKE so that they can be spatially allocated to the modeling grid.

For review of the data and use in planning inventories, the ERTAC results can be summarized for different scenarios such as annual, ozone season or monthly.

More information on the ERTAC tool can be found in the MARAMA 2011/2017 TSD in Appendix 4-3 and in the ERTAC Document titled “Documentation of ERTAC EGU CONUS Versions 2.5 and 2.5L2, dated 12/10/2016, ERTAC EGU Committee”, which can be found on the MARAMA website at http://www.marama.org/2013-ertac-egu-forecasting-tool-documentation under the headings “CONUS 2.5 L2 - Base Year 2011 Projected to 2017 and 2023” and “Run Documentation of ERTAC EGU CONUS 2.5 L2” along with the input and output files.

2.1.2 EGU SIP Inventory

For ozone National Ambient Air Quality (NAAQS) State Implementation Plan (SIP) requirements, the 2011 base year and 2017 projected future year emission inventories must be reported as peak ozone season tons per day, or summer tons per day for New Jersey. For the 2011 base year, peak ozone season tons per day is reported to New Jersey through the Emission Statement Program. In order to estimate summer tons per day for the 2017 future projection year, the following methodology was followed:

If a unit was existing in the 2011 base year than the following equation was used:

*Unit 2017 Emissions (summer tons per day) = (2011 ES+(2011 ES*ERTAC 2011-2017 % Difference))*

Where:

ES = Emissions from Emission Statements in summer tons per day
ERTAC 2011-2017 % Difference = 2017 ERTAC peak ozone season emissions in tons/ 2011 ERTAC peak ozone season emissions in tons
Peak Ozone Season or Summer = June, July, August

For new units operational after 2011 or for units that did not run in 2011 the following equation was used:

Unit 2017 Emissions (summer tons per day) = 2017 ERTAC/2016 operating hours

Where:

2017 ERTAC = 2017 ERTAC peak ozone season emissions in tons
2016 operating hours = Unit operating hours reported to CAMD for 2016 peak ozone season (https://ampd.epa.gov/ampd/)

Peak Ozone Season or Summer = June, July, August

The combined grown and controlled EGU emissions, including the emission reductions from control measure benefits are shown in Attachment 1.

2.2 Non-Electric Generation Unit (non-EGU) Point Sources Growth

For the non-EGU point source sector estimated growth factors were applied to the base 2011 inventory at the North American Industry Classification System (NAICs) level. Each facility has a designated NAICS code based on the type of industry. Growth factors were calculated from 2011 to 2017 using employment projections by NAICs from the New Jersey Department of Labor and Workforce Development's Industry and Occupational Employment Projections.[6] The growth factors were applied to each facility and associated equipment and SCC codes based on the NAICS of the facility.

For more details on growth factor development, see the MARAMA 2011/2017 TSD in Appendix 4-3. The growth factors are shown in the non-EGU point source emission inventory by unit in Attachment 2. The non-EGU point source emission inventories by unit, source classification code (SCC) code and facility are included as Attachments 2, 3 and 4, respectively.

2.3 Non-Electric Generation Unit (non-EGU) Point Sources Control Factors

New Jersey and the USEPA have implemented control measures that reduce point source emissions of air pollutants. For non-EGU point sources, control factors for post-2011 rules were applied to the 2017 grown, uncontrolled non-EGU Point Source inventory in order to estimate the projected 2017 emissions inventory. The equation that was used to project emissions in a future year, y, incorporating growth and the application of new control measures between year x and year y is:

[6] 2010 and 2020 statewide data from New Jersey Department of Labor and Workforce Development's Industry and Occupational Employment Projections; retrieved 10/3/13 from: http://lwd.dol.state.nj.us/labor/lpa/employ/indoccpj/st_index.html

$$E_y = E_x * GF_{x-y} * [1 - (CE * RE * RP)_{x-y}]$$

where: Ey = Controlled emissions in year y
Ex = Controlled emissions in year x
GFx-y = Growth factor used to grow emissions from year x to year y
CE = Control efficiency factor for a control measure implemented between years X and Y
RE = Rule Effectiveness Factor
RP = Rule Penetration Factor
CF=Control Factor = [1 - (CE * RE * RP)x-y]

The control factors (CF) applied to the 2017 non-EGU point source inventory are shown in Attachment 2.

2.4 Point Source Control Measures

The 2011 emission inventory was used as a base for the projection inventory. The existing control measures which reduce point source emissions for NO_x, VOC, and CO in the projection inventory from 2011 to 2017 are shown in Table 1.

Table 1
Point Source Control Measures for the
Northern NJ-NY-CT Nonattainment Area

Federal or State	Control Measure	New Jersey Administrative Code	Pollutants
New Jersey	EGU Rule: Coal-fired Boilers, Oil and Gas Fired Boilers	7:27-4.2, 10.2, 19.4	NO_x, PM, SO_2
New Jersey	EGU Rule: High Electric Demand Day (HEDD)	7:27-19.29	NO_x
Federal	Refinery Consent Decree: ConocoPhillips	NA	NOx
New Jersey	Low Sulfur Fuel Oil	7:27-9	PM, SO_2, NO_x
New Jersey	Petroleum Storage	7:27-16.2	VOC
Federal and State	Boiler/Process Heater NESHAP/New Jersey ICI Boiler Rule	NA	All
Federal	Natural Gas Turbine NSPS	NA	NO_x
Federal	Reciprocating Internal Combustion Engine (RICE) NESHAP	NA	All
Federal	RICE NSPS	NA	NO_x, CO
Federal	Process Heater NSPS	NA	NO_x
Control measures not located in NNJ-NY-CT NAA			
New Jersey	EGU: BL England Administrative Consent Order (ACO)	NA	
New Jersey	Glass Manufacturing	7:27-19.10	NO_x, PM, SO_2

A discussion of the control measure control factors is included below. The rules are discussed in more detail in Chapter 3. The control factors used in the inventory are included in Attachment 2.

EGU Rules: Boilers Serving EGUs and High Electric Demand Day (HEDD)

On March 20, 2009, the State adopted new rules that set limits for EGU coal-fired boilers and oil and gas-fired boilers. The State also adopted new rules to address the NO_x emissions from HEDD EGU units. This rule focuses on units that are capable of generating 15 MW or more and are operated less than or equal to an average of 50 percent of the time during the previous three ozone seasons. The State tightened the emission standards for HEDD units because these units emit significant quantities of NO_x on high electric demand days, which are typically high temperature and high ozone days during the summer. Emission reductions from these rules were estimated by subtracting the 2017 EGU summer tons per day emissions from the 2011 summer tons per day emissions for all units that were operating in 2011. These estimates underestimate actual reductions on the peak ozone days because HEDD units may peak on a few specific ozone days, but their emissions are reported as an average of the peak ozone season. The estimated reductions are shown in Attachment 1.

Refinery Consent Decree: Conoco Phillips

The USEPA's national Petroleum Refinery Initiative was an integrated enforcement and compliance strategy to addresses air emissions from the nation's petroleum refineries, including the Conoco Phillips New Jersey Bayway refinery. The major refinery sources that were affected by the judicial settlement are FCCUs, flare gas recovery, and equipment leaks. The Fluid Catalytic Cracking Units (FCCUs) or cracking units was to reduce NO_x emissions by 60%. Flare gas recovery was to have a 53% reduction in both VOC and NO_x emissions. Lastly, leak detection and repair was to have a 50% control on VOC emissions. These reductions are based on Table A-1 through A-8 in the "Assessment of Control Technology Options For Petroleum Refineries in the Mid-Atlantic Region" report from January 2007 prepared by MACTEC for MARAMA. A rule effectiveness of 100% was applied to these controls because these reductions are specifically written into enforcement actions for these individual facilities.

Low Sulfur Fuel Oil

In 2010, the State adopted amendments to its Sulfur in Fuels rule, N.J.A.C. 7:27-9, which by 2016 reduced the sulfur content in #2 fuel oil to 15 ppm, #4 fuel oil to 2,500 ppm, and #6 fuel oil to 5,000 ppm. Reductions in SO2 were calculated based as a ratio of sulfur content before and after the rule and varied by county based on existing New Jersey rules. Reductions in NO_x were calculated through a regional process with MARAMA and were estimated to be 22% in boilers and 1 % in engines burning distillate oil. A rule effectiveness of 80% and a rule penetration of 100% was applied. Development of the NO_x reduction factors are described in detail in a technical memorandum included in Appendix 4-3, Attachment 1. A summary of the emission reduction factors can be found in Appendix S of the MARAMA 2011/2017 TSD, included in Appendix 4-3, Attachment 2 and also in Appendix 4-5, Attachment 2 of this SIP document.

Petroleum Storage

The NJDEP adopted amendments to N.J.A.C. 7:27-16.2, on April 20, 2009, which established requirements to reduce VOC emissions from bulk petroleum storage facilities. The rule identified specific requirements and the State estimated VOC percent reduction for individual years between 2012 and 2020. The estimated % reductions from the rule are shown in the table below. A rule effectiveness of 80% and a rule penetration of 100% was applied. The control efficiencies are shown in Attachment 2.

Year	% Reduction per year
2012	0.86%
2013	1.72%
2014	2.58%
2015	3.44%
2016	4.30%
2017	5.16%
2018	6.02%
2019	6.88%
2020	7.74%
2017	5.16%
2018	6.02%
2019	6.88%
2020	7.74%

Boiler/Process Heater NESHAP/New Jersey ICI Boiler Rule

The Federal Industrial/Commercial/Institutional (ICI) Boilers and Process Heaters NESHAP rule promulgates national emission standards for the control of hazardous air pollutants (HAP) for new and existing ICI boilers and process heaters at major HAPs sources. The final rule was published in the Federal Register in January 2013 and requires existing major sources to comply with the standards by January 2016. USEPA expected that many boilers that burn coal or oil will be replaced by new natural gas boilers as a result of the rule. Due to New Jersey already having stringent boiler rules in place prior to 2011, minimal reductions are expected from the Federal rule in New Jersey after 2011. Expected emission reductions for the boilers in New Jersey that apply to the rule are based on the USEPA 2011-based V6.2 Modeling Platform[7], included in Appendix 4-3, Attachment 3, and are documented in the MARAMA 2011/2017 TSD in Appendix DD. New Jersey used Point Source Option 2 for it's sources, consistent with the USEPA methodology. This table which shows the % reductions by pollutant is included in Appendix 4-3, Attachment 4. A rule effectiveness of 100% and a rule penetration of 100% was applied.

[7] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.

Natural Gas Turbine NSPS

The New Source Performance Standards (NSPS) for stationary combustion turbines are outlined in the Code of Federal Regulations under 40 CFR Part 60 Subparts GG and KKKK. Subpart GG covers turbine engines that commenced constructed after October 3, 1977 and before February 18, 2005. Subpart KKKK covers both the combustion turbine engine and any associated heat recovery steam generator for units that commenced construction after February 18, 2005. The key pollutants EPA regulates from these sources includes nitrogen oxides (NO_x) and sulfur dioxide (SO_2). The percent reductions were calculated by MARAMA based on USEPA methodology from the USEPA 2011-based V6.2 Modeling Platform[8] with more current AEO growth factors and can be found in Attachment 2. A rule effectiveness of 100% and a rule penetration of 100% was applied.

Reciprocating Internal Combustion Engine (RICE) NESHAP

USEPA developed control factors for three NESHAP rulemakings for RICE. These rules reduce HAPs from existing and new RICE sources. In order to meet the standards, existing sources with certain types of engines will need to install controls. In addition to reducing HAPs, these controls have co-benefits that also reduce CAPs, specifically, CO, NO_X, VOC, PM, and SO_2. The RICE NESHAP rules apply to both point and area sources. These rules are effective in 2017. The percent reductions are based on the USEPA 2011-based V6.2 Modeling Platform[9] and can be found in Attachment 2. A rule effectiveness of 100% and a rule penetration of 100% was applied.

RICE NSPS

The CAA requires USEPA to set NSPS for stationary internal combustion engines, which are generally diesel engines. The standards must consider available emission control technologies and costs of control. On July 11, 2006, EPA issued standards of performance for stationary reciprocating internal combustion engines. These engines are used at facilities such as power plants and chemical and manufacturing plants to generate electricity and to power pumps and compressors. They are also used in emergencies to produce electricity and to pump water for flood and fire control. The final standards, limited emissions of NO_x, PM, SO_2, CO, and hydrocarbons (HC) from stationary RICE to the same stringent levels required by EPA's nonroad diesel engine regulations. The final rule also limited the amount of sulfur in the diesel fuel used to run these engines.

In June 2011, EPA amended the standards to align emission limits for certain categories of stationary internal combustion engines with similar sized engines used in marine applications. These amendments are effective in 2016. pollutants EPA regulates from these sources includes nitrogen oxides (NO_x) and sulfur dioxide (SO_2). The percent reductions were calculated by

[8] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.
[9] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.

MARAMA based on USEPA methodology from the USEPA 2011-based V6.2 Modeling Platform[10] with more current AEO growth factors and can be found in Attachment 2.

Process Heater NSPS

The New Source Performance Standards (NSPS) for industrial-commercial-institutional steam generating units are outlined in the Code of Federal Regulations (CFR) under 40 CFR Part 60 Subparts Db and Dc. Subpart Db covers industrial-commercial-institutional steam generating units with heat inputs greater than 100 MMBtu/h of that commenced constructed after September 18, 1978. Subpart Dc covers smaller industrial-commercial-institutional steam generating units that commenced constructed after June 9, 1989. The key pollutants the EPA regulates from these sources includes particulate matter (PM), nitrogen oxides (NO_x), and sulfur dioxide (SO_2). pollutants EPA regulates from these sources includes nitrogen oxides (NO_x) and sulfur dioxide (SO_2). The percent reductions were calculated by MARAMA based on USEPA methodology from the USEPA 2011-based V6.2 Modeling Platform[11] with more current AEO growth factors and can be found in Attachment 2. A rule effectiveness of 100% and a rule penetration of 100% was applied.

Control measures not located in Northern NJ-NY-CT Nonattainment Area:

Glass Manufacturing

Rule amendments to N.J.A.C. 7:27-19.10 were adopted in March 2009 to lower NO_x emissions from glass manufacturing furnaces. There were seven plants in New Jersey, with a total of 25 furnaces that produce container glass, pressed glass, blown glass, and fiberglass. Nine of these furnaces are electric. Five furnaces use oxy-firing, which burn nearly pure oxygen, reducing most of the nitrogen that is present in ambient air. These 14 furnaces already comply with the proposed NO_x limits. Two of the remaining 11 furnaces are temporarily inactive. The rule required the remaining nine furnaces to implement additional emission control measures to comply with the proposed emission limit. These amendments were estimated to reduce NO_x by 45% from these sources. A rule effectiveness of 80% was applied to the estimated control efficiency and a rule penetration of 100% was applied.

EGU Administrative Consent Order (ACO): BL England

On January 24, 2006 an ACO was signed with B.L. England to reduce air pollutants from its EGUs. The ACO was amended on October 31, 2006, January 13, 2010 and May 18, 2012. Under the ACO agreement, Unit 1 has been shutdown since 2013. Additionally the agreement requires the conversion (or replacement) of Units 2 and 3 to natural gas. Units 2 and 3 will continue to operate until May 1, 2019 to maintain reliability and for emergencies. Operations will be limited in an effort to reduce pollution during the time leading up to the conversions. A copy of the Administrative Consent Order can be found online at: http://www.nj.gov/dep/docs/20120613104728.pdf. Emission reductions were estimated by

[10] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.
[11] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.

subtracting the 2017 EGU summer tons per day emissions from the 2011 summer tons per day emissions.

2.5 Point Source Emission Inventory

Table 2 summarizes the 2017 projected point source emission inventory by county for NO_x, VOC, and CO. Attachments 1 - 4, contain the detailed point source emission inventories. These attachments are only available electronically.

Table 2
2017 Point Source Emission Inventory by County and Pollutant

County	VOC	NO_x	CO
Non-EGU Point Peak Summer Tons Per Day			
New Jersey Portion of Northern NJ-NY-CT NAA			
Bergen	1.39	1.28	0.71
Essex	1.48	4.26	1.13
Hudson	2.61	1.27	0.45
Hunterdon	0.16	1.16	1.50
Middlesex	15.38	3.22	5.94
Monmouth	0.40	0.60	0.82
Morris	0.54	0.99	0.37
Passaic	0.85	0.26	0.16
Somerset	0.93	1.48	0.70
Sussex	0.14	0.15	0.43
Union	3.50	6.33	1.75
Warren	0.39	1.75	0.74
Non-EGU Total	**27.78**	**25.75**	**14.68**
EGU Summer Tons Per Day			
Bergen	0.02	2.90	0.69
Essex	0.12	0.68	1.43
Hudson	0.25	9.74	3.21
Hunterdon	0.04	5.29	2.71
Middlesex	0.49	12.58	10.19
Union	0.25	2.62	1.06
EGU Total	**1.16**	**33.81**	**19.30**
TOTAL POINT			
TOTAL POINT	**28.93**	**59.56**	**33.98**

3.0 Area Sources

3.1 Growth

Growth factors were calculated for area sources utilizing state population projections, USDOE fuel consumption projections, employment projections from the New Jersey Department of Labor, and state specific indicators such as vehicle miles traveled.

A summary table which shows the growth factors for each SCC category and the indicators for those growth factors is included as Attachment 5.

Population

Projected population is the most appropriate growth indicator to use for certain source categories whose emissions are calculated using population such as architectural coatings, consumer products and graphic arts.

Population projection data was obtained by CSRA International, Inc. from the New Jersey Department of Labor and Workforce Development.

The data was combined and straight line interpolation was used to calculate population for the projection years. Statewide growth factors were then calculated using the following equations:

2011-2017 Growth Factor =
2017 Statewide Population / 2011 Statewide Population

2011-2017 Growth Rate (percent per year) =
{[(2011-2017 Growth Factor)^1/y] – 1} * 100 percent

Where:y = the # of years being analyzed (ex: y = 2017-2011 = 6)

A summary table of the population data is included in Appendix T of the MARAMA 2011/2017 Beta 2 TSD, included as Appendix 4-3.

Fuel Consumption

Projected fuel consumption data was obtained from the USDOE Energy Information Administration (EIA), Annual Energy Outlook Report. The growth factors were calculated in the same manner as the population growth factors, using the same equations, but substituting projected fuel consumption for projected population. A summary table of the fuel consumption data is included as Appendix K of the MARAMA 2011/2017 Beta 2 TSD, included as Appendix 4-3.

Employment

Projected employment is the most appropriate growth indicator to use for certain source categories whose emissions are calculated using employment such as autobody refinishing and dry cleaning. It is also the best growth indicator for other categories in which their emissions are calculated using state specific data but state specific data projections are not available, such as construction activities, mining and quarrying and agricultural tilling.

Projected employment data was obtained by CSRA International, Inc. from the New Jersey Department of Labor website. The growth factors were calculated in the same manner as the

population growth factors, using the same equations, but substituting projected employment for projected population. A summary table of the employment data is included in Appendix M of the MARAMA 2011/2017 Beta 2 TSD, included as Appendix 4-3.

Residential Wood Combustion

Growth and control of the residential wood combustion is incorporated into one factor, per the USEPA 2011-based V6.2 Modeling Platform[12]. The factors account for the USEPA rule that sets new source performance standard (NSPS) for woodstoves. The factors are based on estimated turnover of the old stoves to the new stoves. The estimated combined growth and control rates are the same as those used in USEPA's modeling platform and are included in Attachment 5.

No Growth

No growth was projected for industrial wood combustion, commercial/institutional wood combustion, residential anthracite coal combustion, on-site incineration, open burning, agricultural burning, forest wildfires, cigarette smoke, managed burning, structure fires and motor vehicle fires, breweries, wineries, distilleries, traffic markings, landfills, and leaking underground storage tanks.

3.2 Controls

Overview

New Jersey and the USEPA have developed and will develop rules that require control measures to reduce area source emissions of air pollutants. In developing the 2011 emissions inventory, control efficiency factors for the NJDEP pre-2011 rules were applied to the 2011 uncontrolled emissions inventory in order to calculate the 2011 "actual" or controlled emissions inventory. In a similar fashion, control efficiency factors (CEs) reflecting post-2011 rules, relative to existing rules, were applied to the grown emissions inventories, and emission reduction benefits were calculated. The CEs were applied to the grown inventory, to determine emission reduction benefits from the New Jersey rules, relative to the existing rules. These benefits grow in future years in direct relation to the growth factor for the respective emission categories. The equation that was used to project emissions in a future year, y, incorporating growth and the application of new control measures between year x and year y is:

$$E_y = E_x * GF_{x-y} * [1 - (CE * RE * RP)_{x-y}]$$

where:
- Ey = Controlled emissions in year y
- Ex = Controlled emissions in year x
- GFx-y = Growth factor used to grow emissions from year x to year y
- CE = Control efficiency factor for a control measure implemented between years X and Y
- RE = Rule Effectiveness Factor
- RP = Rule Penetration Factor
- CF=Control Factor = [1 - (CE * RE * RP)x-y]

The control factors (CF) applied to the 2017 inventory are shown in the area source emission inventory in Attachment 6. The 2011 emission inventory was used as a base for the projection

[12] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.

inventory. The existing control measures which reduce area source emissions for VOC and NO_x in the projection inventory from 2011 to 2017 are shown in Table 3.

Table 3
Area Source VOC and NO_x Control Measures

Control Measures	Sector	Pollutant	Area Source Category
New Jersey Portable Fuel Containers	Area	VOC	Residential Portable Gas Cans
Federal Residential Woodstove New Source Performance Standards (NSPS)	Area	VOC, NO_x	Fireplaces, Fireplace Inserts, Freestanding Woodstoves, Pellet Stoves, Indoor Furnaces, Outdoor Hydronic Heaters, Outdoor Wood-Burning Devices, and Firelogs
Federal Boiler/Process Heater NESHAP/New Jersey ICI Boiler Rule	Point and Area	VOC, NO_x	Industrial Natural Gas Combustion, Commercial/Institutional Natural Gas Combustion, Industrial Distillate Oil Combustion, Commercial/Institutional Distillate Oil Combustion, Industrial Residual Oil Combustion, Commercial Institutional Residual Oil Combustion, Industrial LPG Combustion, Commercial/Institutional LPG Combustion, Industrial Wood Combustion, Commercial/Institutional Wood Combustion
New Jersey Low Sulfur Fuel Oil Rule	Point and Area	NOx	Industrial Distillate Oil Combustion, Commercial/Institutional Distillate Oil Combustion, Residential Distillate Oil Combustion, Industrial Residual Oil Combustion, Commercial Institutional Residual Oil Combustion, Industrial Kerosene Combustion, Commercial/Institutional Kerosene Combustion, Residential Kerosene Combustion
Federal and State Refueling Controls	Area	VOC	Gasoline Refueling

A discussion of the control measure control factors is included below. The rules are discussed in more detail in Chapter 3. The control factors used in the inventory are included in Attachment 2.

Control Factors

Portable Fuel Containers

New Jersey adopted amendments to its rule limiting VOC emissions from portable fuel containers (PFCs) on December 1, 2008. The rule requires that PFCs and/or spouts have a permeability mot to exceed 0.4 grams/gallon/day, be equipped with an automatic shut-off device and an automatic device that closes and seals when it is removed from the fuel tank. The rule also requires that a PFC have a fuel flow rate and fill level standards.

The rule applies to new containers, and thus the anticipated reductions depend on the turnover of older non-compliant containers to new, lower-emitting containers. The emission reduction calculations assume a 10-year turnover period. Emission reduction percentage were calculated by CSRA International, Inc. for each year.

Residential Woodstove NSPS

As discussed above, the estimated combined growth and control rates are the same as those used in USEPA 2011-based V6.2 Modeling Platform[13] are included in Attachment 5.

Boiler/Process Heater NESHAP/New Jersey ICI Boiler Rule

New Jersey's ICI boiler rules do not generally set limit specifications for area sources, but they do require certain area source boilers to do annual "tune-ups" or adjust the combustion process annually in boilers as small as 5 MMBtu/hr.

The Federal boiler NESHAP also requires tune-ups for area source boilers. Due to New Jersey already having stringent boiler rules in place prior to 2011, minimal reductions are expected from the Federal rule in New Jersey after 2011. The % reductions by pollutant used for the area source tune-ups is included in Appendix DD of the MARAMA 2011/2017 TSD and are included in Appendix 4-3, Attachment 4 of this SIP document.

Low Sulfur Fuel Oil Rule

In 2010, the State adopted amendments to its Sulfur in Fuels rule, N.J.A.C. 7:27-9, which by 2016 reduced the sulfur content in #2 fuel oil to 15 ppm, #4 fuel oil to 2,500 ppm, and #6 fuel oil to 5,000 ppm. Reductions in SO2 were calculated based as a ratio of sulfur content before and after the rule and varied by county based on existing New Jersey rules. Reductions in NO_x were calculated through a regional process with MARAMA and were estimated to be 22% in boilers and 1% in engines burning distillate oil. A rule effectiveness of 80% and a rule penetration of 100% was applied. Development of the NO_x reduction factors are described in detail in a technical memorandum included in Appendix 4-3, Attachment 1. A summary of the emission reduction factors can be found in Appendix S of the MARAMA 2011/2017 TSD, included as Appendix 4-3, Attachment 2 and also in Appendix 4-5, Attachment 6 of this SIP document.

3.3 Area Source Emission Inventory

Table 4 summarizes the 2017 projected area source emission inventory by county for VOC, NO_x and CO. Attachment 6 contains the detailed area source emission inventories. These attachments are only available electronically.

[13] U.S. Environmental Protection Agency. *Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.2, 2011 Emissions Modeling Platform*. August 2015.

Table 4
2017 Area Source Emission Inventory by County and Pollutant

County	VOC Summer Tons Per Day	NO_x Summer Tons per Day	CO Summer Tons per Day
New Jersey Portion of Northern NJ-NY-CT NAA			
Bergen	23.96	3.53	3.50
Essex	20.82	2.84	3.00
Hudson	15.14	2.10	2.27
Hunterdon	4.04	0.46	1.00
Middlesex	23.89	3.08	3.61
Monmouth	18.13	2.18	2.51
Morris	15.03	2.17	2.30
Passaic	13.82	1.63	1.72
Somerset	9.90	1.37	1.48
Sussex	4.27	0.48	0.84
Union	16.09	1.92	2.04
Warren	3.79	0.38	1.03
Total	**168.89**	**22.15**	**25.31**

Overall Emissions Summary

The overall growth rate (with growth and controls) for area sources in the New Jersey portion of the Northern New Jersey-New York-Connecticut nonattainment area from 2011 to 2017 is approximately -0.72% per year for VOC, 0.06% per year for NO_x, and 0.15% per year for CO. The nonattainment area average growth rates from 2011 to 2017 vary within the individual SCC categories and pollutants from approximately negative 18.5 percent per year for industrial residual oil combustion for all three pollutants to 7.58 percent per year for residential pellet-fired woodstoves for all three pollutants.

VOC Emissions Summary

Overall, negative growth is projected in categories such as industrial residual oil combustion, commercial/institutional residual oil, LPG, distillate and kerosene combustion; residential kerosene, LPG and distillate combustion; marine vessel transport of gasoline, crude oil and residual oil; residential wood combustion of indoor cordwood-fired non-EPA certified furnaces, non-EPA certified fireplace inserts for woodstoves, and freestanding, non-EPA certified woodstoves; surface coating of paper, metal furniture, large appliances, motor vehicles, marine, railroad, misc. manufacturing, factory finished wood, machinery and equipment, and electronics; gasoline service stations stage 1, stage 2, underground tank breathing and emptying; truck transport of gasoline, pipeline transport of gasoline, commercial asphalt application, pesticides, aviation gasoline stage 1, aviation gasoline stage 2, industrial wastewater treatment, and degreasing,

Overall, no growth is projected in categories such as industrial wood combustion, commercial/institutional wood combustion, residential anthracite coal combustion, on-site incineration, open burning, agricultural burning, forest wildfires, cigarette smoke, managed burning, structure fires, motor vehicle fires, breweries, wineries, distilleries, traffic markings, landfills, and leaking underground storage tanks.

Overall, positive growth from zero to one percent is projected in categories such as dry cleaning, commercial cooking, architectural coatings, industrial maintenance coatings, other special purpose coatings, graphic arts, industrial adhesives, consumer products, pesticides, residential portable fuel containers, publicly owned treatment works (POTWs), human cremation, surface coating of metal cans and misc. finished metals; autobody refinishing, bakeries, industrial LPG combustion and residential natural gas combustion.

Overall, one to three percent growth is projected for categories such as residential wood combustion of fireplaces, outdoor hydronic heaters, outdoor wood burning devices – NEC, residential firelogs, woodstove fireplace inserts, and freestanding woodstoves; industrial distillate and kerosene combustion, commercial/institutional natural gas combustion, and marine vessel transport of jet naptha, distillate and kerosene.

Overall, growth over five percent is projected for categories such as industrial natural gas combustion and residential wood combustion of pellet-fired woodstoves.

NO_x Emissions Summary

Overall, negative growth is projected in categories such as industrial residual oil combustion, commercial/institutional residual oil, LPG, distillate and kerosene combustion; residential kerosene, LPG and distillate combustion; residential wood combustion of indoor cordwood-fired non-EPA certified furnaces, non-EPA certified fireplace inserts for woodstoves, and freestanding, non-EPA certified woodstoves.

Overall, no growth is projected in categories such as industrial wood combustion, commercial/institutional wood combustion, residential anthracite coal combustion, on-site incineration, open burning, agricultural burning, forest wildfires, cigarette smoke, managed burning, structure fires and motor vehicle fires.

Overall, positive growth from zero to one percent is projected in categories such as industrial LPG combustion, residential natural gas combustion, and human cremation.

Overall, one to three percent growth is projected for categories such as residential wood combustion of fireplaces, outdoor hydronic heaters, outdoor wood burning devices – NEC, residential firelogs, woodstove fireplace inserts, and freestanding woodstoves; industrial distillate and kerosene combustion, and commercial/institutional natural gas combustion.

Overall, growth over five percent is projected for categories such as industrial natural gas combustion and residential wood combustion of pellet-fired woodstoves.

CO Emissions Summary

Overall, negative growth is projected in categories such as industrial residual oil combustion, commercial/institutional residual oil, LPG, distillate and kerosene combustion; residential kerosene, LPG and distillate combustion; residential wood combustion of indoor cordwood-fired non-EPA certified furnaces, non-EPA certified fireplace inserts for woodstoves, and freestanding, non-EPA certified woodstoves.

Overall, no growth is projected in categories such as industrial wood combustion, commercial/institutional wood combustion, residential anthracite coal combustion, on-site incineration, open burning, agricultural burning, forest wildfires, cigarette smoke, managed burning, structure fires and motor vehicle fires.

Overall, positive growth from zero to one percent is projected in categories such as industrial LPG combustion, residential natural gas combustion, commercial cooking, and human cremation.

Overall, one to three percent growth is projected for categories such as residential wood combustion of fireplaces, outdoor hydronic heaters, outdoor wood burning devices – NEC, residential firelogs, woodstove fireplace inserts, and freestanding woodstoves; industrial distillate and kerosene combustion, commercial/institutional natural gas combustion.

Overall, growth over five percent is projected for categories such as industrial natural gas combustion and residential wood combustion of pellet-fired woodstoves.

4.0 Nonroad Sources

New Jersey's 2017 projection emissions inventory for nonroad sources is discussed in Appendix 4-6.

5.0 Onroad Sources

New Jersey's 2017 projection emissions inventory for onroad sources is discussed in Appendix 4-7.