

### **MARAMA Inventory Projection Methodology**

To support air quality planning activities, MARAMA developed growth and control factors for 15 jurisdictions in the mid-Atlantic and Northeast (Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia). Factor development focused on annual emissions of carbon monoxide (CO), ammonia (NH<sub>3</sub>), oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM), sulfur dioxide (SO<sub>2</sub>), and volatile organic compounds (VOC). The PM species in the inventory are categorized as filterable and condensable particles with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (i.e., PM<sub>10</sub>-PRI and PM<sub>25</sub>-PRI).

As states have traditionally done, MARAMA used economic, energy, and demographic activity parameters as surrogates for projecting future emissions. While recognizing that these surrogates may not track exactly with emissions, states consider these surrogates to be the “best available” data for projecting emissions for nonpoint and non-EGU point sources. Using these surrogates, MARAMA developed growth and, where applicable, control factors for the following anthropogenic emission inventory sectors:

- Area Fugitive Dust (AFDUST)
- Nonpoint "other"
- Portable Fuel Containers (PFCs)
- Residential Wood Combustion (RWC)
- Point "non-EGU"

Where the 2014NEIv2 was the starting point for the 2016v1 platform (i.e., nonpoint sources other than agriculture and point "non-EGU" facilities that did not report emissions in 2016), MARAMA developed projection factors to project 2014 emissions to the 2016 base year and, for all sources listed above, projection factors to project 2016 emissions to 2023 and 2028. The Eastern Regional Technical Advisory Committee (ERTAC) developed emission projections for EGUs as part of an inter-regional coordination effort. For all non-anthropogenic sectors (Biogenic, Fires) and the remaining anthropogenic sectors (Agriculture (NH<sub>3</sub> and VOC emissions from livestock and fertilizer sources), Airports, Commercial Marine Vessels, Rail, Oil & Gas, Small EGUs, and Onroad and Nonroad Mobile) states are relying on the National Emissions Collaborative's 2016v1 platform emissions projections.

## **NONPOINT SOURCES**

### **Area Fugitive Dust (AFDUST)**

The AFDUST sector contains PM10 and PM2.5 emission estimates for nonpoint SCCs identified by EPA as dust sources. Categories included in the AFDUST sector are paved and unpaved roads, airstrips, construction (residential, industrial/commercial/institutional, road and total), agriculture production, and mining and quarrying. It does not include fugitive dust from grain elevators, coal handling at coal mines, or vehicular traffic on paved or unpaved roads at industrial facilities because these are treated as point sources.

MARAMA developed and submitted growth factors to project emissions from the 2014NEIv2 to 2016 and from 2016 to 2023 and 2028 for the following AFDUST SCCs for all jurisdictions except NC and NJ which provided their own growth factors:

- paved roads (SCC 2294000000), county-level factors based on state-provided county-level VMT
- residential construction dust (SCC 2311010000) and industrial/commercial/institutional construction dust (SCC 2311020000), state-level factors based on state-provided employment data for NAICS code 236, Construction of Buildings
- road construction dust (SCC 2311030000), state-level factors based on state-provided employment data for NAICS code 237, Heavy and Civil Engineering Construction
- dust from mining and quarrying (SCC 2325000000), state-level factors based on state-provided employment data for NAICS code 212, Mining (except Oil and Gas)
- agricultural crop tilling dust (SCC 2801000003), national-level factors based on agriculture tilling factors from EPA's 2011 platform; no growth for DE, DC, and MD.
- agricultural dust kicked-up from beef cattle hooves (SCC 2805001000), based on national factors from 2016 Collaborative factors; no growth for DE and MD

Unpaved road dust emissions (SCC 2296000000) were held constant at 2014NEIv2 values for 2016 and future years.

### **2016 Nonpoint "Other"**

The Nonpoint "Other" (nonpt) sector consists of all sources from 2014NEIv2 nonpoint that are not included in the AFDUST, Agriculture, Commercial Marine Vessels, Nonpoint Oil & Gas, Nonpoint Rail, PFC, or RWC sectors. MARAMA developed and submitted projection factors to project emissions from the 2014NEIv2 to 2016 and from 2016 to 2023 and 2028. New Jersey

submitted its own projection factors for 2014 to 2016. New Jersey and North Carolina submitted their own projection factors for 2016 to the 2023 and 2028 future years.

The projections consist of two components: growth factors based on the historical and/or forecast activity data and control factors that estimate the impacts of applicable control technologies on future-year emissions. The control factors are discussed below.

MARAMA developed and submitted growth factors to project emissions from the 2014NEIv2 to 2016 and from 2016 to 2023 and 2028 for the following Nonpt "Other" SCCs:

- **Nonpoint fuel combustion sources (SCCs 2102xxxxxx, 2103xxxxxx, 2104xxxxxx)** were projected using the Energy Information Administration's (EIA) Annual Energy Outlook (AEO) for year 2019 as a starting point for projecting industrial, commercial/institutional, and residential fuel combustion sources in this sector. SCCs were mapped to AEO categories by state and AEO region (Mid-Atlantic, Northeast, South-Atlantic) and projection factors were created using a ratio between the 2016 base year and projection year estimates from each specific AEO category. State Energy Data System (SEDS) historical data were used in place of the AEO projections to develop 2014 to 2016 growth factors.
- **Nonpoint industrial sources (SCCs 2302xxxxxx)** were projected mostly by county-level populations. A few jurisdictions opted for state-level employment for several SCCs: commercial cooking (DC), bakery products (MD, NH, VA), breweries (MD), wineries (MD, VA), and fermented beverages total (MA).
- **Nonpoint solvent utilization sources (SCCs 24xxxxxx)** were projected by state-level employment, with the exceptions of 2401008000 (traffic markings, all solvents) which was projected no growth for all jurisdictions, and the following SCCs which were projected by county-level population data:
  - 2401001000: architectural coatings, all solvent types
  - 2401001050: architectural coatings, all other architectural categories
  - 2401100000: industrial maintenance coatings, all solvent types
  - 2401200000: other special purpose coatings, all solvent types
- **Nonpoint petroleum and petroleum products storage SCCs (2501xxxxxx)** are projected by AEO2019 transportation by region and fuel type, with the exception of 2501060xxxx gasoline service stations, which are projected by district-level employment in DC and county-level VMT in MD. **Nonpoint petroleum and petroleum products transport SCCs (2505xxxxxx)** are projected by AEO2019 transportation by region and fuel type for all jurisdictions. NOTE: Nonpoint storage and transport, Portable Fuel Container (PFC) SCCs 2501011xxx and 2501012xxx are in a separate packet (described below).
- **Nonpoint Waste Disposal, Treatment, and Recovery (26xxxxxx)** are projected by county-level population with the exception of the following SCCs which were projected

with no growth for all jurisdictions: 2680003000 (Composting), 2660000000 (leaking underground storage tanks), 2601020000 (incineration), 2610000000 (open burning), and 26200300000 (landfills, municipal total). The landfill dumping/crushing/spreading SCC (2620030001) was projected by county-level population.

- **Nonpoint miscellaneous sources (SCCs 28xxxxxxx)** are projected by state-provided county-level populations, with the exception of domestic and wild animal waste emissions, accidental/catastrophic releases, and a few "other combustion" sources (aircraft/rocket engine firing and testing; cigarette smoke; cremation; firefighting training; human perspiration and respiration; managed burning, slash (logging debris); and motor vehicle fires).

Growth factors were either capped at plus/minus 25% growth (i.e., growth factor between 0.75 and 1.25) or were not capped; around 97% of the growth factors fall into the 0.75 to 1.25 range without being capped for both 2023 and 2028.

### **Portable Fuel Containers (PFCs)**

Nonpoint storage and transport, Portable Fuel Container (PFC) SCCs 2501011xxx and 2501012xxx are projected using state-provided county-level population data. No growth factor caps were applied; growth factors ranged from 0.9461 to 1.0682 for 2014 to 2016, 0.894 to 1.248 for 2016 to 2023 and 0.816 to 1.407 for 2016 to 2028.

The OTC developed a model rule to address VOC emissions from PFCs via performance standards and phased-in PFC replacement that was implemented in two phases. The OTC model rule was applied via control factors as described below in the "Controls" section.

MARAMA developed growth and control factors for the MARAMA region, with the exception of NC which provided its own factors.

### **Residential Wood Combustion**

Residential Wood Combustion (RWC) emissions are projected from the 2014 National Emissions Inventory version 2 (NEI2014v2) to 2016, 2023, and 2028 using factors based on EPA's 2011v6.3 emissions modeling platform methods and implemented into spreadsheet tools by MARAMA.

The 2016v1 platform RWC inventory was projected to 2016 from the U.S. EPA NEI2014v2<sup>1</sup> RWC inventory. Vermont provided updates and North Carolina provided separate projection factors.

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<sup>1</sup> <https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data>

The RWC sector includes residential wood burning devices such as fireplaces, fireplaces with inserts, free standing woodstoves, pellet stoves, outdoor hydronic heaters (also known as outdoor wood boilers), indoor furnaces, and outdoor burning in firepits and chimneys. Free standing woodstoves and inserts are further differentiated into three categories: 1) conventional (not EPA certified); 2) EPA certified, catalytic; and 3) EPA certified, noncatalytic. Generally, the conventional units were constructed prior to 1988. Units constructed after 1988 had to meet EPA emission standards and they are either catalytic or non-catalytic.

RWC emissions from the NEI2014v2 were projected to 2016 using projection factors derived by MARAMA based on implementing the projection methodology from EPA’s 2011 platform<sup>2</sup> into a spreadsheet tool. Projection factors are national by SCC and SCC-pollutant; SCC factors are applied to all pollutants without an SCC-pollutant factor. The 2016 RWC emissions were then projected to the 2023 and 2028 future years using a similar methodology. For all years, Vermont uses an alternate set of factors which are the same as the national factors, except that negative growth is replaced with flat growth (no change). North Carolina provided its own factors. **Table 2** lists the SCC-based projection factors applied to RWC sources.

SCC	SCC Short Name	Pollutant	2014-2016	2016-2023	2016-2028
2104008100	Fireplace: general		1.0200	1.0719	1.1236
2104008210	Woodstove: fireplace inserts; non-EPA certified		0.9660	0.8608	0.7595
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	PM10-PRI	1.0229	1.0409	1.0657
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic	PM25-PRI	1.0229	1.0409	1.0657
2104008220	Woodstove: fireplace inserts; EPA certified; non-catalytic		1.0525	1.0834	1.1321
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	PM10-PRI	1.0244	1.0606	1.1011
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic	PM25-PRI	1.0244	1.0606	1.1011
2104008230	Woodstove: fireplace inserts; EPA certified; catalytic		1.0525	1.1208	1.2007
2104008310	Woodstove: freestanding, non-EPA certified	CO	0.9765	0.8791	0.7883
2104008310	Woodstove: freestanding, non-EPA certified	PM10-PRI	0.9783	0.8734	0.7770

<sup>2</sup> See section 4.2.3.9 of <https://www.epa.gov/air-emissions-modeling/additional-updates-2011-and-2023-emissions-version-63-platform-technical>

2104008310	Woodstove: freestanding, non-EPA certified	PM25-PRI	0.9783	0.8734	0.7770
2104008310	Woodstove: freestanding, non-EPA certified	VOC	0.9794	0.8861	0.7999
2104008310	Woodstove: freestanding, non-EPA certified		0.9765	0.8791	0.7883
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	PM10-PRI	1.0229	1.0409	1.0657
2104008320	Woodstove: freestanding, EPA certified, non-catalytic	PM25-PRI	1.0229	1.0409	1.0657
2104008320	Woodstove: freestanding, EPA certified, non-catalytic		1.0525	1.0834	1.1321
2104008330	Woodstove: freestanding, EPA certified, catalytic	PM10-PRI	1.0247	1.0607	1.1012
2104008330	Woodstove: freestanding, EPA certified, catalytic	PM25-PRI	1.0247	1.0607	1.1012
2104008330	Woodstove: freestanding, EPA certified, catalytic		1.0525	1.1208	1.2007
2104008400	Woodstove: pellet-fired, general	PM10-PRI	1.1440	1.3009	1.4992
2104008400	Woodstove: pellet-fired, general	PM25-PRI	1.1440	1.3009	1.4992
2104008400	Woodstove: pellet-fired, general		1.1438	1.2696	1.4419
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	CO	0.9030	0.3507	0.0530
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	PM10-PRI	0.9385	0.3701	0.0716
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	PM25-PRI	0.9385	0.3701	0.0716
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified	VOC	0.9026	0.3498	0.0517
2104008510	Furnace: Indoor, cordwood-fired, non-EPA certified		0.9030	0.3507	0.0530
2104008610	Hydronic heater: outdoor	PM10-PRI	1.0299	1.0006	0.9890
2104008610	Hydronic heater: outdoor	PM25-PRI	1.0299	1.0006	0.9890
2104008610	Hydronic heater: outdoor		1.0200	0.9927	0.9784
2104008700	Outdoor wood burning device, NEC		1.0200	1.0719	1.1236
2104009000	Residential Firelog Total: All Combustor Types		1.0200	1.0719	1.1236