Emissions Inventory for Air Quality Modeling Technical Support Document: Proposed Tier 3 Emissions Standards

United States
Environmental Protection
Agency

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United States Environmental Protection Agency

EPA-454/R-13-002
March 2013

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ACRONYMS

AEO	Annual Energy Outlook
BEIS	Biogenic Emission Inventory System
bps	Bulk plant storage
btp	Bulk plant terminal-to-pump
C3	Category 3 (commercial marine vessels)
CAP	Criteria Air Pollutant
CMAQ	Community Multiscale Air Quality
CSAPR	Cross-State Air Pollution (formerly Transport) Rule
E0	0% Ethanol gasoline (by volume)
E10	10% Ethanol gasoline
E15	15% Ethanol gasoline
EGU	Electric Generating Utility
EISA	Energy Independence and Security Act of 2007
EPAct	Energy Policy Act of 2005
FAA	Federal Aviation Administration
FIPS	Federal Information Processing Standard
FRM	Final Rulemaking
HAP	Hazardous Air Pollutant
HDGHG	Heavy Duty Greenhouse Gas
HONO	HNO2, nitrous acid
IPM	Integrated Planning Model
LDGHG	Light Duty Greenhouse Gas
LEV	(California) Low-Emission Vehicle Program
MOBILE6	Mobile Source Emission Factor Model, version 6
MOVES	Motor Vehicle Emissions Simulator
MY	Model Year
NEEDS	National Electric Energy Database System
NEI	National Emission Inventory
NMIM	National Mobile Inventory Model
NPRM	Notice for Proposed Rulemaking
OAQPS	EPA's Office of Air Quality Planning and Standards
ORL	One Record per Line (a SMOKE input format)
MP	Multipollutant
NO	Nitric oxide
NO2	Nitrogen dioxide
NOX	Nitrogen oxides
PFC	Portable Fuel Container
PEC	Elemental carbon component of PM2.5
PMFINE	Leftover "Other", or "crustal" component of PM2.5
PNO3	Particulate nitrate component of PM2.5
PSO4	Particulate sulfate component of PM2.5
POC	Organic carbon component of PM2.5
rbt	Refinery-to-bulk terminal
RFS2	Revised annual renewable fuel standard (mandate)
SMOKE	Sparse Matrix Operator Kernel Emissions
SCC	Source Category Code
TAF	Terminal Area Forecast

TSD	Technical Support Document
VOC	Volatile Organic Compound
WRAP	Western Regional Air Partnership

1 Introduction to the Modeling Platform

This Technical Support Document (TSD) describes the development of the emissions inventories used as inputs to the air quality modeling that the U.S. Environmental Protection Agency (EPA) performed to assess the impact of the proposed Tier 3 vehicle and fuel emission standards for cars and trucks. This document provides the details of emissions modeling done to support the development of the Regulatory Impact Assessment (RIA) for the Tier 3 Notice of Proposed Rulemaking (NPRM), hereafter referred to as the "Tier 3 NPRM". The emissions inventories were generated using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system (http://www.smoke-model.org/index.cfm) version 2.7 and processed into the form required by the Community Multi-scale Air Quality (CMAQ) model. CMAQ simulates the numerous physical and chemical processes involved in the formation, transport, and destruction of ozone, particulate matter and air toxics.

As part of the analysis for this rulemaking, the modeling system was used to calculate daily and annual $PM_{2.5}$ concentrations, 8-hr maximum ozone, visibility impairment and seasonal and annual concentrations for the following HAPs: acetaldehyde, acrolein, benzene, 1,3-butadiene, ethanol and formaldehyde. Model predictions of $PM_{2.5}$ and ozone are used in a relative sense to estimate scenario-specific, future-year design values of $PM_{2.5}$ and ozone. These are combined with monitoring data to estimate population-level exposures to changes in ambient concentrations for use in estimating health and welfare effects. In this document, we provide an overview of (1) the emissions components of the modeling platform, (2) the development of the 2005 base year emissions, (3) the development of the future year 2017 and 2030 baseline emissions, and (4) the development of the future year 2017 and 2030 control case emissions.

A modeling platform is the collection of the inputs to an air quality model, including emissions data, meteorology, initial conditions, and boundary conditions. The 2005-based air quality modeling platform includes 2005 base year emissions and 2005 meteorology for modeling ozone, $PM_{2.5}$ and other model species with CMAQ. In support of this rule, EPA modeled the air quality in the Eastern and the Western United States using two separate model runs, each with a horizontal grid resolution of 12 km x 12 km. These 12 km modeling domains were "nested" within a modeling domain covering the remainder of the lower 48 states and surrounding areas using a grid resolution of 36 x 36 km. The results from the 36-km modeling were used to provide incoming "boundary" for the 12km grids. Additional details on the non-emissions portion of this 2005v4.3 modeling platform are described in the air quality modeling TSD.

Version 4.3 of the 2005-based air quality modeling platform was used for the Tier3 NPRM and is referred to as the 2005v4.3 platform. The 2005v4.3 platform builds upon the 2005-based platform, version 4.2, which was the version of the platform used for the final Cross-State Air Pollution Rule (CSAPR) and incorporated changes made in response to public comments on the proposed version of that rule. The Technical Support Document "Preparation of Emissions Inventories for the Version 4.2, 2005-based Platform" (see http://www.epa.gov/ttn/chief/emch/index.html#final) provides information on the platform used for the proposed version of this rule.

Table 1-1 provides a high-level summary of the five emissions cases that were modeled in support of the Tier 3 NPRM. The form of the fuel used for mobile sources is a key discriminator between the cases. Therefore, the mobile source emissions are described with respect to the impacts of the Energy Independence and Security Act of 2007 (EISA) and the Energy Policy Act of 2005 (EPAct) on mobile source fuels.

Table 1-1. List of cases run in support of the Proposed Tier 3 air quality modeling

Case Name	Internal EPA Abbreviation	Description
2005 base case	2005ct	2005 calendar year case / scenarios that use an average year temporal allocation approach for Electrical Generating Units (EGUs), a pre-EISA/EPAct fuel supply for mobile sources, and average year fires data. Air quality outputs from this case are used to compute relative response factors with the 2017 future year reference case scenarios.
2017 reference case	2017ct_ref	2017 future year reference scenario with EGU emissions that represent the implementation of the Cross-State Air Pollution Rule (CSAPR) and upstream stationary and mobile sources representing the implementation of the EISA/EPAct fuel supply (RFS2 Rule).
2017 Tier 3 control case	2017ct_ctla	2017 Tier 3 control case scenario representing national Tier 3 vehicle and fuels emissions standards.
2030 reference case	2030ct_ref_csapr	2030 future year reference scenario with EGU emissions that represent the implementation of the Cross-State Air Pollution Rule (CSAPR) and upstream stationary and mobile sources representing the implementation of the EISA/EPAct fuel supply (RFS2 Rule).
2030 Tier 3 control case	2030ct_ctl_csapr	2030 Tier 3 control case scenario representing national Tier 3 vehicle and fuels emissions standards.

In the remainder of this document, we provide a description of the approach taken to generate the emissions in support of air quality modeling for the Tier 3 NPRM. In Section 2, we describe the 2005v4.3 platform custom configurations, ancillary data and 2005 inventory differences from the v4.2 platform. In Section 3, we describe the speciation differences among each of the cases run. In Section 4, we describe the 2017 and 2030 Reference (i.e., future year baseline) cases as compared to the 2005 base case. In Section 5, we describe the 2017 and 2030 Tier 3 Control cases as compared to the 2017 and 2030 Reference cases. Emission summaries for all Tier 3 NPRM scenarios are provided in Section 6. Appendix A provides a comparison of the ancillary datasets and parameters used for the various Tier 3 NPRM emissions cases, and Appendix B compares the emissions inventory and other input data files used for each of the Tier 3 NPRM cases.

2 2005 Emission Inventories and Their Preparation

As mentioned previously, the 2005 emissions modeling approach for the Tier 3 NPRM used much of the same data and approaches as the 2005v4.2 platform. In this section, we identify the differences between the data used for the Tier 3 NPRM 2005v4.3 platform and that used for the 2005v4.2 platform. Section 2.1 provides ancillary data differences that impact multiple sectors. Section 2.2 discusses the new approach used for emissions preprocessing and processing for all onroad mobile sources. Section 2.3 discusses the updated nonroad mobile components. Sections 2.4 and 2.5 provide differences for the point and nonpoint (area) inventories, respectively. Section 2.6 discusses other emissions categories such as biogenic and non-U.S. sources.

The data used in the 2005 emissions case is often the same as those described in the Final Cross-State Air Pollution Rule TSD (http://www.epa.gov/ttn/chief/emch/index.html#2005), also known as the CAP-BAFM 2005-based Version 4.2 Platform (i.e., 2005v4.2). However, some different emissions data are used for this rulemaking. All of the documentation provided here describes what was done differently and specifically for the Tier 3 NPRM in contrast to what was done for the 2005v4.2 platform.

For the Tier 3 NPRM, a 2005 base case approach was used for the year 2005 emissions scenario. This approach is very similar to that taken for the CSAPR Final Rule (formerly known as the "Transport Rule"). A base case approach uses average year fires and EGU temporal profiles developed from three years of EGU data. We use a base case approach to reduce year-specific variability in some components of the inventory. For example, large fires vary in location and day of the year each year, and EGU shutdowns and high use on high energy demand days also vary by year. By using a base case approach, these two aspects of the inventory are maintained into the future year modeling but do not introduce potentially spurious year-specific artifacts into the air quality modeling estimates. The biogenic emissions data were the same as those used for the 2005v4.2 platform and were also the same for the 2005 case and for both future-year cases. The only significant data changes between the 2005 and the 2017 and 2030 future-year Tier 3 reference and control cases are the emission inventories and speciation approaches.

Table 2-1 below lists the platform sectors used for the Tier 3 NPRM modeling platform. It also indicates which platform sectors include HAP emissions and the associated sectors from the National Emission Inventory (NEI). Subsequent subsections refer to these platform sectors to identify the emissions differences between the 2005v4.2 platform and the Tier 3 NPRM 2005v4.3-based platform.

Table 2-1. Sectors used in emissions modeling for the Tier 3 NPRM 2005v4.3 platform

Platform Sector	2005 NEI Sector	Description	Contains HAP emissions?
IPM sector: *ptipm*	Point	NEI EGU units at facilities mapped to the IPM model using the National Electric Energy Database System (NEEDS) database.	Yes
Non-IPM sector: *ptnonipm*	Point^{+}	All NEI point source units not matched to the ptipm sector, including airports.	Yes
Average-fire sector: *avefire*	N/A	Average-year wildfire and prescribed fire emissions, county and annual resolution.	Yes
Agricultural sector: *ag*	Nonpoint	Ammonia (NH_3) emissions from NEI nonpoint livestock and fertilizer application.	No
Area fugitive dust sector: *afdust*	Nonpoint	PM_{10} and $PM_{2.5}$ emissions from fugitive dust sources in the NEI nonpoint inventory.	No
Remaining nonpoint sector: *nonpt*	Nonpoint^{+}	All U.S. nonpoint (i.e. inventoried at the county-level) sources not otherwise included in other emissions modeling sectors.	Yes
Nonroad sector: *nonroad*	Mobile: Nonroad	Monthly nonroad emissions from the NONROAD model version NR08b and National Mobile Inventory Model (NMIM) software version NMIM20090504b and NMIM and Meteorology database version NCD20101201Tier3. Nonroad version is equivalent to NONROAD2008a used in 2005v4.2 for future year 2017; however, E15 fuels are allowed for the 2030 cases.	Yes
C1 & C2 CMV and locomotives: *alm_no_c3*	Mobile: Nonroad	Primarily 2002 NEI non-rail maintenance locomotives, and category 1 and category 2 commercial marine vessel (CMV) emissions sources, county and annual resolution. Aircraft emissions are no longer in this sector and are now included in the Non-EGU sector (as point sources); also, category 3 CMV emissions are no longer in this sector and are now contained in the seca_c3 sector.	Yes
C3 commercial marine: *seca_c3*	Mobile: nonroad	Annual point source-formatted, year 2005 category 3 (C3) CMV emissions, developed for the rule called "Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder", usually described as the Emissions Control Area (ECA) study (http://www.epa.gov/otaq/oceanvessels.htm). Utilized final projections from 2002, developed for the C3 ECA Proposal to the International Maritime Organization (EPA-420-F-10-041, August 2010).	Yes

Platform Sector	2005 NEI Sector	Description	Contains HAP emissions?
Onroad Mobile: *onroad*	Mobile: onroad+	Motor Vehicle Emissions Simulator (MOVES) emission factors created using the Tier 3 NPRM version to account for hourly-based meteorology dependencies at a select number of representative counties. Includes local input information such as fuels, temperatures, vehicle fleet, speed distributions and controls. Emission factors are combined with activity data and gridded temperature via SMOKE to produce gridded emissions. These emissions are discussed extensively in Section 2.2.	Yes
Biogenic: *biog*	N/A	Hour-specific, grid cell-specific emissions generated from the BEIS3.14 model, including emissions in Canada and Mexico. Unchanged from the 2005v4 platform, and the same data are used for all future year scenarios.	No
Other point sources not from the NEI: *othpt*	N/A	Point sources from Canada's 2006 inventory and Mexico's Phase III 1999 inventory, annual resolution. Also includes annual U.S. offshore oil 2005v2 NEI point source emissions. Unchanged from the 2005v4 platform, and the same data are used for all future year scenarios.	No
Other nonpoint and nonroad not from the NEI: *othar*	N/A	Annual year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) nonpoint and nonroad mobile inventories. Unchanged from the 2005v4 platform, and the same data is used for all future year scenarios.	No
Other onroad sources not from the NEI: *othon*	N/A	Year 2006 Canada (province resolution) and year 1999 Mexico Phase III (municipio resolution) onroad mobile inventories, annual resolution. Unchanged from the 2005v4 platform, and the same data are used for all future year scenarios.	No

+ Some data included in modeling sector has been revised beyond what is included in the 2005 NEI v1 or v2.

2.1 Custom configuration for emissions modeling for Tier 3 NPRM

Unlike the 2005v4.2 platform, the configuration for Tier 3 NPRM modeling included additional hazardous air pollutants (HAPs) and used slightly revised ancillary speciation data. Both of these differences are described in this section.

Table 2-2 lists the additional HAP pollutants processed for the Tier 3 NPRM 2005v4.3 platform, which were not included in the 2005v4.2 platform. A "lite" version of the multi-pollutant CMAQ (Version 4.7) was used that required emissions only for the species listed in the footnote of Table 2-2. In addition to the model species differences, the Tier 3 NPRM platform had a few additional custom aspects in the 2005 cases. Table 2-3 lists the datasets used by the (Tier 3 NPRM) 2005v4.3 platform that are different from the 2005v4.2 platform.

Another consideration is the speciation across the Tier 3 NPRM future-year cases as compared to 2005. Section 3 provides a detailed account of these differences. The future-year ancillary data were largely the same as those in 2005, with no substantial differences for most modeling sectors. The exception to this is onroad mobile, which required several new ancillary input files to support the SMOKE to MOVES modules; these are discussed in detail in Section 2.4. All other ancillary data files not required for SMOKE to MOVES processing can otherwise be found at the 2005-based platform website (http://www.epa.gov/ttn/chief/emch/index.html#2005).

Table 2-2. Model species produced by SMOKE for CB05 with SOA for the Tier 3 NPRM platform

Inventory Pollutant	Model Species	Model species description
CL2	CL2	Atomic gas-phase chlorine
HCl	HCL	Hydrogen Chloride (hydrochloric acid) gas
CO	CO	Carbon monoxide
NO_X	NO	Nitrogen oxide
	NO2	Nitrogen dioxide
	HONO	Nitrous acid
SO_2	SO2	Sulfur dioxide
	SULF	Sulfuric acid vapor
NH_3	NH3	Ammonia
VOC	ACROLEIN*	Acrolein from the HAP inventory
	ALD2	Acetaldehyde from VOC speciation
	ALD_PRIMARY*	Acetaldehyde from the HAP inventory
	ALDX	Propionaldehyde and higher aldehydes
	BENZENE	Benzene (not part of CB05)
	BUTADIENE13*	1,3-butadiene from the HAP inventory
	ETH	Ethene
	ETHA	Ethane
	ETOH	Ethanol, from select inventories provided by OTAQ
	FORM	Formaldehyde
	FORM_PRIMARY*	Formaldehyde from the HAP inventory
	IOLE	Internal olefin carbon bond (R-C=C-R)
	ISOP	Isoprene
	MEOH	Methanol
	OLE	Terminal olefin carbon bond (R-C=C)
	PAR	Paraffin carbon bond
	TOL	Toluene and other monoalkyl aromatics
	XYL	Xylene and other polyalkyl aromatics
Various additional VOC species from the biogenics model which do not map to the above model species	SESQ	Sesquiterpenes
	TERP	Terpenes
PM_{10}	PMC	Coarse PM > 2.5 microns and ≤ 10 microns
$PM_{2.5}$	PEC	Particulate elemental carbon ≤ 2.5 microns
	PNO3	Particulate nitrate ≤ 2.5 microns
	POC	Particulate organic carbon (carbon only) ≤ 2.5 microns
	PSO4	Particulate Sulfate ≤ 2.5 microns
	PMFINE	Other particulate matter ≤ 2.5 microns
Sea-salt species (non – anthropogenic emissions)	PCL	Particulate chloride
	PNA	Particulate sodium

- - ACROLEIN, ALD2_PRIMARY, BUTADIENE13, ETHANOL and FORM_PRIMARY are the extra "CMAQ-lite" HAPs that are not in the v4.2 platform.

Table 2-3. Description of differences in 2005 case ancillary data (unrelated to SMOKE to MOVES) between the 2005v4.3 and 2005v4.2 platforms

Ancillary Data Type	Difference between 2005v4.2 platform and 2005v4.3 platform
Speciation cross-references and Speciation profiles	The Tier 3 NPRM 2005v4.3 data files are configured to support the multi-pollutant (MP) version of CMAQ, whereas the 2005v4.2 platform data files are configured to support only the non-MP version. Therefore, the Tier 3 NPRM data files include profiles for additional VOC HAP species.
Speciation VOC to TOG conversion profiles	Added Tier 3-specific VOC to TOG and nonHAP VOC to nonHAP TOG assignments
SCC Descriptions	Added onroad diesel SCCs representing start and idle modes (223007X000)
Inventory tables	The Tier 3 NPRM data file was updated to support SMOKE to MOVES pollutants and modes, the MP "lite" version of CMAQ, and, to accept inventory Ethanol (ETOH). The 2005v4.2 platform data file is configured to support only the non-MP version.

2.2 Onroad mobile sources (onroad)

For each scenario, emissions from cars, trucks and motorcycles were estimated by using the EPA's Motor Vehicle Emission Simulator (MOVES) to create emission factors that were then input to the Sparse Matrix Operator Kernel Emissions system (SMOKE). The SMOKE-MOVES integration tools combined the county and temperature-specific emission factors with the activity data to compute the actual emissions. In brief, our approach was to use the met4moves program to identify a set of temperatures that needed emission rates. For each scenario, we ran MOVES repeatedly to produce emission rates by temperature, Source Classification Code (SCC), speed bin, and representing county. The moves2smk tool then reformatted the MOVES rates and selected the appropriate rates for each county and month. Movesmrg multiplies the emission rates by county VMT or vehicle population, applies speciation profiles to develop inventories for pollutants not included in MOVES and temporally, and spatially allocates emissions to individual grid cells for CMAQ input.

2.2.1 MOVES

For the Tier 3 NPRM, EPA used a version of the MOVES 2010a model that was enhanced for the rule. This version o fthe model included updated information on how fuel parameters impact vehicle emissions and updates on our understanding of evaporative emissions. It also included some minor updates to emission rates and some changes designed to make the model run more efficiently. All updates are described in detail in a memorandum to the docket (U.S. EPA 2013, Memorandum to Docket: Updates to MOVES for the Tier 3 NPRM). The following sections describe inputs to the MOVES model that were specific to this analysis.

The gridded meteorological input data for the entire year of 2005 were derived from simulations of the Pennsylvania State University / National Center for Atmospheric Research Mesoscale Model (MM5), a limited-area, nonhydrostatic, terrain-following system that solves for the full set of physical and thermodynamic equations which govern atmospheric motions. The Meteorology-Chemistry Interface Processor (MCIP) version 3.4 was used as the software for maintaining dynamic consistency between the meteorological model and chemistry mechanisms. The hourly gridded meteorological data was post-processed by met4moves to determine the maximum temperature ranges, average relative humidity, and a series of diurnal temperature profiles. MOVES was then run for each temperature bin and diurnal profile to compute the required emission factors.

Vehicle population data is a required input for MOVES when modeling on a county basis. Using the technical guidance provided to states by EPA, estimates for vehicle populations were generated for use in the MOVES databases. The populations were computed using the county-specific VMT and national average ratios of vehicle population to vehicle VMT from the MOVES application. This method is described in Section 3.3 of the document, "Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity" (EPA-420-B-10-023, April 2010), which is available on the EPA web site at: http://www.epa.gov/otaq/models/moves/index.htm.

The county inputs used for the rule were derived from the inputs used for the 2005 National Emissions Inventory (NEI). This inventory covers the 50 United States (U.S.), Washington DC, Puerto Rico and the U.S. Virgin Islands. The NEI was created by the EPA's Emission Inventory and Analysis Group (EIAG) in Research Triangle Park, North Carolina, in cooperation with the Office of Transportation and Air Quality (OTAQ) in Ann Arbor, Michigan.

OTAQ has developed a consolidated modeling system known as the National Mobile Inventory Model (NMIM) to calculate emissions from onroad highway mobile source and nonroad mobile sources. NMIM documentation is available at http://www.epa.gov/otaq/models/nmim/420r05024.pdf. NMIM includes a county-level database with the important input parameters specific to each county. The data in the NMIM county database (NCD) are used to develop NONROAD model input files within NMIM. The basis for the 2005 default vehicle miles traveled (VMT) is data supplied by the Federal Highway Administration (FHWA), as well as publicly available data from FHWA's Highway Statistics series. Details of how the NCD was developed are documented for the NEI "Documentation for the 2005 Mobile National Emissions Inventory, Version 2 (December 2008)", which can be obtained on EPA web site: http://www.epa.gov/ttn/chief/net/2005inventory.html.

For the onroad portion of the inventory estimates for the rule, including all base and control scenarios, the current EPA highway mobile source emission model (MOVES) was used. This required conversion of the NCD parameters to a format consistent with MOVES. A contractor was given the assignment (TranSystems, Contract No. EP-D-06-001, WA 4-65) to convert the NCD to MOVES formatted input databases. This was accomplished with the assistance of converters designed for this purpose. These converters are available on the EPA web site at: http://www.epa.gov/otaq/models/moves/tools.htm.

All of the county-specific onroad data available in the NCD was converted to MOVES format for use at the county scale consistent with the databases created using the MOVES County Data Manager (CDM), except for the information regarding fuel properties. The fuel properties were updated using more recent information and methods specifically for this rule and described elsewhere in this document. Any table entries in the NCD that contained national average default information from the MOBILE6 model were replaced with the more recent national average default information used by MOVES.

2.2.2 Representing counties

Although EPA compiles county-specific databases for all counties in the nation, many of the states can provide little or no county-specific information for most counties. Rather than explicitly model every county in the nation (there are over 3,000 counties), we have performed detailed modeling for some counties and less detailed estimates for the other counties. In this rule, this has been accomplished using a concept called "representing counties".

In this approach, we group counties that have similar properties and therefore would have similar emission rates. Then, we explicitly compute emission factors for only one county in the group (the "representing" county). These representative emission factors are then used, in combination with county specific activity and meteorology data to generate emissions estimates for all of the counties in the group. This approach dramatically reduces the number of modeling runs required to generate inventories and still takes into account differences between counties.

As described in Section 2.2.4, to generate onroad mobile emissions, MOVES was run in conjunction with the EPA SMOKE model to generate the gridded inventories used in air quality modeling. SMOKE uses emission rates (not inventories) to generate inventory estimates within each grid. Since SMOKE handles the differences in the fleet mix, temperatures, speeds and VMT versus location and time, MOVES can be run in the "emission rate" (i.e. emissions factor) mode. As a result, when counties are grouped, they can be grouped independently of fleet mix, speeds and temperature. This greatly increases the number of counties that can be in each grouping, since temperature is a factor that varies among the counties[1]. For this analysis, we grouped counties with similar fuel, emission standards, altitude, and inspection and maintenance (I/M) programs.

The information used to group the counties was derived from the NMIM inputs used for the 2005 NEI onroad and nonroad mobile sectors. For the onroad portion of the inventory estimates for the rule, including all base and control scenarios, the current EPA highway mobile source emission model (MOVES) was used. This required conversion of the NCD parameters to a format consistent with MOVES.

The NCD also does not contain county-specific information regarding vehicle populations and there are no default values. Vehicle population data is a required input for MOVES when modeling on a county basis. Using the technical guidance provided to states by EPA, the contractor generated appropriate estimates for vehicle populations for use in the MOVES databases using the county specific VMT and national average ratios of vehicle populations versus vehicle VMT from the MOVES application. This method is described in Section 3.3 of the document, "Technical Guidance on the Use of MOVES2010 for Emission Inventory Preparation in State Implementation Plans and Transportation Conformity" (EPA-420-B-10-023, April 2010), which is available at: http://www.epa.gov/otaq/models/moves/index.htm.

The grouping of counties uses a tree algorithm, which is conceptually simple. In the tree algorithm, all counties are assigned to various categories. Then, by grouping counties within the same categories, you get groups of counties that have the similar parameters. Counties were sorted into their Petroleum Administration for Defense Districts (PADDs). PADD 1 is divided into three sub-PADD groupings and each sub-group is treated as a separate PADD (1a, 1b and 1c). Each state belongs to a PADD and all counties in any state are within the same PADD. Table 2-4 below shows the PADDs and the states within each PADD.

Table 2-4. Allocation of states to the Petroleum Administration for Defense Districts

PADD	State FIPS	State Name	Abbreviation
1a	09	CONNECTICUT	CT
1a	23	MAINE	ME
1a	25	MASSACHUSETTS	MA
1a	33	NEW HAMPSHIRE	NH
1a	44	RHODE ISLAND	RI
1a	50	VERMONT	VT
1b	10	DELAWARE	DE
1b	11	DISTRICT OF COLUMBIA	DC
1b	24	MARYLAND	MD
1b	34	NEW JERSEY	NJ
1b	36	NEW YORK	NY
1b	42	PENNSYLVANIA	PA

[1] This differs from the calculation of nonroad inventories where temperature was considered in the choice of representing county.

PADD	State FIPS	State Name	Abbreviation
1c	12	FLORIDA	FL
1c	13	GEORGIA	GA
1c	37	NORTH CAROLINA	NC
1c	45	SOUTH CAROLINA	SC
1c	51	VIRGINIA	VA
1c	54	WEST VIRGINIA	WV
1c	72	PUERTO RICO	PR
1c	78	VIRGIN ISLANDS	VI
2	17	ILLINOIS	IL
2	18	INDIANA	IN
2	19	IOWA	IA
2	20	KANSAS	KS
2	21	KENTUCKY	KY
2	26	MICHIGAN	MI
2	27	MINNESOTA	MN
2	29	MISSOURI	MO
2	31	NEBRASKA	NE
2	38	NORTH DAKOTA	ND
2	39	OHIO	OH
2	40	OKLAHOMA	OK
2	46	SOUTH DAKOTA	SD
2	47	TENNESSEE	TN
2	55	WISCONSIN	WI
3	01	ALABAMA	AL
3	05	ARKANSAS	AR
3	22	LOUISIANA	LA
3	28	MISSISSIPPI	MS
3	35	NEW MEXICO	NM
3	48	TEXAS	TX
4	08	COLORADO	CO
4	16	IDAHO	ID
4	30	MONTANA	MT
4	49	UTAH	UT
4	56	WYOMING	WY
5	02	ALASKA	AK
5	04	ARIZONA	AZ
5	06	CALIFORNIA	CA
5	15	HAWAII	HI
5	32	NEVADA	NV
5	41	OREGON	OR
5	53	WASHINGTON	WA

The counties in each PADD were sorted into fuel groups using the January fuel properties and the July fuel properties. The fuel supply and fuel formulation data were taken from the 2005 fuels developed for the rule. The fuel parameters used for grouping and the ranges of values used for the bins are described in Table 2-5; the parameter categories in Table 2-5 are used in all calendar years for Tier 3 NPRM.

Table 2-5. Gasoline parameter categories

Gasoline Parameter	Category ID	Minimum Value (>=)	Maximum Value (<)
Reid Vapor Pressure (psi)	1	0	7.3
	2	7.3	8.2
	3	8.2	9.2
	4	9.2	100
Sulfur (ppm)	1	0	50
	2	50	100
	3	100	110
	4	110	1000
Ethanol (volume percent)	1	0	3
	2	3	8
	3	8	100
Benzene (volume percent)	1	0	1
	2	1	1.5
	3	1.5	2
	4	2	10

Some states have adopted California Low-Emissions Vehicle (LEV) highway vehicle emission standards or plan to adopt them. Since the emission rates in these states will be different than in neighboring states, they must be modeled separately. Also, because the implementation of California standards varies between these states, each state with California standards must be modeled independently from the other states with California standards as well. Each state with California standards will be treated separately when choosing representing counties. Table 2-6 shows the states with California emission standards.

Table 2-6. States adopting California emission standards

State ID	State Name	Abbreviation	CA Program Begins
06	California	CA	1994
25	Massachusetts	MA	1995
36	New York	NY	1996
50	Vermont	VT	2000
23	Maine	ME	2001
09	Connecticut	CT	2008
42	Pennsylvania	PA	2008
44	Rhode Island	RI	2008
41	Oregon	OR	2009
53	Washington	WA	2009
34	New Jersey	NJ	2009
24	Maryland	MD	2011
10	Delaware	DE	2014
35	New Mexico	NM	2016

The counties in each PADD-fuel group were sorted into groups with and without I/M vehicle inspection programs. I/M programs were determined using the 2005 calendar year entries in the IMCoverage table of the MOVES database. The I/M category is the state in which the county resides. All I/M programs within a state were considered as a single program, even though each county may be administered separately and have a different program design.

Altitude was also added as its own category. Altitude is a field in the County table of the MOVESDB20101006 database. Counties are either high (H) or low (L) altitude based on the criteria set forth by EPA certification procedures (4,000 feet above sea level). The result is a set of county groups with similar fuel, emission standards, altitude and I/M program. Then the county with the highest VMT in each group is chosen as the representing county. The categories are summarized below in Table 2-7.

Table 2-7. Summary of county grouping characteristics for representative counties

County Grouping Characteristic	Description
PADD	Petroleum Administration for Defense Districts (PADDs). PADD 1 is divided into three sub-PADD groupings and each sub-group is treated as a separate PADD (1a, 1b and 1c). Each state belongs to a PADD and all counties in any state are within the same PADD.
Fuel Parameters	Average gasoline fuel properties for January and July 2005, including RVP, sulfur level, ethanol fraction and percent benzene.
Emission Standards.	Some states have adopted California LEV highway vehicle emission standards or plan to adopt them. Since implementation of the standards varies, each state with California standards is treated separately.
Inspection/Maintenance Programs	Counties were grouped within a state according to whether or not they had an I/M program. All I/M programs within a state were considered as a single program, even though each county may be administered separately and have a different program design.
Altitude	Counties are either high or low altitude based on the criteria set forth by EPA certification procedures (4,000 feet above sea level).

Using these criteria, a set of 106 counties were selected to represent the nation. Of these, only 103 were needed to model the 48 states included in the modeling domain for the air quality analysis inventory. If MOVES runs were performed for all U.S. counties and months, there would be 3,141 counties (excluding AK and HI) times 12 months = 37,692 county-months rather than the 1,236 needed with representative counties. The MOVES runs for each representative county and fuel month were performed independently of one another on different computer processors, with each accessing a MySQL database specific to that run.

2.2.3 SMOKE-MOVES inputs

Both MOVES and SMOKE require meteorological data. The program met4moves takes gridded hourly meteorological data, the representative counties, and the representative fuel months as inputs and produces separate meteorological products for MOVES and SMOKE. Met4moves uses the representative counties and fuel months to determine the full range of meteorology in that county group. For each representative county and fuel month, it determines all the grid cells that fall within the corresponding counties in that county group for the number of months that correspond to the fuel month[2]. The temperature range is then determined by looking at the minimum and maximum temperature across all these grid cells for all hours in that time period. Relative humidity is calculated by taking an average over these same grid cells.

[2] Spatial surrogates are used in determining which grid cells to pull in calculating the various meteorological statistics. These spatial surrogates both map counties to grid cells. The spatial surrogates further limit the grid cells by determining whether some of the grid cells should not be included in the calculation of temperature range. For example, if some of the county has no roads or population, e.g. high mountains, then there is no reason to include it in the temperature range for onroad emissions.

For rate-per-profile (RPP) process emissions, SMOKE-MOVES uses the change in temperature over the day (i.e., the diurnal profile), instead of the temperature at the hour of processing. Met4moves create a series of diurnal profiles based on the extent of the temperature range and the size of the temperature bins. For MOVES, these diurnal profiles span the full range of temperatures for that representative county and fuel month. To satisfy SMOKE's needs in computing RPP emissions, met4moves creates a minimum and maximum temperature range for each county in the domain. Note that these temperature ranges are county-specific, and are not based on the representative county or county group.

Met4moves can be run in daily or monthly mode for producing SMOKE input. In monthly mode, the temperature range is determined by looking at the range of temperatures over the whole month for that specific county. Therefore, there is one temperature range per county per month. While in daily mode, the temperature range is determined by evaluating the range of temperatures in that county for that day. The output for the daily mode is one temperature range per county per day. Typically, the SMOKE input produced in monthly mode will have larger temperature ranges for each county than when it is run in daily mode. For the Tier 3 NPRM runs, met4moves was run in daily mode.

In addition to the lookup tables of emission rates produced by MOVES, SMOKE requires county-specific VMT, population, and average speed by road type to calculate the necessary emissions for air quality modeling. VMT by county and Source Classification Code (SCC) was developed using MOVES2010a and the National County Database. The National County Database (NCD20101201) contained the most recent estimates of 2005 VMT and the best available estimates of allocation of VMT from national to the county level at the time the modeling was performed. Accordingly, for the 2005 base year, the estimates of VMT by county and SCC were taken directly from the NCD.

The average speeds provided to SMOKE for each county were derived from the default national average speed distributions found in the default MOVES2010a database AvgSpeedDistribution table. These average speeds are the average speeds developed for the previous EPA highway vehicle emission factor model, MOBILE6. The same speed data was used for the base and future year cases.

In MOVES, there is a distribution of average speeds for each hour of the day for each road type. The average speeds in these distributions were used to calculate an overall average speed for each hour of the day. These hourly average speeds were weighted together using the default national average hourly vehicle miles traveled (VMT) distribution found in the MOVES default database HourlyVMTFraction table, to calculate an average speed for each road type. This average speed by road type was provided to SMOKE for each county.

2.2.4 Generating emission factors for SMOKE

After representative counties and fuel months were chosen, the met4moves script was executed to produce the set of MOVES RunSpecs and meteorology tables that would ultimately generate a set of SMOKE lookup tables encompassing the full range of temperatures for all the counties and months in each group. OTAQ also provided VMT, population, and average speed tables for every county.

The onroad model-ready emissions were produced by running SMOKE-MOVES using 103 representative counties and two fuel months. SMOKE-MOVES is a series of scripts and programs that 1) produce meteorological data for MOVES (Met4Moves), 2) construct a set of MOVES RunSpecs that produce lookup tables by temperature and average speed (runspec_generator), 3) process the MOVES lookup tables into a SMOKE-ready format (moves2smkEF), and 4) runs SMOKE. The way that OTAQ used SMOKE-MOVES differs somewhat from the way that SMOKE-MOVES was initially designed to be run. The full sequence of events was the following:

1) OAQPS ran met4moves for a nation-wide 12 km grid. This generated the temperatures needed for the emission factor lookup tables and an average humidity for each county and month. The inputs to met4moves are the hourly gridded temperature and humidity generated by the meteorological model used for CMAQ along with the list of representative counties and fuel months. For each representative county and fuel-month, met4moves queries all the grid cells in all the represented county-months to find the full range of temperatures and profiles needed and averages the relative humidity.

2) OTAQ ran the runSpec_generator Perl script, (runspec_generator_v0.3_04Nov2010.plx). The inputs to this process include the representative county list, fuel month list, temperature bin size (=10 degrees here), and the outputs from met4moves. The runspec_generator script produced MOVES run-specifications that control how the MOVES run is configured, along with zonemonthhour tables in CSV format. Specifications were generated for the three types of MOVES processes: rate-per-distance (RPD), rate-per-profile (RPP), and rate-per-vehicle (RPV). Run specifications were generated as needed to simulate the range of conditions reflected in the meteorological inputs. For RPD and RPV, a series of run specifications were created for each representative county, one for each temperature bin covering the temperature ranges provided by the met4moves output. For RPP, a second series of run specifications were created for each representative county, one for each diurnal profile provided by the met4moves output. The input data specific to each county were loaded into databases called "scaleinputdatabases", and the zonemonthhour tables were also loaded into databases.

3) OTAQ ran a tool to read the county databases, the zonemonthhour databases, other user-supplied databases, and the run specifications. The tool implemented LEV programs into the specifications as appropriate and also modified the pollutant-process associations in the run specifications to meet the needs of the Tier 3 NPRM. The tool then packaged the information into a form that could be used by the compute server.

4) OTAQ issued the command to start the required MOVES runs for each county and fuel month on the compute servers.

5) Once the MOVES runs were complete, OTAQ ran the moves2smkEF postprocessor to reformat the MySQL tables into the emission factor tables in CSV format that are readable by the SMOKE movesmrg program. The postprocessor also performed additional calculations to support SMOKE processing of CMAQ ready model emissions: speciating HONO from NO and NO_2, speciating the AE5 PM species (PEC, POC, PNO3, PSO4, PMFINE, and PMC for break and tire wear), and aggregating the detailed MOVES modes into 5 broader modes (exhaust, evaporative, permeation, break wear, and tire wear)[3].

6) OAQPS downloaded the emission factors from the server and executed SMOKE programs to produce gridded, hourly, speciated emissions for CMAQ. See the next section for details.

[3] The moves2smk postprocessor also corrects the extended idle emissions for RPV by merging in data from a separate national extended idle run and replaces missing EF from RPD due to missing SCCroadtypes in some reference counties.

2.2.5 Running SMOKE for onroad mobile

Running SMOKE using emission factors (EF) from MOVES required the development of a new set of functionality. The central SMOKE program that performs this new analysis is movesmrg which takes activity data, meteorological data, and the EF to produce gridded emissions. SMOKE is run independently for each of the three processes: rate-per-distance (RPD), rate-per-vehicle (RPV) and rate-per-profile (RPP).

The emissions process RPD is for modeling the on-network emissions. This includes the following modes: vehicle exhaust, evaporation, permeation, break wear, and tire wear. For RPD, the activity data is monthly VMT, monthly speed (SPEED), and hourly speed profiles for weekday versus weekend (SPDPRO)[4]. The SMOKE program temporal takes vehicle and roadtype specific temporal profiles and distributes the monthly VMT to day of the week and hour. Movesmrg reads the speed data for that county and SCC and the temperature from the gridded hourly data and uses these values to look-up the appropriate EF from the representative county's EF table. It then multiplies this EF by hourly temporalized VMT to calculate the emissions for that grid cell and hour. This is repeated for each pollutant and SCC in that grid cell.

The emissions process RPV is for modeling the off-network emissions. This includes the following modes: vehicle exhaust, evaporative, and permeation For RPV, the activity data is vehicle population (VPOP). Movesmrg reads the temperature from the gridded hourly data and uses the temperature plus SCC and the hour of the day to look up the appropriate EF from the representative county's EF table. It then multiplies this EF by the VPOP for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC in that grid cell.

The emissions process RPP is for modeling the off-network emissions for parked vehicles. This includes the mode vehicle evaporative (fuel vapor venting). For RPP, the activity data is VPOP. Movesmrg reads the county based diurnal temperature range from met4moves output for SMOKE. It uses this temperature range to determine the most similar idealized diurnal profile from the EF table using the temperature min and max, SCC, and hour of the day. It then multiplies this EF by the VPOP for that SCC and FIPS to calculate the emissions for that grid cell and hour. This repeats for each pollutant and SCC within the county. For more details on processing RPD, RPV, and RPP in SMOKE, see: http://www.smoke-model.org/version3.1/html/ch02s08s04.html.

MOVES was run for a series of representative counties and fuel months. For each representative county and fuel month, three EF tables were created: RPD, RPV, and RPP. SMOKE was run so that for each model day it would read in a single EF table (based on the appropriate fuel month), process all the counties that are part of the county group (i.e. are represented by that representative county), then read the next representative county EF table, etc. After all days in the model year were looped over, SMOKE has generated a separate set of daily intermediate files for each of the emissions processes (RPD, RPV, and RPP). Post-processing scripts were developed to integrate the process specific intermediate files into model-ready intermediate files for the onroad sector. These files were generated for a national 12km domain. To support the CMAQ runs they were further processed to create an aggregated 36km sector specific model-ready file and two 12km domains (12EUS1 and 12WUS1).

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[4] If the SPDPRO is available, the hourly speed takes precedence over the average speed in the SPEED inventory. Due to an oversight, SPDPRO was not used in the base and future-years modeling. A later sensitivity was run including the SPDPRO input for the base year which found that the use of hourly speed slightly increased the emissions for most pollutants (e.g. nationally NO_x showed a 0.8% increase, VOC showed a 1% increase, and $PM_{2.5}$ showed a 3% increase).

2.3 Nonroad mobile sources (nonroad, alm_no_c3, seca_c3)

The nonroad sectors include a wide-range of mobile emission sources ranging from locomotives, marine vessels, construction and farming equipment to hand-held lawn tools. As discussed in Section 4, nonroad upstream impacts also impact the (post-EPAct/EISA/RFS2) Tier 3 NPRM future year cases, reflecting increased ethanol production resulting in fuel volume increases for locomotives and C1/C2 CMV emissions.

2.3.1 Emissions generated with the NONROAD model (nonroad)

Most nonroad emissions were estimated using the NONROAD model, as run by EPA's NMIM. NONROAD is EPA's model for calculating emissions from nonroad equipment, except for aircraft, locomotives, and commercial marine vessels. The NONROAD model and extensive documentation can be found at http://www.epa.gov/otaq/nonrdmdl.htm. NMIM is a program that references a national database of county-month data, writes county-month input files for NONROAD based on that data, runs NONROAD once for every county and month requested by the user and collects the results in an output database. Information and downloads for NMIM can be found at http://www.epa.gov/otaq/nmim.htm. Rather than running every county, NMIM is designed to run NONROAD for "representative counties" and to use individual county activity data to develop national inventories.

Inputs for NMIM runs were stored in the NMIM County Database (NCD). The NCD version used for this modeling was NCD20101201Tier3. This NCD is based on NCD20101201, which is the version that includes all updates from the 2008 National Emission Inventory process described at http://www.epa.gov/ttn/chief/net/2008inventory.html. For this analysis, updates were made to the underlying fuel supply for the Tier 3 NPRM future year reference cases. Thus, the NCD20101201Tier3 contained special versions of countyyearmonth, gasoline, and diesel. The fuels in the NCD2010201Tier3 were developed from the fuels used for onroad vehicles, as described in Section 2.2.1.

A special countymonthhour table that contained 2005 meteorology was copied into the standard countymonthhour table. The use of the countymonthhour table for meteorology was selected by the RunSpec setting useYearlyWeatherDataSelected="false." A minor change was also made for snowmobiles: the SCC toxics table in the NMIM County Database (NCD) was updated to correct 1,3-butadiene exhaust emissions for 2-stroke snowmobiles (SCC 2260001020), as shown in Table 2-8 below. This correction addressed an issue identified in air quality modeling for the RFS2 rule, where unexpected increases in ambient concentrations were observed in rural areas during winter due to snowmobile emissions, available at: http://www.epa.gov/otaq/renewablefuels/420r10006.pdf. The increases were based on data from only three engines, which showed unusually high1,3-butadiene emissions with 10% ethanol (Eth oxygenate). Other data suggests that this increase is highly unlikely to be representative of the in-use fleet as a whole; thus results were corrected to those in the "NCD20101201Tier3" column. In Table 2-8, Base Gasoline represents cases where the fuel type is not Eth, MTBE or RFG. Eth gas is used where the fuel contains ethanol which is greater than or equal to 5% by volume or Ethyl Tertiary Butyl Ether (ETBE) is greater than or equal to 5% by volume. MTBE gas is used where the fuel contains MTBE which is greater than or equal to 12% by volume or Tertiary Amine Methyl Ether (TAME) is greater than or equal to 13% by volume. Finally, RFG gas is used where the fuel is RFG and where the fuel contains oxygenate greater than 5% by volume and where the fuel contains MTBE which is less than 12% by volume or TAME is less than 13% by volume.

Table 2-8. Updated 1,3-butadiene to VOC ratio for 2-stroke snowmobiles for NMIM's gasoline categories

Fuel Type	**NCD20101201**	**NCD20101201Tier3**
Base Gasoline	0.0012	0.0012
Ethyl Tertiary Butyl Ether (Eth) Gas	0.00732	0.0012
Methyl Tertiary Butyl Ether (MTBE) Gas	0.0012	0.0012
Reformulated Gasoline (RFG) Gas	0.0012	0.0012

A special county map table was developed to use representing counties in the NMIM runs. The algorithm for producing representing counties for NMIM was identical to that used for MOVES except that ten degree temperature bins were added to the criteria. The result was 293 representing counties. Finally, NMIM does not estimate ethanol emissions, so the inventory for this pollutant was from the chemical speciation that is obtained by post-processing through SMOKE.

2.3.1.1 Representing counties for NONROAD

"Representing counties" is a way of saving NMIM run-time by grouping together similar counties and generating emission factors by running the NONROAD model for only one of those counties and then using those emission factors for all the counties in the group. For this analysis, 293 county groups were developed. The counties in each group were in the same state, had similar fuels in both summer and winter, and had similar I/M programs. Since there are winter fuels and summer fuels, January was chosen as the fuel-month to represent the seven months October through April, and July was chosen to represent the five months May-September. The total number of county-months for which NMIM runs needed to be performed was thus 293 times 12 months = 3,516 county-months for each scenario-year. If NMIM runs were performed for all U.S. counties and months, there would be 3141 counties (excluding AK and HI) times 12 months = 37,692 county-months. Representing counties were chosen for NONROAD model NMIM runs by grouping counties based on the characteristics listed in Table 2-9.

Table 2-9. Criteria for grouping representative counties for nonroad mobile analysis

Characteristic	Grouping Criteria
Petroleum Administration for Defense District (PADD)	All counties in a group must be in the same PADD.
Gasoline parameters	Fuel bins were created for RVP, sulfur, benzene, and ethanol. All counties in each group had all of these fuel properties in the same bins for all twelve months.
Inspection/Maintenance Programs	Counties with I/M programs were grouped with other counties with I/M programs in the same state.
Altitude	All counties in the group must be in the same altitude category (high or low).
Temperatures	All counties in the group must have similar temperatures, as detailed below.

Nonroad inventories are not calculated on a grid basis, as the highway mobile sources were. So, when running NMIM for nonroad emissions, the representing counties must also account for temperatures. The temperatures are taken from the 2005 calendar year values in the CountyYearMonthHour table of the NCD20100602 NMIM database. As shown in

Table 2-10, ten-degree Fahrenheit (F) bins were created for min and max temperatures for each month. All counties in each group had all min and max temperatures for all twelve months in the same bins. The lowest interval includes all temperatures below -10 degrees F. The highest interval includes all temperatures above 100 degrees F.

Table 2-10. NONROAD model temperature (F) categories

Temperature Bin	Minimum Temperature (>=)	Maximum Temperature (<)
1	-20	-10
2	-10	0
3	0	10
4	10	20
5	20	30
6	30	40
7	40	50
8	50	60
9	60	70
10	70	80
11	80	90
12	90	100
13	100	200

Once counties were grouped, the representing county was chosen as the one with the highest VMT. The same set of 293 county groups and representing counties was used for all years and scenarios.

2.3.1.2 Fuel inputs for NONROAD runs

For the nonroad mobile portion of the inventory estimates for the rule, the NMIM county database (NCD) developed for the 2005 NEI, with the one exception of the county-specific fuel properties, was used to calculate nonroad emissions. The fuels that were developed for use with MOVES to compute onroad mobile emissions for the Tier 3 NPRM (see Section 2.2) were converted to NMIM fuels. Practically, this means the fuelsupply and fuelformulation tables from MOVES were converted into the countyyearmonth, gasoline, and diesel tables in the NCD. For the year 2005 modeling, onroad and nonroad gasoline formulations are assumed to be identical.

MOVES allows for multiple gasoline fuels, each with a market-share, for a single county-month, the market shares always sum to one. The NCD allows only one fuel per county month, but, for each of the four oxygenates (ETOH, MTBE, TAME, and ETBE), the NCD has columns for both volume percent and market share. The sum of these market shares is less than or equal to one. If the market-share is less than one, the remainder of the market is non-oxygenated (conventional) gasoline. When there are multiple MOVES gasoline fuels for a single county-month, non-oxygenate MOVES fuel properties are multiplied by market share and summed to produce the fuel property in the gasoline table. Individual non-ethanol oxygenates and California ethanol occur in only one fuel per county-month in MOVES, so the volume and market share are transferred to the appropriate columns for that oxygenate in NMIM. In states other than California, for multiple ethanol volumes with volume percents less than 10, the product of market-share and volume percent is averaged and then divided by 10, resulting in a market share for E10.

2.3.1.3 NMIM runs

Table 2-11 shows the NMIM runs that were performed to generate the NONROAD model county-month results for both national inventories and air quality modeling inventories.

Table 2-11. NONROAD NMIM runs

Case	Year	Run Name
Base	2005	Tier3Base2005Nr
Reference	2017	Tier3Ref2017e10Nr
Reference	2030	Tier3Ref2030NrAdj2
Control	2017	Tier3Ctla2017e10Nr
Control	2030	Tier3Ctl2030NrAdj2

MOVES fuels were used for future year cases and converted to NMIM format. However, for 2017, EPA assumed that nonroad equipment would use only E10. For 2030, EPA assumed that nonroad equipment would use only E15. The details of the fuels conversion from MOVES to NMIM were discussed above. Table 2-12 describes the components in the NONROAD/NMIM system common to all Tier 3 NPRM modeling scenarios.

Table 2-12. Summary of NONROAD modeling components

Model	Version	Description
NONROAD	NR08b	This is identical to the official NONROAD2008, (see: http://www.epa.gov/otaq/nonrdmdl.htm#model) except it was modified to allow modeling of emissions on E15 fuels in 2030. The existing fuel effects algorithm was retained.
NMIM Code	NMIM20090504b	This is the same as the official NMIM2008a software, (available at http://www.epa.gov/otaq/nmim.htm) except the NONROAD model was updated to NRO8b.
NMIM Database	NCD20101201Tier3	This is based on NCD20101201, which was developed for the 2008 NEI. It was adapted to model the desired scenarios.
Meteorology	NCD20101201Tier3	Historical data for calendar year 2005 from the National Climatic Data Center. County temperatures were determined by weighting nearby temperature stations by their distance from the population-based centroid of each county.

2.3.2 Locomotives and commercial marine vessels (alm_no_c3, seca_c3)

The year 2005 emissions for locomotive and commercial marine vessel sources used for this rule are the same as they were for the Final Rulemaking: Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles signed on August 9, 2011 and available at http://www.epa.gov/oms/climate/regulations.htm#1-2, and the Final Cross-State Air Pollution (CSAPR) Rule: ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_28jun2011.pdf. The procedures for calculating emissions from locomotives and C1/C2 commercial marine were developed for the Locomotive Marine Rule (2008) and are detailed in the RIA "Final Rule: Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder", published May 6, 2008 and republished June 30, 2008, and available at: http://www.epa.gov/oms/locomotives.htm#2008final. The procedures used for calculating C3 commercial marine emissions are those developed in the recent C3 "Final Rule: Control of Emissions from New Marine Compression-Ignition Engines at or Above 30 Liters per Cylinder", published April 30, 2010 and available at: http://www.epa.gov/oms/oceanvessels.htm#car-ems.

2.4 2005 point sources (ptipm and ptnonipm sectors)

Point sources are sources of emissions for which geographic coordinates (e.g., latitude/longitude) are specified, as in the case of an individual facility. A facility may have multiple emission points that may be characterized as units such as boilers, reactors, spray booths, kilns, etc. A unit may have multiple processes (e.g., a boiler that sometimes burns residual oil and sometimes burns natural gas). Note that this section describes only NEI point sources within the contiguous United States. The offshore oil platform (othpt sector) and category 3 CMV emissions (seca_c3 sector) are also point source formatted inventories but are unchanged for the Tier 3 NPRM modeling from the modeling of other recent rules. Discussion of the seca_c3 and othpt sector emissions can be found in the Final CSAPR TSD referenced in Section 2.3.2.

After removing offshore oil platforms (othpt sector), two platform sectors were created from the remaining 2005v2 NEI point sources to provide inputs into SMOKE: the EGU sector – also called the Integrated Planning Model (IPM) sector (i.e., ptipm) and the non-EGU sector – also called the non-IPM sector (i.e., ptnonipm). This split facilitates the use of different SMOKE temporal processing and future-year projection techniques for each of these sectors, along with the replacement of ptipm emissions with outputs from IPM in emissions cases for future years. The inventory pollutants processed through SMOKE for both ptipm and ptnonipm sectors were: CO, NO_X, VOC, SO_2, NH_3, PM_{10}, and $PM_{2.5}$ and the following HAPs: HCl (pollutant code = 7647010), and Cl2 (code = 7782505). We did not utilize BAFM from these sectors as we chose to speciate VOC without any use (i.e., integration) of VOC HAP pollutants from the inventory. Integration is discussed in detail in Section 3.

The ptnonipm emissions were provided to SMOKE as annual emissions. The ptipm emissions for the base case were input to SMOKE as daily emissions. The ptipm emissions are unchanged from those in the 2005v4.2 –the basis for the Final CSAPR and Heavy Duty Greenhouse Gas (HDGHG) FRM- emission modeling platform. However, for the ptnonipm sector for all Tier 3 NPRM scenarios, including year 2005 emissions, additional known ethanol plants were included that were not in 2005v4.2. We also removed all onroad refueling emissions as these were replaced with MOVES-based onroad refueling emissions (discussed in Section 2.5.2).

2.4.1 Ethanol plants (ptnonipm)

The ethanol plant information originally used in the RFS2 rule was updated. All ethanol plants were assigned coordinates based on analysis using searches of company web sites and Google Earth verification for many sites. Emissions were calculated based on plant design capacity and emission factors based on production process and energy source (e.g. dry mill natural gas, wet mill coal, etc.). Finally, because benzene, acetaldehyde and formaldehyde (BAF) emissions were directly computed for these sources, we treated these ethanol plants as VOC integrate sources, unlike the rest of the ptnonipm sector. A summary of the ethanol plant emissions used in the 2005 scenario is provided in

Table 2-13. More details are provided in a memorandum to the docket (Cook, 2012).

Table 2-13. 2005 ethanol plant emissions

Pollutant	Emissions
1,3-Butadiene	0.0003
Acrolein	10.5
Formaldehyde	13.3
Benzene	5.7
Acetaldehyde	314.4
CO	7,023
NO_X	8,204
PM_{10}	10,107
$PM_{2.5}$	3,691
SO_2	9,001
VOC	10,754

2.5 2005 nonpoint sources (afdust, ag, avefire, nonpt)

The year 2005 area-source fugitive dust (afdust), agricultural animal and fertilizer NH_3 (ag), and average (typical)-year fires (avefire) emissions are the same as those used in the CSAPR Final (2005v4.2) emission modeling platform. Nonpoint sources that were not subdivided into the afdust, ag, or avefire sectors were assigned to the "nonpt" sector, and most of these sources are also unchanged for Tier 3 NPRM modeling. The 2005 nonpoint sources that change in this study are limited to portable fuel containers (PFCs) and onroad refueling.

2.5.1 Portable fuel containers

Year 2005 PFC emissions are unchanged from the CSAPR Final inventory except for the addition of ethanol. Ethanol emissions were not provided for 2005, but were supplied for future year scenarios. Therefore, we scaled year 2017 pre-RFS2 (not Tier 3 NPRM reference case) ethanol emissions by the ratio of 2005 to 2017 pre-RFS2 VOC emissions to compute year 2005 ethanol emissions as follows:

Ethanol_2005 = Ethanol_2017(pre-RFS2) * [VOC_2005 / VOC_2017(pre-RFS2)]

2.5.2 Onroad refueling

As mentioned in Section 2.2, NEI-based onroad refueling emissions were replaced with estimates from the revised version of EPA's Motor Vehicle Emissions Simulator (MOVES2010a) at the county level for all twelve months. This section describes how the emission inventories for refueling from on-road vehicles in calendar years 2005, 2017 and 2030 for Tier 3 NPRM reference and control cases were generated for air quality modeling. The refueling inventory includes emissions from spillage loss and displacement vapor loss. For this analysis, the refueling emissions were estimated using the revised Tier 3 version of EPA's Motor Vehicle Emissions Simulator (MOVES2010a) at the county level for all twelve months.

In an effort to reduce MOVES runtime, the "representing counties" approach was used instead of running every single county in the lower 48 states. As described in Section 2.2 for onroad counties, we selected representing counties by grouping counties based on Petroleum Administration for Defense Districts (PADD), fuel parameters, usage of California emission standards, I/M programs, and altitude. One additional parameter included in developing the representing counties for refueling was temperature.

Temperature bins with increments of ten degrees F were created for the minimum and maximum temperatures for each month using the temperatures from the 2005 calendar year values in the

CountyYearMonthHour table of the NMIM County Database (NCD) NCD20100602 NMIM database. All counties in each group had min and max temperatures for all twelve months in the same temperature bins.

Once counties were grouped, the representing county was chosen as the one with the highest VMT, resulting in total of 238 counties. The same set of county groups and representing counties was used for all years and scenarios.

MOVES was run in inventory mode for only the representing counties using the county-specific on-road data, such as vehicle miles travelled, fleet age distribution, speed distribution, and meteorology, available from the NCD. The customized fuel inputs, discussed in Section 2.2.2.1, were used for each of the representing counties.

The resulting refueling emission inventories for 238 representing counties in U.S. short tons were converted to emission factors by dividing the inventory by the corresponding activity in each representing county. Then, the calculated emission factors from the representing counties were applied to the represented counties and multiplied by the county-specific activity to generate the inventories for all counties.

2.6 Other sources (biogenics, othpt, othar, and othon)

All emissions from Canada, Mexico, and Offshore Drilling platforms (othpt, othar, and othon), and all non-anthropogenic inventories (biogenics and ocean chlorine) are unchanged from the 2005v4.2 (used for the Final CSAPR and HDGHG FRM) emissions modeling platform. The same emissions are used for all Tier 3 NPRM scenarios and years.

3 VOC Speciation Changes that Represent Fuel Changes

A significant detail that is different in each of the Tier 3 NPRM modeling cases and different from the 2005v4.2 emissions modeling is the VOC speciation profiles used to split total VOC emissions into the VOC model species needed for CMAQ. In this section, we summarize the various speciation profile information used in configuring the various cases.

A major change between the 2005v4.2 platform and the Tier 3 NPRM base and future modeling is the integration of ethanol for key sectors and specific inventories. In the previous platform, the inventories for specific sources had benzene, acetaldehyde, formaldehyde and/or methanol (BAFM). These emissions would be integrated, namely their emissions would come from the inventory not from speciating VOC. To prevent double counting, BAFM would be removed from VOC, leaving the remainder (NONHAPVOC) to be speciated to other components (i.e. non-BAFM species). See section 3.1.2.1 of the 2005v4 platform for more details ftp://ftp.epa.gov/EmisInventory/2005v4/2005_emissions_tsd_07jul2010.pdf.

In the Tier 3 NPRM modeling, if ethanol was present in the inventories, it would also be integrated. To differentiate when a source was integrating BAFM versus EBAFM (ethanol in addition to BAFM), the speciation profiles which do not include ethanol are referred to as an "E-profile", for example pre-Tier 2 vehicles E10 gasoline exhaust speciation profile 8751 where ethanol is speciated from VOC, versus 8751E where ethanol is obtained directly from the inventory. For the onroad sector, ethanol is integrated for all emissions from gasoline vehicles. For the nonpt sector, ethanol is integrated for refueling and portable fuel containers (PFCs). In the future-year case, the nonpt sector includes a cellulosic corn ethanol and biodiesel inventory (SCC 30125010) in which ethanol is integrated. For fuel distribution operations associated with the bulk-plant-to-pump (btp) distribution, ethanol is speciated from VOC –thus a "BAFM" profile- because the fuel distribution operations in the nonpoint inventories are NEI-based and therefore do not include ethanol specifically because the NEI does not provide ethanol as a pollutant.

The onroad sector has some additional changes to VOC speciation. Instead of speciating VOC directly, SMOKE-MOVES uses TOG instead of VOC. Therefore, SMOKE does not need to convert VOC to TOG before creating NONHAPTOG and performing additional speciation. A second change in VOC speciation is the differentiation of a new mode. In previous platforms, onroad mobile emissions were divided into exhaust, evaporative and refueling modes. For the Tier 3 NPRM base and future years, gasoline vehicle's evaporative mode is further divided into permeation-specific emissions and evaporative. Similar to evaporative and exhaust profiles, these profiles change between the base and future year cases. Additional updates include headspace vapor speciation utilizes a combination of the E10 headspace vapor profile and E0 headspace vapor profile as opposed to using solely E0 for 2005[5], and a new Heavy Duty Diesel vehicle exhaust mode profile for pre-2007 model year (MY) vehicles that replaces an older 2004-vintage medium-duty diesel profile. See Table 3-1 for more details.

The VOC speciation approach is customized to account for the impact of fuel changes in the future year cases. These changes affect the onroad sector, the nonroad sector, and parts of the nonpt and ptnonipm sectors. These fuel changes and vehicle changes are implemented by using different VOC profiles and combinations of profiles between the base and future cases. The speciation changes from fuels in the nonpt sector are for refueling, cellulosic ethanol and cellulosic diesel, portable fuel containers (PFCs), and fuel distribution operations associated with the bulk-plant-to-pump (btp) distribution. The speciation changes from fuels in the ptnonipm sector include btp distribution operations inventoried as point sources. Refinery to bulk terminal (rbt) fuel distribution and bulk plant storage (bps) speciation does not change across the modeling cases because this is considered upstream from the introduction of ethanol into the fuel. Mapping of fuel distribution SCCs to btp and rbt emissions categories can be found in Appendix B of the Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 5.0, 2007 Emissions Modeling Platform, http://epa.gov/ttn/chief/emch/2007v5/2007v5_TSD_Appendices_14dec12.pdf.

Note that VOC speciation is customized by using different speciation profiles in the base versus future year cases. For some sources related to the mobile sector and fuel distribution, a combination of profiles are specified by county, month and mode (e.g. exhaust, evaporative, permeation). SMOKE calculates a resultant profile by calculating the fraction of each profile by month, county, and mode. The GSPRO_COMBO ancillary file controls this feature in SMOKE. The GSPRO_COMBO file represents the county specific mixture of fuels, for example the mixture of E10 and E0. For the nonpt sector, a further complication in developing the GSPRO_COMBO is differentiating the sources that integrate ethanol (i.e. use E-profiles) and those that do not integrate ethanol. By using the mode for refueling (RFL__VOC) and PFC (EVP__VOC), these ethanol integrated sectors can be differentiated from btp (VOC).

Table 3-1 summarizes the different profiles utilized for the fuel-related sources in each of the sectors for 2005 and the future year cases. A comparison of the 2005v4.2 platform with the Tier 3 NPRM 2005 case is also included. Appendix A lists ancillary input data set names used for Tier 3 NPRM emissions modeling.

[5] This was an oversight in the 2005v4.2 platform corrected for this modeling effort.

Table 3-1. Summary of VOC speciation profile approaches by sector across cases

Category	2005v4.2		2005 Tier 3 NPRM		2017 Tier 3 reference & control		2030 reference & control	
Onroad Gasoline								
Exhaust	COMBO		COMBO		COMBO		8758E	Tier2 E15 Exhaust
	8750	Pre-Tier 2 E0 Exhaust	8750E	Pre-Tier 2 E0 Exhaust	8751E	Pre-Tier 2 E10 Exhaust		
	8751	Pre-Tier 2 E10 Exhaust	8751E	Pre-Tier 2 E10 Exhaust	8757E	Tier 2 E10 Exhaust		
					8758E	Tier 2 E15 Exhaust		
Evaporative	COMBO		COMBO (All evap except permeation)		COMBO (All evap except permeation)		8872E	E15 Evap
	8753	E0 Evap	8753E	E0 Evap	8754E	E10 Evap		
	8754	E10 Evap	8754E	E10 Evap	8872E	E15 Evap		
			COMBO (Permeation evap)		COMBO (Permeation evap)		8770E	E15 Evap permeation
			8766E	E0 Evap perm	8769E	E10 Evap perm		
			8769E	E10 Evap perm	8770E	E15 Evap perm		
Refueling	8762	E0 Headspace composite	COMBO		COMBO		8871E	E15 Headspace
			8869E	E0 Headspace	8870E	E10 Headspace		
			8870E	E10 Headspace	8871E	E15 Headspace		
Onroad Diesel								
Exhaust	4674	2004 MDD exhaust	8774	Pre-2007 MY HDD exhaust	877T3	Pre & Post 2007 MY HDD exhaust	8775	2007+ MY HDD Exh
							877RM	Weighted HDD Exh[a]
					Weighted 8774 and 8775 profiles		877RH	Weighted HDD Exh[b]
							[a] Class 6&7 HDDVs	
							[b] Class 8a&8b HDDVs	
Evaporative	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace
Refuel	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace
Nonroad Gasoline								
Exhaust	COMBO		COMBO		8751	Pre-Tier 2 E10 exhaust	8758	Tier 2 E15 exhaust
	8750	Pre-Tier 2 E0 exhaust	8750	Pre-Tier 2 E0 exhaust				
	8751	Pre-Tier 2 E10 exhaust	8751	Pre-Tier 2 E10 exhaust				
Evaporative	COMBO		COMBO		8754	E10 Evap	8872	E15 Evap
	8753	E0 evap	8753	E0 evap				
	8754	E10 evap	8754	E10 evap				

Category	2005v4.2		2005 Tier 3 NPRM		2017 Tier 3 reference & control		2030 reference & control	
Refueling	8762	E0 Headspace composite	COMBO		8870	E10 Headspace	8871	E15 Headspace
			8869	E0 Headspace				
			8870	E10 Headspace				
Nonroad Diesel								
Exhaust	4674	2004 MDD exhaust	8774	Pre-2007 MY HDD exhaust	8774	Pre-2007 MY HDD exhaust	8774	Pre-2007 MY HDD exhaust
Evaporative	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace
Refueling	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace	4547	Diesel Headspace
PFC	8762	E0 Headspace composite	COMBO		8870E	E10 Headspace	8871E	E15 Headspace
			8869E	E0 Headspace				
			8870E	E10 Headspace				
Aircraft	5565	Aircraft Exhaust	5565*	Aircraft Exhaust	5565*	Aircraft Exhaust	5565*	Aircraft Exhaust
			* Updated version in SPECIATE 4.3		* Updated version in SPECIATE 4.3		* Updated version in SPECIATE 4.3	
Locomotives	4674	2004 MDD exhaust	8774	Pre-2007 MY HDD exhaust	8774	Pre-2007 MY HDD exhaust	8774	Pre-2007 MY HDD exhaust
Marine	2480	Ship Channel Downwind	2480	Ship Channel Downwind	2480	Ship Channel Downwind	2480	Ship Channel Downwind
BTP	8762	E0 Headspace composite	COMBO		COMBO		8871	E15 Headspace
			8869	E0 Headspace	8870	E10 Headspace		
			8870	E10 Headspace	8871	E15 Headspace		
RBT/BPS	8762	E0 Headspace composite	8869	E0 Headspace	8869	E0 Headspace	8869	E0 Headspace
Ethanol Plants	1188	fermentation process	8776	Ethanol Fuel Prod	8776	Ethanol Fuel Prod[a]	8776	Ethanol Fuel Prod[a]
					8776E	Ethanol Fuel Prod[b]	8776E	Ethanol Fuel Prod[b]
					[a] corn ethanol and biodiesel ptnonipm		[a] corn ethanol and biodiesel ptnonipm	
					[b] cellulosic ethanol & cellulosic diesel nonpt		[b] cellulosic ethanol & cellulosic diesel nonpt	

4 2017 and 2030 Reference Cases

The 2017 and 2030 Tier 3 NPRM reference cases represent emissions in the future, including emissions impacts of the fuel volumes mandated by the 2005 EPAct and 2007 EISA and finalized in the RFS2 program. The reference cases include MSAT2 and LDGHG but do not include HDGHG impacts. The 2017 reference case assumes 21.6 billion gallons of renewable fuels (24 billion ethanol-equivalent gallons due to volume increases of ethanol), with 17.8 billion gallons of E10 and E15, 1.5 billion gallons of biodiesel, 0.2 billion gallons of renewable diesel, and 2.2 billion gallons of cellulosic diesel. By the year 2030, the reference case assumes 30.5 billion gallons of renewable fuels (36 billion ethanol-equivalent gallons due to volume increases of ethanol), with 22.2 billion gallons of E15 (no E10), 1.7 billion gallons of biodiesel, 0.2 billion gallons of renewable diesel, and 6.5 billion gallons of cellulosic diesel. The fuel changes required upstream emissions estimates and adjustments in addition to the downstream changes to onroad and nonroad mobile source emissions. For nonroad mobile sources, and for onroad mobile including refueling sources, OTAQ-generated emissions were provided to reflect the reference case fuels.

The 2017 and 2030 reference cases use many of the same growth and control assumptions as those for the Final Cross-State Air Pollution Rule (CSAPR), because other than onroad mobile, nonroad mobile, onroad refueling, PFC, and ethanol plant sources, both Tier 3 NPRM and CSAPR use the same 2005v4.2-based emissions inventories. There are some differences between the shared projection inputs from the 2012 and 2014 base case projections in CSAPR and the 2017 and 2030 reference cases for Tier 3 NPRM:

1) 2017 includes some additional controls that were promulgated after 2014, (e.g., post-2014 consent decrees and fuel sulfur rules in a couple of states). Likewise, 2030 includes some additional controls promulgated after 2017.
2) Growth factors for several sources are year-specific; so while the methodology is the same as CSAPR, the future year emissions estimates differ (e.g., oil and gas in a couple states, residential wood combustion).
3) Onroad refueling uses year and scenario-specific (i.e., reference) MOVES emissions for all Tier 3 NPRM modeling, rather than NEI emissions.
4) There is a new dataset of ethanol plants that replaces a limited set of NEI ethanol plants in 2005v4.2-based CSAPR 2012 and 2014 projections. These Tier 3 reference case emissions are different in 2017 and 2030 and also in the 2005 base case.
5) Minor errors identified after CSAPR modeling was complete were fixed (e.g., we include agricultural dust projections for the couple of states that provided point source farms).

There are other new inputs unique to the Tier 3 NPRM reference cases that were not part of the CSAPR projections. Examples of these are RFS2 upstream inputs such as biodiesel and cellulosic ethanol plants. These new inputs and projections for Tier 3 NPRM reference cases are discussed later in this section. The remainder of Section 4 is very similar to Section 4 in the CSAPR emissions modeling TSD, available from ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_28jun2011.pdf, but with the updates just discussed.

The future case projection methodologies vary by sector. For EGU emissions (ptipm sector), the emissions reflect state rules and federal consent decrees through December 1, 2010. For onroad mobile sources, all national measures for which data were available at the time of modeling have been included. The future case scenarios reflect projected economic changes and fuel usage for EGU and mobile sectors. For nonEGU point (ptnonipm sector) and nonpoint stationary sources (nonpt, ag, and afdust sectors), local control programs that might have been necessary for areas to attain the 1997 $PM_{2.5}$ NAAQS annual standard, 2006 PM NAAQS (24-hour) standard, and the 1997 ozone NAAQS are generally not included in the future base-case projections for most states. Exceptions are some NO_X and VOC reductions associated with the New York, Virginia, and Connecticut State Implementation Plans (SIP), which were added as part of the comments received from the CSAPR and a larger effort to start including more local control information on stationary non-EGU sources; this is described further in Section 4.2. The following bullets summarize the projection methods used for sources in the various sectors, while additional details and data sources are given in Table 4-1.

- IPM sector (ptipm): Unit-specific estimates from IPM, version 4.10.
- Non-IPM sector (ptnonipm): Projection factors and percent reductions reflect CSAPR (Transport Rule) comments and emission reductions due to control programs, plant closures, consent decrees and settlements, and 1997 and 2001 ozone State Implementation Plans in NY, CT, and VA. We also used projection approaches for point-source livestock and aircraft that are consistent with projections used for the sectors that contain the bulk of these emissions. Terminal area forecast (TAF) data aggregated to the national level were used for aircraft to account for projected changes in landing/takeoff activity. Year-specific speciation was applied to some portions of this sector and was discussed in Section 3.
- Average fires sector (avefire): No growth or control.
- Agricultural sector (ag): Projection factors for livestock estimates based on expected changes in animal population from 2005 Department of Agriculture data; no growth or control for NH_3 emissions from fertilizer application.
- Area fugitive dust sector (afdust): Projection factors for dust categories related to livestock estimates based on expected changes in animal population; no growth or control for other categories in this sector.
- Remaining Nonpoint sector (nonpt): Projection factors that implement CSAPR Proposal comments and reflect emission reductions due to control programs. Residential wood combustion projections based on growth in lower-emitting stoves and a reduction in higher emitting stoves. PFC projection factors reflecting impact of the final Mobile Source Air Toxics (MSAT2) rule and include ethanol emissions. Gasoline stage II onroad refueling emissions obtained directly from MOVES. Oil and gas projection estimates are provided for the non-California Western Regional Air Partnership (WRAP) states as well as Oklahoma and Texas. Year-specific speciation was applied to some portions of this sector and was discussed in Section 3.
- Nonroad mobile sector (nonroad): Same version of the NONROAD2008a, including same set of 293 county groups and representing counties as the 2005 base case. Future-year equipment population estimates and control programs (final locomotive-marine and small spark ignition) to years 2017 and 2030 are included. The only differences between the Tier 3 NPRM future case runs are the fuels used, specifically, the ratio of E10 and E15 fuels. Year-specific speciation was applied to some portions of this sector and is discussed in Section 3.
- Locomotive, and non-Class 3 commercial marine sector (alm_no_c3): Projection factors for Class 1 and Class 2 commercial marine and locomotives which reflect CSAPR Proposal comments and activity growth and final locomotive-marine controls.
- Class 3 commercial marine vessel sector (seca_c3): Base-year 2005 emissions grown and controlled to 2017 and 2030, incorporating CSAPR Proposal comments and controls based on Emissions Control Area (ECA) and International Marine Organization (IMO) global NO_X and SO_2 controls.
- Onroad mobile: uses a version of MOVES developed for the Tier 3 NPRM that incorporates new car and light truck greenhouse gas emissions standards (LDGHG) affecting model years 2012 and later

(published May 7, 2010). These emissions also include RFS2 fuels. VOC speciation uses different future-year values to take into account both the increase in ethanol use, and the existence of Tier 2 vehicles that use a different speciation profile. This sector includes all non-refueling onroad mobile emissions (exhaust, evaporative, brake wear and tire wear modes). SMOKE-MOVES was used in a similar configuration as the 2005 base case to apportion MOVES emissions factors into hourly gridded temperature-adjusted emissions.

- Other nonroad/nonpoint (othar): No growth or control.
- Other onroad sector (othon): No growth or control.
- Other nonroad/nonpoint (othar): No growth or control.
- Other point (othpt): No growth or control.
- Biogenic: 2005 emissions used for all future-year scenarios.

Table 4-1 summarizes the control strategies and growth assumptions by source type that were used to create the 2017 and 2030 reference-case emissions from the 2005v4.3 base-case inventories. EGU projections are discussed separately in the next section. These future year reference case projections and controls are also included in the Tier 3 NPRM control cases. All Mexico, Canada, and offshore oil emissions are unchanged in all future cases from those in the 2005 base case.

The remainder of this section is organized either by source sector or by specific emissions category within a source sector for which a distinct set of data were used or developed for the purpose of projections for the Tier 3 NPRM. This organization allows consolidation of the discussion of the emissions categories that are contained in multiple sectors, because the data and approaches used across the sectors are consistent and do not need to be repeated. Sector names associated with the emissions categories are provided in parentheses.

Table 4-1. Control strategies and growth assumptions for creating the Tier 3 NPRM 2017 and 2030 reference case emissions inventories from the 2005 base case

Control Strategies and/or growth assumptions (grouped by affected pollutants or standard and approach used to apply to the inventory)	**Pollutants affected**	**Approach/ Reference**
Non-EGU Point (ptnonipm sector) projection approaches		
MACT rules, national, VOC: national applied by SCC, MACT Boat Manufacturing Wood Building Products Surface Coating Generic MACT II: Spandex Production, Ethylene manufacture Large Appliances Miscellaneous Organic NESHAP (MON): Alkyd Resins, Chelating Agents, Explosives, Phthalate Plasticizers, Polyester Resins, Polymerized Vinylidene Chloride Reinforced Plastics Asphalt Processing & Roofing Iron & Steel Foundries Metal: Can, Coil Metal Furniture Miscellaneous Metal Parts & Products Municipal Solid Waste Landfills Paper and Other Web Plastic Parts Plywood and Composite Wood Products Carbon Black Production Cyanide Chemical Manufacturing Friction Products Manufacturing Leather Finishing Operations Miscellaneous Coating Manufacturing Organic Liquids Distribution (Non-Gasoline) Refractory Products Manufacturing Sites Remediation	VOC	EPA, 2007a
Consent decrees on companies (based on information from the Office of Enforcement and Compliance Assurance – OECA) apportioned to plants owned/operated by the companies	VOC, CO, NOx, PM, SO_2	1
DOJ Settlements: plant SCC controls for: Alcoa, TX Premcor (formerly Motiva), DE	All	2
Refinery Consent Decrees: plant/SCC controls	NOx, PM, SO_2	3
Hazardous Waste Combustion	PM	4
Municipal Waste Combustor Reductions –plant level	PM	5
Hospital/Medical/Infectious Waste Incinerator Regulations	NO_X, PM, SO_2	EPA, 2005
Large Municipal Waste Combustors – growth applied to specific plants	All (including Hg)	5
MACT rules, plant-level, VOC: Auto Plants	VOC	6
MACT rules, plant-level, PM & SO_2: Lime Manufacturing	PM, SO_2	7
MACT rules, plant-level, PM: Taconite Ore	PM	8
Livestock Emissions Growth from year 2002 to years 2017 and 2030 (some farms in the point inventory)	NH_3, PM	9
NESHAP: Portland Cement (09/09/10) – plant level based on **Industrial Sector Integrated Solutions (ISIS)** policy emissions in 2013. The ISIS results are from the ISIS-Cement model runs for the NESHAP and NSPS analysis of July 28, 2010 and include closures.	Hg, NO_X, SO2, PM, HCl	10; EPA, 2010
New York ozone SIP controls	VOC, NO_X, HAP VOC	11
Additional plant and unit closures provided by state, regional, and the EPA agencies and additional consent decrees. Includes updates from CSAPR comments.	All	12

Control Strategies and/or growth assumptions (grouped by affected pollutants or standard and approach used to apply to the inventory)	**Pollutants affected**	**Approach/ Reference**
Emission reductions resulting from controls put on specific boiler units (not due to MACT) after 2005, identified through analysis of the control data gathered from the Information Collection Request (ICR) from the Industrial/Commercial/Institutional Boiler NESHAP.	NO_X, SO_2, HCl	Section 4.2.13.2
Reciprocating Internal Combustion Engines (RICE) NESHAP	NO_X, CO, PM, SO_2	13
Ethanol plants that account for increased ethanol production due to RFS2 mandate	All	14
State fuel sulfur content rules for fuel oil *–effective only in Maine, New Jersey, and New York*	SO_2	15
Nonpoint (nonpt sector) projection approaches		
Municipal Waste Landfills: projection factor of 0.25 applied	All	EPA, 2007a
Livestock Emissions Growth from year 2002 to years 2017 and 2030	NH_3, PM	9
New York, Connecticut, and Virginia ozone SIP controls	VOC	11, 16
RICE NESHAP	NO_X, CO, VOC, PM, SO_2	13
State fuel sulfur content rules for fuel oil *–effective only in Maine, New Jersey, and New York*	SO_2	15
Residential Wood Combustion Growth and Change-outs from year 2005 to years 2017 and 2030	All	17
Gasoline and diesel fuel Stage II refueling via MOVES2010 Tier 3 month-specific inventories for 2017 and 2030 with assumed RFS2 and LDGHG fuels	VOC, Benzene, Ethanol	18
Portable Fuel Container Mobile Source Air Toxics Rule 2 (MSAT2) inventory growth and control from year 2005 to years 2017 and 2030	VOC	19
Use Phase II WRAP 2018 Oil and Gas for both 2017 and 2030	VOC, SO_2, NO_X, CO	Section 4.2.14
Use 2008 Oklahoma and Texas Oil and Gas, and apply year 2017 and 2021 projections for TX (last year available used as surrogate for 2030), and RICE NESHAP controls to Oklahoma emissions.	VOC, SO_2, NO_X, CO, PM	Section 4.2.14

APPROACHES/REFERENCES- Non-EGU Stationary Sources:

1. Appendix B in the MATS Proposal TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf
2. For Alcoa consent decree, used http:// cfpub.epa.gov/compliance/cases/index.cfm; for Motiva: used information sent by State of Delaware
3. Used data provided by the EPA, OAQPS, Sector Policies and Programs Division (SPPD).
4. Obtained from Anne Pope, the US EPA - Hazardous Waste Incinerators criteria and hazardous air pollutant controls carried over from 2002 Platform, v3.1.
5. Used data provided by the EPA, OAQPS SPPD expert.
6. Percent reductions and plants to receive reductions based on recommendations by rule lead engineer, and are consistent with the reference: EPA, 2007a
7. Percent reductions recommended are determined from the existing plant estimated baselines and estimated reductions as shown in the Federal Register Notice for the rule. SO_2 percent reduction are computed by 6,147/30,783 = 20% and PM_{10} and $PM_{2.5}$ reductions are computed by 3,786/13,588 = 28%
8. Same approach as used in the 2006 Clean Air Interstate Rule (CAIR), which estimated reductions of "PM emissions by 10,538 tpy, a reduction of about 62%." Used same list of plants as were identified based on tonnage and SCC from CAIR: http://www.envinfo.com/caain/June04updates/tiop_fr2.pdf
9. Except for dairy cows and turkeys (no growth), based on animal population growth estimates from the US Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute. See Section 4.2.10.
10. Data files for the cement sector provided by Elineth Torres, the EPA-SPPD, from the analysis done for the Cement NESHAP: The ISIS documentation and analysis for the cement NESHAP/NSPS is in the docket of that rulemaking-docket # EPA-HQ-OAR-2002-005. The Cement NESHAP is in the Federal Register: September 9, 2010 (Volume 75,

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11. New York NO_X and VOC reductions obtained from Appendix J in NY Department of Environmental Conservation Implementation Plan for Ozone (February 2008): http://www.dec.ny.gov/docs/air_pdf/NYMASIP7final.pdf.
12. Appendix D of Cross-State Air Pollution Rule: ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_appendices_28jun2011.pdf
13. Appendix F in the Proposed (Mercury and Air) Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf
14. The 2008 data used came from Illinois' submittal of 2008 emissions to the NEI.
15. Based on available, enforceable state sulfur rules as of November, 2010: http://www.ilta.org/LegislativeandRegulatory/MVNRLM/NEUSASulfur%20Rules_09.2010.pdf , http://www.mainelegislature.org/legis/bills/bills_124th/billpdfs/SP062701.pdf , http://switchboard.nrdc.org/blogs/rkassel/governor_paterson_signs_new_la.html , http://green.blogs.nytimes.com/2010/07/20/new-york-mandates-cleaner-heating-oil/
16. VOC reductions in Connecticut and Virginia obtained from CSAPR comments.
17. Growth and Decline in woodstove types based on industry trade group data, See Section 4.2.11.
18. MOVES (2010a) results for onroad refueling including activity growth from VMT, Stage II control programs at gasoline stations, and phase in of newer vehicles with onboard Stage II vehicle controls. http://www.epa.gov/otaq/models/moves/index.htm
19. VOC, benzene, and ethanol emissions for 2017 and 2030 based on MSAT2 rule and ethanol fuel assumptions (EPA, 2007b)

Control Strategies and/or growth assumptions (grouped by affected pollutants or standard and approach used to apply to the inventory)	Pollutants affected	Approach/ Reference
Onroad mobile and nonroad mobile controls (list includes all key mobile control strategies but is not exhaustive)		
National Onroad Rules: Tier 2 Rule: Signature date February, 2000 2007 Onroad Heavy-Duty Rule: February, 2009 Final Mobile Source Air Toxics Rule (MSAT2): February, 2007 Renewable Fuel Standard: March, 2010 Light Duty Greenhouse Gas Rule: May, 2010 Corporate Average Fuel Economy standards for 2008-2011	all	1
Local Onroad Programs: National Low Emission Vehicle Program (NLEV): March, 1998 Ozone Transport Commission (OTC) LEV Program: January,1995	VOC	2
National Nonroad Controls: Clean Air Nonroad Diesel Final Rule – Tier 4: June, 2004 Control of Emissions from Nonroad Large-Spark Ignition Engines and Recreational Engines (Marine and Land Based): "Pentathalon Rule": November, 2002 Clean Bus USA Program: October, 2007 Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder: October, 2008 Locomotive and marine rule (May 6, 2008) Marine SI rule (October 4, 1996) Nonroad large SI and recreational engine rule (November 8, 2002) Nonroad SI rule (October 8, 2008) Phase 1 nonroad SI rule (July 3, 1995) Tier 1 nonroad diesel rule (June 17, 2004)	all	3,4,5
Aircraft (emissions are in the nonEGU point inventory)**:** Itinerant (ITN) operations at airports to years 2017 and 2030	all	6

Control Strategies and/or growth assumptions (grouped by affected pollutants or standard and approach used to apply to the inventory)	Pollutants affected	Approach/ Reference
Locomotives: Energy Information Administration (EIA) fuel consumption projections for freight rail Clean Air Nonroad Diesel Final Rule – Tier 4: June 2004 Locomotive Emissions Final Rulemaking, December 17, 1997 Locomotive rule: April 16, 2008 Control of Emissions of Air Pollution from Locomotives and Marine: May 2008	all	EPA, 2008; 3; 4; 5
Commercial Marine: Category 3 marine diesel engines Clean Air Act and International Maritime Organization standards (April, 30, 2010) –*also includes CSAPR comments.* EIA fuel consumption projections for diesel-fueled vessels Clean Air Nonroad Diesel Final Rule – Tier 4 Emissions Standards for Commercial Marine Diesel Engines, December 29, 1999 Locomotive and marine rule (May 6, 2008) Tier 1 Marine Diesel Engines, February 28, 2003	all	7, 3; EPA, 2008

APPROACHES/REFERENCES – Mobile Sources

1. http://epa.gov/otaq/hwy.htm
2. Only for states submitting these inputs: http://www.epa.gov/otaq/lev-nlev.htm
3. http://www.epa.gov/otaq/nonroad-diesel.htm
4. http://www.epa.gov/cleanschoolbus/
5. http://www.epa.gov/otaq/marinesi.htm
6. Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) System, January 2010: http://www.apo.data.faa.gov/main/taf.asp
7. http://www.epa.gov/otaq/oceanvessels.htm

4.1 Stationary source projections: EGU sector (ptipm)

The future-year data for the ptipm sector used in the air quality modeling were created using version 4.10 Final of the Integrated Planning Model (IPM) (http://www.epa.gov/airmarkt/progsregs/epa-ipm/index.html). The IPM is a multiregional, dynamic, deterministic linear programming model of the U.S. electric power sector. Version 4.10 Final reflects federal and state rules and binding, enforceable consent decrees through December of 2010. The 2017 IPM emissions reflect the CSAPR as finalized in July 2011; the 2030 IPM emissions reflected the CSAPR proposal[6]. Both the reference and control case emissions do not reflect the final Mercury and Air Toxics (MATS) rule or the Boiler MACT regulatory assumptions. Therefore, the same year-specific IPM emissions are used in the reference and control cases for Tier 3 NPRM.

Version 4.10 Final reflects state rules and consent decrees through December 1, 2010, information obtained from the 2010 Information Collection Request (ICR), and information from comments received on the IPM-related Notice of Data Availability (NODA) published on September 1, 2010. Notably, IPM 4.10 Final included the addition of over 20 GW of existing Activated Carbon Injection (ACI) for coal-fired EGUs reported to EPA via the ICR. Additional unit-level updates that identified existing pollution controls (such as scrubbers) were also made based on the ICR and on comments from the IPM NODA. Units with SO_2 or NO_X advanced controls (e.g., scrubber, SCR) that were not required to run for compliance with Title IV, New Source Review (NSR), state settlements, or state-specific rules were modeled by IPM to either operate those controls or not based on economic efficiency parameters. The IPM run for the reference (and control) cases modeled with CMAQ assumed that 100% of the HCl found in the coal was emitted into the

[6] The intention was to use the final CSAPR in the 2030 scenarios. Although this was an oversight, subsequent analysis showed that the differences in NOx between proposal and final would have a minimal impact on AQ results.

atmosphere. However, in the final IPM results for the rule, neutralization of 75% of the available HCl was included based on recent findings.

Further details on the reference case EGU emissions inventory used for this rule can be found in the IPM v.4.10 Documentation, available at http://www.epa.gov/airmarkets/progsregs/epa-ipm/transport.html. The reference cases modeled in IPM for this rule includes estimates of emissions reductions that will result from the Cross-State Air Pollution Rule (CSAPR). However, reductions from the Boiler MACT rule were not represented this modeling because the rule was stayed at the time the modeling was performed. A complete list of state regulations, NSR settlements, and state settlements included in the IPM modeling is given in Appendices 3-2, 3-3, and 3-4 beginning on p. 68 of http://www.epa.gov/airmarkets/progsregs/epa-ipm/CSAPR/docs/DocSuppv410_FTransport.pdf. For the 2017 reference (and control) case EGU emissions, the IPM outputs for 2020, which are also representative of the year 2017, were used. These emissions were very similar to the year 2015 emissions output from the same IPM modeling case. For the 2030 cases, IPM outputs were year 2030.

Directly emitted PM emissions (i.e., $PM_{2.5}$ and PM_{10}) from the EGU sector are computed via a post processing routine which applies emission factors to the IPM-estimated fuel throughput based on fuel, configuration and controls to compute the filterable and condensable components of PM. This methodology is documented in the IPM CSAPR TSD.

4.2 Stationary source projections: non-EGU sectors (ptnonipm, nonpt, ag, afdust)

To project U.S. stationary sources other than the ptipm sector, we applied growth factors and/or controls to certain categories within the ptnonipm, nonpt, ag and afdust platform sectors. This subsection provides details on the data and projection methods used for these sectors. The Tier 3 NPRM future year scenarios also required obtaining and preprocessing numerous other inputs that we received directly from OTAQ.

In estimating future-year emissions, we assumed that emissions growth does not track with economic growth for many stationary non-IPM sources. This "no-growth" assumption is based on an examination of historical emissions and economic data. More details on the rationale for this approach can be found in Appendix D of the Regulatory Impact Assessment for the PM NAAQS rule (EPA, 2006).

The starting point for projecting the 2005 Tier 3 NPRM emissions was to use similar emission projection methodologies as used for the 2005v4.2 platform for the Final CSAPR, which incorporated responses to public comments on the modeling inventories. The 2012 and 2014 projection factors developed for the CSAPR (see http://www.epa.gov/ttn/chief/emch/index.html#final) were updated to reflect years 2017 and 2030.

Year-specific projection factors for years 2017 and 2030 were created. Growth factors (and control factors) are provided in the following sections where feasible. However, some sectors used growth or control factors that varied geographically and their contents could not be provided in the following sections (e.g., gasoline distribution varies by state and pollutant and has hundreds of records).

Table 4-2 lists the stationary non-EGU inputs and projection factors that were applied to account for year 2017 and 2030 RFS2 mandate impacts on emissions to the reference and control cases. These inputs are discussed in more detail in Section 4.2.1 through Section 4.2.9. All other stationary non-EGU projections, controls and plant closure information not related to the RFS2 impacts are discussed in Section 4.2.10 through Section 4.2.14. With the exception of onroad refueling emissions, all other stationary non-EGU emissions in the 2017 and 2030 reference cases are unchanged in the 2017 and 2030 control cases (see

Section 5); therefore, with the exception of onroad refueling, we will simply note that these emissions are "year 2017" or "year 2030" rather than the more cumbersome "year 2017 reference case" and "year 2030 reference case", respectively.

Table 4-2. Tier 3 NPRM reference case stationary non-EGU source-related projection methods

Input	**Type**	**Sector(s)**	**Description**
Corn ethanol plants	SMOKE ORL file that replaces 2005 base case ORL file	Ptnonipm	Based on RFS2 analysis and production volumes. Point source format.
Biodiesel plants	SMOKE ORL file	Ptnonipm	Accounts for facilities with current production capacities, to support RFS2 biodiesel production. Point source format.
Cellulosic fuel production	SMOKE ORL file	Nonpt	Accounts for cellulosic ethanol and cellulosic diesel to support RFS2 cellulosic production. County-level (nonpoint) format.
Ethanol transport and distribution	SMOKE ORL file	Nonpt	Accounts for ethanol vapor losses and spillage at any point in the transport and distribution chain. County-level (nonpoint) format.
Portable Fuel Containers (PFCs)	SMOKE ORL	Nonpt	NONROAD-model based emissions from PFCs, including vapor displacement, tank permeation, and diurnal evaporation. County-level (nonpoint) format.
Onroad refueling	SMOKE ORL file	nonpt	MOVES-based gasoline and diesel fuel spillage and displacement vapor losses. County-level (nonpoint) format, monthly resolution. *This is the only non-EGU component that has different emissions in the Tier 3 control cases compared to the reference cases.*
Refinery adjustments	Projection factors	Ptnonipm	Accounts for changes in various refinery processes due to incorporation of RFS2 fuels.
Ethanol transport gasoline & ethanol blends	Projection factors	nonpt, ptnonipm	Accounts for RFS impacts on emissions from bulk plant storage, refinery to bulk terminal, and bulk terminal to pump.
Upstream agricultural adjustments	Projection factors	afdust, ag, nonpt, ptnonipm	Accounts for changes in ag burning/dust, fertilizer application/production, livestock dust/waste and pesticide application/production.

4.2.1 Ethanol plants (ptnonipm)

As discussed in Section 2.4.1, we replaced all corn ethanol plants that OTAQ had supplied from the RFS2 rule –see Section 2.1.2 in the CSAPR Final TSD- with those more recently compiled for the 2005 Tier 3 NPRM. Additional ethanol plants cited for development in support of increased ethanol production for RFS2 are the cause for the increased number of facilities and emissions in years 2017 and 2030. Table 4-3 provides the summaries for the corn ethanol plants in the 2017 and 2030 cases.

Table 4-3. 2017 and 2030 corn ethanol plant emissions [tons]

Pollutant	2017	2030
1,3-Butadiene	0.0011	0.0003
Acrolein	41.7	10.5
Formaldehyde	45.2	13.3
Benzene	20.3	5.7
Acetaldehyde	643.2	314.4
CO	14,847	7,023
NO_X	20,035	7,396
PM_{10}	21,639	10,107
$PM_{2.5}$	6,825	3,691
SO_2	11,299	9,001
VOC	35,459	10,754

4.2.2 Biodiesel plants (ptnonipm)

OTAQ developed an inventory of biodiesel plants for 2017 and 2030 that were sited at existing plant locations in support of producing biodiesel fuels for the RFS2 mandate. The RFS2 rule estimated 1.45 billion gallons per year (Bgal) of biodiesel fuel production by year 2017 and 1.67 Bgal by year 2030. Only plants with current production capacities were assumed to be operating in 2017 and 2030. Total plant capacity at these existing facilities is limited to just over 1 Bgal. There was no attempt to site future year plants to account for the need to match biodiesel production needed for RFS2. Therefore, OTAQ applied scalar adjustments to each individual biodiesel plant to match the 2017 and 2030 production targets of 1.45 Bgal and 1.67 Bgal respectively: 1.41 for 2017 and 1.63 for 2030. Once facility-level production capacities were scaled, emission factors were applied based on soybean oil feedstock. Inventories were modeled as point sources with Google Earth and web searching validating facility coordinates and correcting state-county FIPS. Table 4-4 provides the 2017 and 2030 biodiesel plant emissions estimates.

Table 4-4. 2017 and 2030 biodiesel plant emissions [tons]

Pollutant	2017	2030
Acrolein	3.09E-04	3.56E-04
Formaldehyde	2.23E-03	2.56E-03
Benzene	4.71E-05	5.42E-05
Acetaldehyde	3.59E-04	4.14E-04
CO	726	836
NO_X	1,171	1,349
PM_{10}	99	114
$PM_{2.5}$	99	114
SO_2	9	10
VOC	64	73

4.2.3 Portable fuel containers (nonpt)

OTAQ provided year 2017 and 2030 PFC emissions that include estimated Reid Vapor Pressure (RVP) and oxygenate impacts on VOC emissions, and more importantly, large increases in ethanol emissions from RFS2. Existing inventories were adjusted to account for impacts of RVP and ethanol from RFS2, using adjustment factors derived from modeling done with the NONROAD2008b model. NONROAD was run at the national level using average nationwide fuel parameters for an all E0 case, the low ethanol base case, and the reference case. The percent change in refueling emissions from gasoline equipment was used to adjust the vapor displacement emissions, the percent change in tank permeation was used for PFC permeation, and the percent change in diurnal emissions was used for evaporation. Because these PFC inventories contain ethanol, we developed a VOC E-profile that integrated ethanol, see Section 3 for more details. Emissions for 2017 and 2030 are provided in Table 4-5.

Table 4-5. PFC emissions for 2017 and 2030 [tons]

Pollutant	2017	2030
VOC	123,186	146,593
Benzene	1,368	1,622
Ethanol	11,565	31,632

4.2.4 Cellulosic fuel production (nonpt)

OTAQ developed county-level inventories for cellulosic diesel and cellulosic ethanol production for 2017 and 2030 to satisfy RFS2 production. The methodology for building cellulosic plant emissions inventories is fairly similar conceptually to that for building the biodiesel plant inventories. First, we assume that cellulosic diesel and cellulosic ethanol are produced in the same counties where current production capacity exists, based on RFS2 FRM inventories. Design capacities for 2022 used in the RFS2 rule air quality modeling were adjusted to account for differences with estimated volumes of cellulosic fuels produced for 2017 and 2030, using final RFS2 rule data. Since the final RFS2 rule assumed about 57 percent of cellulosic fuel nationwide was cellulosic diesel, with the remainder cellulosic ethanol, we assumed this split would apply to every plant. In reality, however, depending on available feedstocks, plants are likely to produce one fuel or the other. Emission factors were applied based on an assumed natural gas combustion process. Table 4-6 provides the year 2017 and 2030 cellulosic plant emissions estimates.

Table 4-6. 2017 and 2030 cellulosic plant emissions [tons]

Pollutant	2017	2030
Acrolein	21	61
Formaldehyde	58	168
Benzene	27	79
Acetaldehyde	786	2,286
CO	42,839	124,336
Ethanol	1,875	5,530
NH_3	0.5	1.6
NO_X	64,062	185,745
PM_{10}	7,533	21,862
$PM_{2.5}$	3,796	10,986
SO_2	4,973	14,475
VOC	5,336	15,489

We had no refined information on potential VOC speciation differences between cellulosic diesel and cellulosic ethanol sources. Therefore, we summed up cellulosic diesel and cellulosic ethanol sources and used the same SCC (30125010: Industrial Chemical Manufacturing, Ethanol by Fermentation production) for VOC speciation as was used for corn ethanol plants. However, these cellulosic inventories contain ethanol; therefore we developed a VOC E-profile that integrated ethanol, see Section 3 for more details.

4.2.5 Ethanol transport and distribution (nonpt)

OTAQ developed county-level inventories for vapor losses from ethanol transport and distribution for 2017 and 2030 to account for losses for the processes such as truck, rail and waterways loading/unloading and intermodal transfers such as highway-to-rail, highways-to-waterways, and all other possible combinations of transfers. Emission rates were applied based on June 2008 AP-42 factors and ethanol versus gasoline vapor mass equations. These emissions are entirely evaporative and therefore limited to VOC and are summarized in Table 4-7. The leading descriptions are "Industrial Processes; Food and Agriculture; Ethanol Production" for each SCC.

Table 4-7. 2017 and 2030 VOC losses (Emissions) due to ethanol transport and distribution [tons]

SCC	Description	2017	2030
30205031	Denatured Ethanol Storage Working Loss	27,763	34,642
30205052	Ethanol Loadout to Truck	19,069	23,794
30205053	Ethanol Loadout to Railcar	9,610	11,991

4.2.6 Onroad refueling (nonpt)

As discussed in Section 2.5.2, the refueling inventory includes gasoline and diesel fuel emissions from spillage loss and displacement vapor loss. For this analysis, the refueling emissions were estimated using the revised version of EPA's Motor Vehicle Emissions Simulator (MOVES2010a) at the county level for all twelve months. The same set of representative counties and temperatures were used for all Tier 3 NPRM scenarios. VMT, fleet age distribution and speed distribution were developed for 2017 and 2030. Because these refueling inventories contain ethanol, we developed a VOC E-profile that integrated ethanol, see Section 3 for more details. A summary of the 2017 and 2030 onroad mobile refueling emissions is provided in Table 4-8. As discussed earlier in Section 4.2 and later in Section 5, these are the only stationary emissions components of the Tier 3 NPRM inventories that are (very slightly) changed in the Tier 3 control cases.

Table 4-8. Tier 3 NPRM Reference case onroad gasoline and diesel refueling emissions [tons]

Fuel Type	Pollutant	2017	2030
Gasoline	VOC	63,759	40,781
Diesel	VOC	12,962	16,449
Gasoline	Benzene	161	91
Gasoline	Ethanol	8,735	7,253

4.2.7 Refinery adjustments (ptnonipm)

Refinery emissions were adjusted for changes in fuels due to the RFS2 mandate. These adjustments were provided by OTAQ and impact processes such as process heaters, catalytic cracking units, blowdown systems, wastewater treatment, condensers, cooling towers, flares and fugitive emissions. The impact of the RFS2-based reductions is shown in

Table 4-9.

Table 4-9. Impact of refinery adjustments on 2017 and 2030 emissions [tons]

Pollutant	Reductions 2017	Reductions 2030
CO	12,674	13,602
NO_X	20,183	34,850
PM_{10}	4,367	7,550
$PM_{2.5}$	2,525	4,365
SO_2	13,846	24,014
VOC	3,693	6,428

4.2.8 Ethanol transport gasoline and blends (ptnonipm, nonpt)

Emissions changes in the transport of changing fuels from the RFS2 mandate impact several processes including bulk plant storage (BPS), refinery to bulk terminal (RBT) and bulk terminal to pump (BTP). These impacts, provided by OTAQ, result in approximately 15,000 tons of VOC reductions in 2017 and 46,000 tons in 2030 for these processes.

4.2.9 Upstream agricultural adjustments (afdust, ag, nonpt, ptnonipm)

Changes in domestic biofuel volumes, resulting from the RFS2 fuels mandate, impact upstream agricultural-related source categories in several emissions modeling sectors. These source categories include fertilizer application, pesticide application and livestock waste (NH_3 only), agricultural tilling, unloading and livestock dust (PM only) and fertilizer production mixing and blending, pesticide production and agricultural burning (all pollutants). As seen in Table 4-10, the cumulative impact of these source-specific changes is a net increase in emissions for upstream agricultural sources.

Table 4-10. Upstream agricultural emission increases due to RFS2 fuels in 2017 and 2030 [tons]

Pollutant	Increases 2017	Increases 2030
CO	302	416
NH_3	45,272	61,793
NO_X	363	500
PM_{10}	42,934	59,004
$PM_{2.5}$	6,500	8,972
SO_2	69	95
VOC	16	23

4.2.10 Livestock emissions growth (ag, afdust)

Growth in ammonia (NH_3) and dust (PM_{10} and $PM_{2.5}$) emissions from livestock in the ag, afdust and ptnonipm sectors was based on projections of growth in animal population.

Table 4-11 provides the growth factors from the 2005 base-case emissions to year 2017 and 2030 scenarios for animal categories applied to the ag, afdust, and ptnonipm sectors for livestock-related SCCs.

Table 4-11. Growth factors from year 2005 to 2017 and 2030 for animal operations

Animal Category	2017	2030
Dairy Cow	1.0000	1.0000
Beef	1.0206	1.0385
Pork	1.0893	1.1666
Broilers	1.3442	1.6426
Turkeys	1.0000	1.0000
Layers	1.2406	1.4491
Poultry Average	1.2674	1.4991
Overall Average	1.0935	1.1745

Except for dairy cows and turkey production, the animal projection factors are derived from national-level animal population projections from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI). For dairy cows and turkeys, we assumed that there would be no growth in emissions. This assumption was based on an analysis of historical trends in the number of such animals compared to production rates. Although productions rates have increased, the number of animals has declined. Thus, we do not believe that production forecasts provide representative estimates of the future number of cows and turkeys; therefore, we did not use these forecasts for estimating future-year emissions from these animals. In particular, the dairy cow population is projected to decrease in the future as it has for the past few decades; however, milk production will be increasing over the same period. Note that the ammonia emissions from dairies are not directly related to animal population but also nitrogen excretion. With the cow numbers going down and the production going up we suspect the excretion value will be changing, but we assumed no change because we did not have a quantitative estimate.

The inventory for livestock emissions used 2002 emissions values therefore, our projection method projected from 2002 rather than from 2005.

Appendix E in the 2002v3 platform documentation provides the animal population data and regression curves used to derive the growth factors: http://www.epa.gov/scram001/reports/Emissions%20TSD%20Vol2_Appendices_01-15-08.pdf. Appendix F in the same document provides the cross references of livestock sources in the ag, afdust and ptnonipm sectors to the animal categories in

Table 4-11

Table 4-11.

4.2.11 Residential wood combustion growth (nonpt)

We projected residential wood combustion (RWC) emissions 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, higher-polluting wood stoves, there will be an overall reduction of the emissions from these sources. The approach cited here was developed as part of a modeling exercise to estimate the expected benefits of the woodstoves change-out program (http://www.epa.gov/burnwise). Details of this approach can be found in Section 2.3.3 of the PM NAAQS Regulatory Impact Analysis (EPA, 2006).

The specific assumptions we made were:

- Fireplaces, source category code (SCC)=2104008001: increase 1%/year
- Old woodstoves, SCC=2104008002, 2104008010, or 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) we computed a weighted average distribution based on 19.4% fireplaces, 71.6% old woodstoves, 9.1% new woodstoves using 2002v3 Platform missions for $PM_{2.5}$. 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 2002v3 NEI. This approach results in an overall decrease of 1.056% per year for this source category.

We discovered an interpolation error in the year 2017 projection factors for RWC after air quality modeling. Table 4-12 presents the projection factors used to project the 2005 base case (2002 emissions) for RWC, including these 2017 errors. Table 4-13 shows the national impact (tons) of the 2017 projection factor error.

Table 4-12. Projection factors for growing year 2005 residential wood combustion sources

<table>
<tr><th>SCC</th><th>SCC Description</th><th>Erroneous 2017</th><th>Correct 2017</th><th>2030</th></tr>
<tr><td>2104008000</td><td>Total: Woodstoves and Fireplaces</td><td>0.45</td><td>0.84</td><td>0.70</td></tr>
<tr><td>2104008001</td><td>Fireplaces: General</td><td rowspan="2">0.65</td><td rowspan="2">1.15</td><td rowspan="2">1.28</td></tr>
<tr><td>2104008070</td><td>Outdoor Wood Burning Equipment</td></tr>
<tr><td>2104008002</td><td>Fireplaces: Insert; non-EPA certified</td><td rowspan="3">0.36</td><td rowspan="3">0.70</td><td rowspan="3">0.44</td></tr>
<tr><td>2104008010</td><td>Woodstoves: General</td></tr>
<tr><td>2104008051</td><td>Non-catalytic Woodstoves: Non-EPA certified</td></tr>
<tr><td>2104008003</td><td>Fireplaces: Insert; EPA certified; non-catalytic</td><td rowspan="6">0.74</td><td rowspan="6">1.30</td><td rowspan="6">1.56</td></tr>
<tr><td>2104008004</td><td>Fireplaces: Insert; EPA certified; catalytic</td></tr>
<tr><td>2104008030</td><td>Catalytic Woodstoves: General</td></tr>
<tr><td>2104008050</td><td>Non-catalytic Woodstoves: EPA certified</td></tr>
<tr><td>2104008052</td><td>Non-catalytic Woodstoves: Low Emitting</td></tr>
<tr><td>2104008053</td><td>Non-catalytic Woodstoves: Pellet Fired</td></tr>
</table>

Table 4-13. Impact of year 2017 projection factor error on residential wood combustion estimates

Pollutant	2005 Emissions	Erroneous 2017 Emissions	Erroneous 2017 Reductions	Correct 2017 Emissions	Correct 2017 Reductions
NO_X	38,292	18,023	20,270	33,545	4,747

$PM_{2.5}$	381,362	174,769	206,593	326,706	54,656
SO_2	5,302	2,529	2,773	4,697	605
VOC	569,950	242,126	327,824	450,990	118,959

4.2.12 Aircraft growth (ptnonipm)

The 2005 point-source emissions for aircraft are projected to future years by applying activity growth using data on itinerant (ITN) operations at airports. The ITN operations are defined as aircraft take-offs whereby the aircraft leaves the airport vicinity and lands at another airport, or aircraft landings whereby the aircraft has arrived from outside the airport vicinity. We used projected ITN information available from the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) System: http://www.apo.data.faa.gov/main/taf.asp (publication date January 2010). This information is available for approximately 3,300 individual airports, for all years up to 2030. We aggregated and applied this information at the national level by summing the airport-specific (U.S. airports only) ITN operations to national totals by year and by aircraft operation, for each of the four available operation types: commercial, general, air taxi and military. We computed growth factors for each operation type by dividing future-year ITN by 2005-year ITN. We assigned factors to inventory SCCs based on the operation type.

The methods that the FAA used for developing the ITN data in the TAF are documented in: http://www.faa.gov/data_research/aviation/aerospace_forecasts/2009-2025/media/2009%20Forecast%20Doc.pdf

Table 4-14 provides the national growth factors for aircraft; all factors are applied to year 2005 emissions. For example, year 2017 commercial aircraft emissions are 12.88% higher than year 2005 emissions. The same aircraft factors were used for each of the year-specific scenarios: reference and control.

Table 4-14. Factors used to project 2005 base-case aircraft emissions to 2017 and 2030

SCC	SCC Description	2017	2030
2275001000	Military aircraft	1.0229	1.0275
2275020000	Commercial aircraft	1.1288	1.5059
2275050000	General aviation	0.8918	0.9916
2275060000	Air taxi	0.8620	1.0259
27501015	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	1.0229	1.0275
27502001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Piston Engine: Aviation Gas	1.1288	1.5059
27502011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Commercial;Jet Engine: Jet A	1.1288	1.5059
27505001	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Piston Engine: Aviation Gas	0.8918	0.9916
27505011	Internal Combustion Engines;Fixed Wing Aircraft L & TO Exhaust;Civil;Jet Engine: Jet A	0.8918	0.9916
27601014	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-4	1.0229	1.0275
27601015	Internal Combustion Engines;Rotary Wing Aircraft L & TO Exhaust;Military;Jet Engine: JP-5	1.0229	1.0275

We did not apply growth factors to any point sources with SCC 27602011 (Internal Combustion Engines; Rotary Wing Aircraft L & TO Exhaust; Commercial; Jet Engine: Jet A) because the facility names associated with these point sources appeared to represent industrial facilities rather than airports. This SCC is only in one county, Santa Barbara, California (State/County FIPS 06083).

None of our aircraft emission projections account for any control programs. We considered the NO_X standard adopted by the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) in February 2004, which is expected to reduce NO_X by approximately 2% in 2015 and 3% in 2020. However, this rule, signed July 2011 (see http://www.epa.gov/otaq/aviation.htm), was not adopted as an EPA (or U.S.) rule prior to Tier 3 NPRM modeling; therefore, the effects of this rule were not included in the future-year emissions projections.

4.2.13 Stationary source control programs, consent decrees & settlements, and plant closures (ptnonipm, nonpt)

We applied emissions reduction factors to the 2005 emissions for particular sources in the ptnonipm and nonpt sectors to reflect the impact of stationary-source control programs including consent decrees, settlements, and plant closures. Some of the controls described in this section were obtained from comments on the CSAPR proposal. Detailed summaries of the impacts of the control programs are provided in Appendix D of the CSAPR TSD:
ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_appendices_28jun2011.pdf.

Controls from the NO_X SIP call were assumed to have been implemented by 2005 and captured in the 2005 base case (2005v2 point inventory). This assumption was confirmed by review of the 2005 NEI that showed reductions from Large Boiler/Turbines and Large Internal Combustion Engines in the Northeast states covered by the NO_X SIP call. The future-year base controls consist of the following:

- We did not include MACT rules where compliance dates were prior to 2005, because we assumed these were already reflected in the 2005 inventory. The EPA OAQPS Sector Policies and Programs Division (SPPD) provided all controls information related to the MACT rules, and this information is as consistent as possible with the preamble emissions reduction percentages for these rules.
- Various emissions reductions from the CSAPR comments, including but not limited to: fuel switching at units, shutdowns, future-year emission limits, ozone SIP VOC controls for some sources in Virginia and Connecticut, and state and local control programs were included.
- Evolutionary information regarding plant closures (i.e., emissions were zeroed out for future years) was also included where information indicated that the plant was actually closed after the 2005 base year and prior to CSAPR and Tier 3 NPRM modeling that began in the spring of 2011. We also applied unit and plant closures received from the CSAPR comments. However, plants projected to close in the future (post-2010) were not removed in the future years because these projections can be inaccurate due to economic improvements. We also applied cement kiln (unit) and cement plant closures discussed later in Section 4.2.6.1. More detailed information on the overall state-level impacts of all control programs and projection datasets, including units and plants closed in the 2017 and 2030 reference (same in the control) case ptnonipm inventories are provided in Appendix D of the Final CSAPR TSD:
ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_appendices_28jun2011.pdf. The magnitude of all unit and plant closures on the non-EGU point (ptnonipm) sector 2005 base-case emissions is shown in Table 4-15 below. These same reductions are seen in all Tier 3 NPRM future year scenarios.

Table 4-15. Summary of non-EGU emission reductions applied to the 2005 inventory due to unit and plant closures

	CO	NH_3	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Reductions	125,162	636	109,237	21,143	12,600	190,734	26,750

- In addition to plant closures, we included the effects of the Department of Justice Settlements and Consent Decrees on the non-EGU (ptnonipm) sector emissions. We also included estimated impacts of HAP standards per Section 112, 129 of the Clean Air Act on the non-EGU (ptnonipm) and nonpoint (nonpt) sector emissions, based on expected CAP co-benefits to sources in these sectors.
- Numerous controls have compliance dates beyond 2008; these include refinery and the Office of Compliance and Enforcement (OECA) consent decrees, Department of Justice (DOJ) settlements, as well as most national VOC MACT controls. Additional OECA consent decree information is provided in Appendix B of the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf. The detailed data used are available at the website listed in Section 1.
- Refinery consent decree controls at the facility and SCC level (collected through internal coordination on refineries by the EPA) were included.
- Fuel sulfur fuel limits were enforceable for Maine, New Jersey and New York.
- Criteria air pollutant (cap) reductions which are a cobenefit to RICE NESHAP controls, including SO_2 RICE cobenefit controls, were included.
- We applied New York State Implementation Plan available controls for the 1997 8-hour Ozone standard for non-EGU point and nonpoint NO_X and VOC sources based on NY State Department of Environmental Conservation February 2008 guidance. These reductions are found in Appendix J in: http://www.dec.ny.gov/docs/air_pdf/NYMASIP7final.pdf (see Section 3.2.6 in the CSAPR TSD: ftp://ftp.epa.gov/EmisInventory/2005v4_2/transportrulefinal_eitsd_28jun2011.pdf.)

Most of the control programs were applied as replacement controls, which means that any existing percent reductions ("baseline control efficiency") reported in the NEI were removed prior to the addition of the percent reductions due to these control programs. Exceptions to replacement controls are "additional" controls, which ensure that the controlled emissions match desired reductions regardless of the baseline control efficiencies in the NEI. We used the "additional controls" approach for many permit limits, settlements and consent decrees where specific plant and multiple-plant-level reductions/targets were desired and at municipal waste landfills where VOC was reduced 75% via a MACT control using projection factors of 0.25.

4.2.13.1 Reductions from the Portland Cement NESHAP (ptnonipm)

As indicated in Table 4-1, the Industrial Sectors Integrated Solutions (ISIS) model (EPA, 2010) was used to project the cement industry component of the ptnonipm emissions modeling sector to 2013. There were no future year estimates for 2017 or 2030, so 2013 estimates were used for all future year Tier 3 NPRM modeling scenarios. This approach provided reductions of criteria and hazardous air pollutants, including mercury. The ISIS cement emissions were developed in support for the Portland Cement NESHAPs and the NSPS for the Portland cement manufacturing industry.

The ISIS model produced a Portland Cement NESHAP policy case of multi-pollutant emissions for individual cement kilns (emission inventory units) that were relevant for years 2013 through 2017. These ISIS-based emissions included information on new cement kilns, facility and unit-level closures, and updated policy case emissions at existing cement kilns. The units that opened or closed before 2010 were included in the projections as were the ISIS-based policy case predictions of emissions reductions and activity growth.

The ISIS model results for the future show a continuation of the recent trend in the cement sector of the replacement of lower capacity, inefficient wet and long dry kilns with bigger and more efficient preheater and precalciner kilns. Multiple regulatory requirements such as the NESHAP and NSPS currently apply to the cement industry to reduce CAP and HAP emissions. Additionally, state and local regulatory requirements might apply to individual cement facilities depending on their locations relative to ozone and $PM_{2.5}$ nonattainment areas. The ISIS model provides the emission reduction strategy that balances: 1) optimal (least cost) industry operation, 2) cost-effective controls to meet the demand for cement, and 3) emission reduction requirements over the time period of interest.

Table 4-16 shows the magnitude of the ISIS-based cement industry reductions in the future-year emissions, and the impact that these reductions have on total stationary non-EGU point source (ptnonipm) emissions.

Table 4-16. Future-year ISIS-based cement industry annual reductions [tons/yr] for the non-EGU (ptnonipm) sector

Pollutant	Cement Industry emissions in 2005	Reductions in 2017 & 2030	Percent Reduction
NO_X	193,000	56,740	2.4%
$PM_{2.5}$	14,400	7,840	1.8%
SO_2	128,400	106,000	5.0%
VOC	6,900	5,570	0.4%
HCl	2,900	2,220	4.5%

4.2.13.2 Boiler reductions not associated with the MACT rule (ptnonipm)

The Boiler MACT ICR collected data on existing controls. We used an early version of a database developed for that rulemaking entitled "survey_database_2008_results2.mdb" (EPA-HQ-OAR-2002-0058-0788) which is posted under the Technical Information for the Boiler MACT major source rule (http://www.epa.gov/ttn/atw/boiler/boilerpg.html). We extracted all non-EGU stationary (ptnonipm) controls that were installed after 2005, determined a percent reduction, and verified with source owners that these controls were actively in use. In many situations we learned that the controls were on site but were not in use. A summary of the plant-unit specific reductions that were verified to be actively in use are summarized in Table 4-17. All reductions are promulgated by the present day, and therefore these reductions are the same for all Tier 3 NPRM future year scenarios.

Table 4-17. State-level non-MACT boiler reductions from ICR data gathering [tons]

State	Pollutant	Pre-controlled Emissions	Controlled Emissions	Reductions in 2017 & 2030	Percent Reduction
Michigan	NO_X	907	544	363	40
North Carolina	SO_2	652	65	587	90
Virginia	SO_2	3,379	338	3,041	90
Washington	SO_2	639	383	256	40
North Carolina	HCl	31	3	28	90

4.2.13.3 RICE NESHAP (ptnonipm and nonpt)

There are three rulemakings for National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines (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 also reduce CAPs, specifically, CO, NO_X, VOC, PM, and SO_2. In 2014 and beyond, compliance dates have passed for all three rules; thus all three rules are included in the 2017 and 2030 emissions projections.

The rules can be found at http://www.epa.gov/ttn/atw/rice/ricepg.html and are listed below:

- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (69 FR 33473) published 06/15/04
- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (FR 9648) published 03/03/10
- National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines; Final Rule (75 FR 51570) published 08/20/2010

The difference among these three rules is that they focus on different types of engines, different facility types (major for HAPs, versus area for HAPs) and different engine sizes based on horsepower (HP). In addition, they have different compliance dates. We project CAPs from the 2005 NEI RICE sources, based on the requirements of the rule for existing sources only because the inventory includes only existing sources and the current projection approach does not estimate emissions from new sources.

A complete discussion on the methodology to estimate RICE controls is provided in Appendix F in the Proposed MATS Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf. Impacts of the RICE controls on stationary non-EGU emissions (nonpt and ptnonipm sectors), excluding WRAP, Texas, and Oklahoma oil and gas emissions (see Section 4.2.7) are provided in Table 4-18. These reductions are promulgated before year 2017, and therefore these reductions are the same for all Tier 3 NPRM future year scenarios.

Table 4-18. National impact of RICE controls on non-EGU projections

	CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Reductions	116,434	111,749	1,595	1,368	21,957	14,669

4.2.13.4 Fuel sulfur rules (ptnonipm and nonpt)

Fuel sulfur rules that were signed (enforceable) at the time of the Tier 3 NPRM emissions processing are limited to Maine, New Jersey and New York. Several other states have fuel sulfur rules that were in development but not finalized prior to the final CSAPR and proposed Tier 3 emissions processing: http://www.ilta.org/LegislativeandRegulatory/MVNRLM/NEUSASulfur%20Rules_09.2010.pdf.

The fuel sulfur content for all home heating oil SCCs in 2005 is assumed to by 3000 part per million (ppm). Effective July 1, 2012, New York requires all heating oil sold in New York to contain no more than 15ppm of sulfur, thus reducing SO_2 emissions by 99.5% for post-2012 (2017 and 2030) projections. These New York sulfur content reductions are further discussed here: http://switchboard.nrdc.org/blogs/rkassel/governor_paterson_signs_new_la.html.

The New Jersey year 2017 standard of 15ppm (assuming 500ppm baseline for Kerosene) sulfur content yields a 96.25% SO_2 emissions reduction for kerosene (fuel #1). The New Jersey sulfur content reductions are discussed here: http://njtoday.net/2010/09/01/nj-adopts-rule-limiting-sulfur-content-in-fuel-oil/.

For Tier 3 year 2017 projections, the Maine fuel sulfur rule, effective in year 2016, reduces sulfur to50 ppm from 3,000 ppm in 2005, resulting in a 98.3% reduction for all Tier 3 year 2017 scenarios. A more stringent Maine fuel sulfur rule effective January 1, 2018 reduces sulfur to 15ppm from 3,000 ppm in 2005, resulting in a 99.5% reduction for all Tier 3 year 2030 scenarios. These Maine sulfur content reductions are discussed here: http://www.mainelegislature.org/legis/bills/bills_124th/billpdfs/SP062701.pdf. The impact of these fuel sulfur content reductions on SO2 is shown in Table 4-19. These year-specific reductions are the same for all Tier 3 scenarios: low-ethanol, reference and control.

Table 4-19. Impact of fuel sulfur (SO_2) controls on 2017 and 2030 non-EGU projections [tons]

State	**2017 Reductions**	**2030 Reductions**
Maine	8,323	18,470
New Jersey	998	998
New York	54,431	54,431
Total	**63,751**	**73,898**

4.2.14 Oil and gas projections in TX, OK, and non-California WRAP states (nonpt)

For the 2005v4.2 platform, we incorporated updated 2005 oil and gas emissions from Texas and Oklahoma. For Texas oil and gas production we used year 2017 estimates and for year 2030 we used the last available future year, year 2021, estimates from the Texas Commission of Environmental Quality (TCEQ) and used them as described in: http://www.tceq.state.tx.us/assets/public/implementation/air/am/contracts/reports/ei/5820783985FY0901-20090715-ergi-Drilling_Rig_EI.pdf.

We also received 2008 data for Oklahoma that we used as the best available data to represent 2017 and 2030. We utilized the latest available future year, year 2018, Phase II WRAP oil and gas emissions data for the non-California Western Regional Air Partnership (WRAP) states to represent both 2017 and 2030. RICE NESHAP reductions, discussed earlier in this section, which are effective by year 2014, were applied to the year 2008 Oklahoma oil and gas inventory but not applied to the 2017 and 2021 TCEQ oil and gas estimates or 2018 WRAP Phase II oil and gas inventory.

For Oklahoma, we applied CO, NO_X, SO_2 and VOC emissions reductions from the RICE NESHAP, which we assumed has some applicability to this industry (see Appendix F in the Proposed Toxics Rule TSD: http://www.epa.gov/ttn/chief/emch/toxics/proposed_toxics_rule_appendices.pdf). All these year-specific oil and gas projection estimates are the same for the reference and control Tier 3 NPRM scenarios. Table 4-20 shows the 2005, 2017 and 2030 emissions including RICE reductions for Oklahoma.

Table 4-20. Oil and gas emissions for 2005, 2017 and 2030 including additional reductions due to the RICE NESHAP

	NOX			PM2.5			SO2			VOC		
	2005	**2017**	**2030**	**2005**	**2017**	**2030**	**2005**	**2017**	**2030**	**2005**	**2017**	**2030**
Alaska	836	453	453				62	1	1	68	12	12
Arizona	13	15	15							37	49	49
Colorado	32,188	33,517	33,517				350	11	11	35,500	43,639	43,639
Montana	10,617	13,880	13,880				640	6	6	9,187	14,110	14,110
Nevada	71	63	63				1	0	0	105	163	163
New Mexico	61,674	74,648	74,648				369	12	12	215,636	267,846	267,846
North Dakota	6,040	20,869	20,869				688	4	4	8,988	17,968	17,968
Oklahoma	39,668	42,402	42,402	1,918	2,231	2,231	1,014	2	2	155,908	163,598	163,598
Oregon	61	44	44							19	14	14
South Dakota	566	557	557				43	0	0	370	562	562
Texas	42,854	34,772	26,061	2,945	1,085	435	5,977	36	33	4,337	2,800	1,504
Utah	6,896	6,297	6,297				149	1	1	43,403	81,890	81,890
Wyoming	36,172	34,142	34,142				541	3	3	166,939	304,748	304,748
Total	**237,656**	**261,659**	**252,948**	**4,862**	**3,316**	**2,666**	**9,834**	**76**	**73**	**640,498**	**897,400**	**896,104**

4.3 *Onroad mobile source projections (onroad)*

The same versions of MOVES and SMOKE-MOVES were used to create all Tier 3 NPRM onroad emission scenarios. Section 2.2 describes these components in support of year 2005 processing. This section will only address the differences related to creating and processing year 2017 and 2030 Tier 3 NPRM reference case emissions. Section 5 will discuss the differences related to creating and processing year 2017 and 2030 Tier 3 NPRM control case emissions. Speciation changes for all scenarios are discussed in Section 3.

Inputs for temperatures (Section 2.2.1), the representative counties and fuel months (Section 2.2.2), the overall parallel processing procedures (Section 2.2.3), speed data (Section 2.2.4), and SMOKE-MOVES configurations (Section 2.2.4) were previously discussed and were the same for all Tier 3 NPRM scenarios. However, year-specific MOVES inputs were obtained for fuels and California LEV standards, and SMOKE inputs of VMT and vehicle populations were year-specific and are described below.

For the 2017 and 2030 VMT inventories, MOVES2010a was run with default inputs to generate total national VMT by SCC. But, because MOVES uses a static (1999) default allocation of VMT to county, MOVES was not used for these allocations. Instead, the 2017 county VMT was created by interpolating between the NCD VMT values for 2015 and those for 2020 and computing the NCD fraction for each county, then multiplying these fractions by the MOVES VMT. (Unlike MOVES, the NCD accounts for geographical shifts in activity over time.) For 2030, NCD values for 2030 were used directly. The VMT was also adjusted to account for increased onroad transportation of ethanol fuels and the resulting increase in travel by large tanker trucks.

Vehicle populations by county and SCC were developed similarly to the VMT, using MOVES to generate national totals for each year and using the NCD to allocate to county. However, the NCD does not include population estimates, so we used MOVES to generate the 2005 national population and we assumed that, for each calendar year (2005, 2017 and 2030) and for each SCC, the allocation of national vehicle population to county was proportional to the allocation of VMT (summed across road types).

The MOVES 2017 and 2030 emissions used for Tier 3 NPRM reference cases reflect onroad mobile control programs that were final at the time the modeling was done. This included the Light-Duty Vehicle Tier 2 Rule and the Mobile Source Air Toxics (MSAT2) final rule. MOVES used fuel sulfur levels of 30ppm in all states in the Tier 3 reference scenarios (except California which was modeled with MOVES2010a default fuels). In terms of fleet composition, both reference scenarios assumed 100% Tier 2 and older vehicles.

4.3.1 California LEV

The list of states which have implemented programs to require the sale of vehicles in their state certified for sale in California began with the information stored in the modeling inputs used for the 2008 National Emission Inventory (NEI) stored in the National Mobile Inventory Model (NMIM) County database. This information was reviewed and updated by states during the process of developing the national inventory for calendar year 2008. This information was supplemented with information from a "Dear Manufacturer" letter, "Sales of California-certified 2008-2010 Model Year Vehicles (Cross-Border Sales Policy)" (October 29,2007) produced by the Compliance and Innovative Strategies Division of the US Environmental Protection Agency which describes the areas that have recently implemented a California standards program. This information was used to generate emission rate table inputs for the MOVES model for each of these areas using the guidance provided in the document, "Instructions for Using LEV and NLEV Inputs for MOVES" (EPA-420-B-10-003, January 2010) provided to States with the MOVES model. For calendar year 2017, areas that had implemented California standards would still have these programs in place in calendar years 2017 and 2030. See Table 2-6 for a list of these states and dates of implementation. More information on the states that have implemented California LEV standards can be found at: http://www.dieselnet.com/standards/us/#cal.

4.4 Nonroad mobile source projections (nonroad, alm_no_c3, seca_c3)

The components of the nonroad mobile sectors are discussed in Section 2.3. Nonroad mobile emissions reductions for the Tier 3 NPRM reference cases include year-specific regulations affecting locomotives, various nonroad engines including diesel engines and various marine engine types, fuel sulfur content, and evaporative emissions. This section discusses the changes due to the NONROAD/NMIM system (nonroad sector) and additional C1/C2 CMV and locomotive emissions from volume increases resulting from incorporation of larger amounts of renewable fuels in the 2017 and 2030 reference cases.

4.4.1 Emissions generated with the NONROAD model (nonroad)

As discussed in Section 2.3.1, most nonroad emissions were estimated using the EPA's NONROAD model, run via EPA's consolidated modeling system known as the National Mobile Inventory Model (NMIM). NONROAD is EPA's model for calculating emissions from nonroad equipment, except for aircraft, locomotives, and commercial marine vessels. Like the onroad emissions, the NONROAD/NMIM system provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, nonroad refueling emissions for nonroad sources are not included in the nonpoint (nonpt) sector and so are retained in the nonroad sector.

The same temperatures and representative counties were used for all NONROAD model-generated Tier 3 NPRM scenarios for all years as were used for the 2005 base case, describe in section 2.3.1. For 2017, E10 and E15 are available in every county, but nonroad equipment is assumed to burn only E10. For 2030, EPA assumed that nonroad equipment would use only E15. To generate the NMIM fuels, the E10 fuel was copied from MOVES to NMIM, and the E10 oxygenate was assigned a market share of 1. Nonroad diesel fuel sulfur levels are retained from NMIM.

Table 2-11 in Section 2.3.1.3 lists the NMIM emission scenarios used in the Tier 3 NPRM modeling. The only difference between the reference scenarios are the increases in activity between calendar years (based on NONROAD model default growth estimates of future-year equipment population) and changes in fuels and engines that reflect implementation of national regulations and local control programs that impact each year differently due to engine turnover. For year 2017, EPA assumed that nonroad equipment would use only E10. The 2030 modeling, EPA assumed use of E15 fuels for both the reference and control scenarios. For all scenarios, the NONROAD sulfur levels are taken from the NCD. Although the NONROAD Model estimates changes in VOC emissions from E15, NMIM calculates toxics as if the fuel were E10. EPA calculated adjustment factors based on highway effects to apply to certain toxic emissions to correct for the use of E15 in 2030. Emission estimates for ethanol come from speciation of VOC in the SMOKE model. These ethanol adjustments for nonroad engines running on E15 came from the EPAct Phase 1 data.

We have not included voluntary nonroad programs in our projections such as programs encouraging either no refueling or evening refueling on Ozone Action Days and diesel retrofit programs. The national nonroad regulations incorporated in all Tier 3 NPRM future year scenarios are those promulgated prior to December 2009, and beginning about 1990. Recent rules include:

- "Clean Air Nonroad Diesel Final Rule - Tier 4": (http://www.epa.gov/nonroaddiesel/2004fr.htm), published June 29, 2004, and,
- Control of Emissions from Nonroad Large Spark-Ignition Engines, and Recreational Engines (Marine and Land-Based), November 8, 2002 ("Pentathalon Rule").
- OTAQ's Locomotive Marine Rule, March 2008: (http://www.epa.gov/otaq/nonrdmdl.htm)
- OTAQ's Small Engine Spark Ignition ("Bond") Rule, November 2008: (http://www.epa.gov/otaq/smallsi.htm)

All future year nonroad emissions used NMIM data that are based on AEO2009 fuels and the same NMIM county database NCD20101201Tier3. We converted emissions from monthly totals to monthly average-day values based the on number of days in each month. Only criteria and select HAPs (benzene, acetaldehyde, butadiene, acrolein, and formaldehyde) were retained when creating SMOKE one record per line (ORL) files.

4.4.2 Locomotives and Class 1 & 2 commercial marine vessels (alm_no_c3)

Aircraft emissions reside in the nonEGU point inventory (ptnonipm), and the projection factors used to create year 2017 and year 2030 estimates, are discussed in Section 4.2. The remaining 2005 NEI emissions for locomotives and Class 1 and Class 2 commercial marine vessel (C1/C2 CMV) use year-specific projection estimates. Base future year locomotive and C1/C2 CMV emissions were calculated using projection factors that were computed based on national, annual summaries of emissions in 2002, 2017 and 2030. Some additional emissions were then factored in due to changes in fuels. These national summaries were used to create national by-pollutant, by-SCC projection factors; these factors include final locomotive-marine controls and are provided in Table 4-21. Modest additive Class I railroad and C1/C2 CMV emissions that account for RFS2 volume increases in the Tier 3 future year reference scenarios were then added into the reference case due to the volume differences in corn, cellulosic and imported ethanol and cellulosic diesel fuels. These additional emissions are summarized in
Table 4-22.

Table 4-21. Factors applied to year 2005 emissions to project locomotives and class 1 and class 2 commercial marine vessel emissions to 2017 and 2030

SCC	SCC Description	Pollutant	2017	2030
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	CO	0.938	0.956
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NH_3	1.144	1.285
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	NO_X	0.700	0.372
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	PM_{10}	0.642	0.350
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	$PM_{2.5}$	0.653	0.356
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	SO_2	0.087	0.045
2280002X00	Marine Vessels, Commercial;Diesel;Underway & port emissions	VOC	0.786	0.402
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	CO	1.334	1.640
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NH_3	1.325	1.627
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	NO_X	0.627	0.357
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	PM_{10}	0.578	0.260
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	$PM_{2.5}$	0.586	0.263
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	SO_2	0.005	0.006
2285002006	Railroad Equipment;Diesel;Line Haul Locomotives: Class I Operations	VOC	0.589	0.293
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	CO	0.328	0.403
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NH_3	1.325	1.627
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	NO_X	0.352	0.350
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	PM_{10}	0.286	0.272
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	$PM_{2.5}$	0.288	0.275
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	SO_2	0.001	0.001
2285002007	Railroad Equipment;Diesel;Line Haul Locomotives: Class II / III Operations	VOC	0.315	0.387
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	CO	1.071	1.188
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NH_3	1.325	1.627
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	NO_X	0.496	0.241
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	PM_{10}	0.461	0.148
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	$PM_{2.5}$	0.463	0.149
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	SO_2	0.005	0.005
2285002008	Railroad Equipment;Diesel;Line Haul Locomotives: Passenger Trains (Amtrak)	VOC	0.475	0.136
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	CO	1.057	1.172
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NH_3	1.325	1.627
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	NO_X	0.489	0.237
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	PM_{10}	0.455	0.146
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	$PM_{2.5}$	0.455	0.146

SCC	SCC Description	Pollutant	2017	2030
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	SO_2	0.005	0.005
2285002009	Railroad Equipment;Diesel;Line Haul Locomotives: Commuter Lines	VOC	0.469	0.134
2285002010	Railroad Equipment;Diesel;Yard Locomotives	CO	1.341	1.649
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NH_3	1.325	1.627
2285002010	Railroad Equipment;Diesel;Yard Locomotives	NO_X	1.128	0.851
2285002010	Railroad Equipment;Diesel;Yard Locomotives	PM_{10}	0.914	0.690
2285002010	Railroad Equipment;Diesel;Yard Locomotives	$PM_{2.5}$	0.934	0.704
2285002010	Railroad Equipment;Diesel;Yard Locomotives	SO_2	0.006	0.007
2285002010	Railroad Equipment;Diesel;Yard Locomotives	VOC	1.509	1.074

Table 4-22. Additional class 1 railroad and C1/C2 CMV emissions from RFS2 fuel volume changes

Pollutant	2017 Class 1 Rail (tons)	2017 C1/C2 CMV (tons)	2030 Class 1 Rail (tons)	2030 C1/C2 CMV (tons)
1,3-Butadiene	0.83	0.01	0.56	0.01
Acrolein	0.80	0.08	0.54	0.05
Formaldehyde	11.12	3.21	7.50	2.23
Benzene	0.66	0.44	0.45	0.30
Acetaldehyde	4.83	1.59	3.26	1.11
CO	1,250	197	1,906	272
NH_3	3.93	0.62	5.99	0.95
NO_X	5,731	890	4,298	642
PM_{10}	141	29	86	21
$PM_{2.5}$	136	27	83	20
SO_2	2.96	3.96	4.51	5.99
VOC	257	21	173	15

The future-year locomotive emissions account for increased fuel consumption based on Energy Information Administration (EIA) fuel consumption projections for freight rail, and emissions reductions resulting from emissions standards from the Final Locomotive-Marine rule (EPA, 2008). This rule lowered diesel sulfur content and tightened emission standards for existing and new locomotives and marine diesel emissions to lower future-year PM, SO_2, and NO_X, and is documented at: http://www.epa.gov/otaq/nonrdmdl.htm. Voluntary retrofits under the National Clean Diesel Campaign (http://www.epa.gov/otaq/diesel/index.htm) are not included in our projections.

We applied HAP factors for VOC HAPs by using the VOC projection factors to obtain 1,3-butadiene, acetaldehyde, acrolein, benzene, and formaldehyde.

Class 1 and 2 CMV gasoline emissions (SCC = 2280004000) were not changed for future-year processing. C1/C2 diesel emissions (SCC = 2280002100 and 2280002200) were projected based on the Final Locomotive Marine rule national-level factors provided in Table 4-21. Similar to locomotives, VOC HAPs were projected based on the VOC factor.

Delaware provided updated future-year NO_X, SO_2, and PM emission estimates for C1/C2 CMV as part of the Transport Rule comments. These updated emissions were applied to the 2017 and 2030 inventories and override the C1/C2 projection factors in Table 4-21.

4.4.3 Class 3 commercial marine vessels (seca_c3)

The seca_c3 sector emissions data were provided by OTAQ in an ASCII raster format used since the SO_2 Emissions Control Area-International Marine Organization (ECA-IMO) project began in 2005. The (S)ECA Category 3 (C3) commercial marine vessel 2002 base-case emissions were projected to year 2005 for the 2005 base case and to 2017 and 2030, which includes ECA-IMO controls. The resulting coordinated strategy, including emission standards under the Clean Air Act for new marine diesel engines with per-cylinder displacement at or above 30 liters, and the establishment of Emission Control Areas is at: http://www.epa.gov/oms/oceanvessels.htm

These projection factors vary depending on geographic region and pollutant; where VOC HAPs are assigned the same growth rates as VOC. The projection factors used to create the 2017 and 2030 seca_c3 sector emissions are provided in Table 4-23. Note that these factors are relative to 2002. Factors relative to 2005 can be computed from the 2002-2005 factors.

The geographic regions are described in the ECA Proposal technical support document: http://www.epa.gov/oms/regs/nonroad/marine/ci/420r09007-chap2.pdf. These regions extend up to 200 nautical miles offshore, though less at international boundaries. North and South Pacific regions are divided by the Oregon-Washington border, and East Coast and Gulf Coast regions are divided east-west by roughly the upper Florida Keys just southwest of Miami.

The factors to compute HAP emission are based on emissions ratios discussed in the 2005v4 documentation (ftp://ftp.epa.gov/EmisInventory/2005v4/2005_emissions_tsd_07jul2010.pdf). As with the 2005 base case, this sector uses CAP-HAP VOC integration.

Table 4-23. NO_X, SO_2, $PM_{2.5}$ and VOC factors to project class 3 CMV emissions for 2017 and 2030

Region	NO_X		SO_2		$PM_{2.5}$		VOC	
	2017	2030	2017	2030	2017	2030	2017	2030
Alaska East	1.409	1.702	0.062	0.095	0.203	0.312	1.631	2.487
Alaska West	1.469	2.052	1.571	0.456	1.571	0.571	1.571	2.396
East Coast	1.435	1.072	0.070	0.123	0.264	0.470	1.955	3.464
Gulf Coast	1.120	0.688	0.055	0.079	0.207	0.303	1.529	2.217
Hawaii East	1.539	1.416	0.078	0.147	0.268	0.506	2.036	3.839
Hawaii West	1.725	2.783	2.037	0.733	2.035	0.871	2.037	3.842
North Pacific	1.240	0.874	0.064	0.098	0.222	0.348	1.644	2.528
South Pacific	1.573	1.232	0.084	0.166	0.293	0.589	2.114	4.225
Great Lakes	1.106	1.090	0.046	0.057	0.171	0.214	1.302	1.621
Outside ECA	1.585	2.427	1.891	0.623	1.891	0.745	1.891	3.417

4.5 *Canada, Mexico, and offshore sources (othar, othon, and othpt)*

Emissions for Canada, Mexico, and offshore sources were not projected to future years, and are therefore the same as those used in the 2005 base case for all Tier 3 future year scenarios. Therefore, the Mexico emissions are based on year 1999, offshore oil is based on year 2005, and Canada is based on year 2006. For both Mexico and Canada, their responsible agencies did not provide future-year emissions that were consistent with the base year emissions.

5 2017 and 2030 Tier 3 Control Cases

The 2017 and 2030 Tier 3 NPRM control (hereafter simply referred to as the "control") cases represent the future with implementation of all RFS2 impacts discussed in Section 4 plus the inclusion of Tier 3 fuel sulfur reductions and phasing in of Tier 3 vehicle controls. Similar to the 2017 and 2030 base cases discussed in Section 4, the control cases also include MSAT2 and LDGHG but do not include HDGHG impacts.

Similar to the 2017 reference case, the 2017 control case assumes 21.6 billion gallons of renewable fuels (24 billion ethanol-equivalent gallons due to volume increases of ethanol), with 17.8 billion gallons of E10 and E15, 1.5 billion gallons of biodiesel, 0.2 billion gallons of renewable diesel, and 2.2 billion gallons of cellulosic diesel. By the year 2030, the control (and reference) case assumes 30.5 billion gallons of renewable fuels (36 billion ethanol-equivalent gallons due to volume increases of ethanol), with 22.2 billion gallons of E15 (no E10), 1.7 billion gallons of biodiesel, 0.2 billion gallons of renewable diesel, and 6.5 billion gallons of cellulosic diesel.

The only notable differences between the reference and control scenarios for both 2017 and 2030 are the fuel sulfur levels and fleet composition. For both 2017 and 2030, fuel sulfur levels are 30ppm (though 10ppm in California) in the reference case and 10ppm in all states in the Tier 3 control scenarios. For both the 2017 and 2030 reference scenarios, fleet composition is composed entirely (100%) of Tier 2 and older vehicles. For the Tier 3 control scenarios, new emission standards for model year 2014 and later light-duty motor vehicles result in assumed 93% Tier 2 and older vehicles (fraction of vehicle population) and 7% Tier 3 vehicles in 2017 and 20% Tier 2 and older vehicles and 80% Tier 3 vehicles by 2030.

Tier 3 standards are expected to impact onroad mobile, and to a much smaller extent, nonroad mobile in 2017 and 2030, and onroad refueling emissions in 2030. However, all other upstream sources, including portable fuel containers, are not expected to be affected. Therefore, the year 2017 and 2030 Tier 3 control and reference case emissions are the same for several components of the modeling inventory. This section will address only those components that are different between the reference and control scenarios in years 2017 and 2030.

VOC speciation changes between these control cases and the reference cases are discussed in Section 3.

5.1 Non-EGU stationary source projections (nonpt)

The 2017 Tier 3 control case non-EGU emissions are unchanged from the 2017 reference case. For the 2030 Tier 3 control case emissions, the only update is to use different onroad refueling emissions. These monthly-resolution county-level (nonpoint sector) refueling emissions are MOVES-based gasoline and diesel fuel spillage and include displacement vapor losses. A summary of the onroad refueling emissions in the 2030 control and reference cases is provided in Table 6-1; note that there is a negligible difference in refueling emissions between the 2030 reference and 2030 control cases.

Table 6-1. Onroad Gasoline and Diesel Refueling Emissions for 2017 and 2030 Reference Cases

Fuel Type	Pollutant	2017 Reference and Control	2030 Reference	2030 Control
Gasoline	VOC	63,759	40,781	40,777
Diesel	VOC	12,962	16,449	16,450
Gasoline	Benzene	161	91	91
Gasoline	Ethanol	8,735	7,253	7,252

5.2 Onroad mobile (onroad)

The same version of MOVES and SMOKE-MOVES Integration Tool was used to create all Tier 3 NPRM onroad emission scenarios. Section 2.2 describes these components in support of year 2005 processing. This section will only address the differences related to creating and processing year 2017 and 2030 Tier 3 NPRM control case emissions. Section 4 discussed the differences related to creating and processing year 2017 and 2030 Tier 3 NPRM reference case emissions. Speciation changes for all scenarios are discussed in Section 3.

Inputs for temperatures (Section 2.2.1), the representative counties and fuel months (Section 2.2.2), the overall parallel processing procedures (Section 2.2.3), speed data (Section 2.2.4), and SMOKE-MOVES configurations (Section 2.2.4) were previously discussed and were the same for all Tier 3 NPRM scenarios. However, SMOKE inputs of VMT and vehicle populations were year-specific but were consistent between reference and control (Section 4.3).

MOVES used fuel sulfur levels of 10ppm in all states in the Tier 3 control scenarios, including California. New emission standards for model year 2014 and later light-duty motor vehicles result in assumed 93% Tier 2 and older vehicles (fraction of vehicle population) and 7% Tier 3 vehicles in the 2017 control scenario and 20% Tier 2 and older vehicles and 80% Tier 3 vehicles in the 2030 control scenario. Other than fuels and the application of Tier 3 vehicle emission standards, (described in the RIA for the rule) the MOVES runs were identical between the reference and control scenarios of the same year.

5.3 Nonroad mobile (nonroad)

The components of the nonroad mobile sectors are discussed in Section 2.3. Nonroad mobile emissions reductions for the Tier 3 NPRM control cases are restricted to various nonroad engines including diesel engines, fuel sulfur content, and evaporative emissions. This section discusses the changes due to the NONROAD/NMIM system (nonroad sector). The C1/C2 CMV and locomotive emissions (alm_no_c3) and C3 CMV (seca_c3 sector) are unchanged in the control cases and use the same emissions as the 2017 and 2030 reference cases.

5.3.1 Emissions generated with the NONROAD model (nonroad)

As discussed in Section 2.3.1, most nonroad emissions are were estimated using the EPA's NONROAD model, as run by the EPA's consolidated modeling system known as the National Mobile Inventory Model (NMIM). NONROAD is EPA's model for calculating emissions from nonroad equipment, except for aircraft, locomotives, and commercial marine vessels. Like the onroad emissions, the NONROAD/NMIM system provides nonroad emissions for VOC by three emission modes: exhaust, evaporative and refueling. Unlike the onroad sector, nonroad refueling emissions for nonroad sources are not included in the nonpoint (nonpt) sector and so are retained in this sector.

The same temperatures and representative counties were used for all NONROAD model-generated Tier 3 NPRM scenarios. For 2017, E10 and E15 are available in every county, but nonroad equipment is assumed to burn only E10. For 2030, nonroad equipment is assumed to burn only E15. To generate the NMIM fuels in 2017 the E10 fuels were converted from MOVES to NMIM as described for the 2005 base case, assigned a market share of 1. In 2030, the E15 fuels were used. For both calendar years, the controlled sulfur levels were carried over to the nonroad case where they affected the sulfate emissions. Highway diesel fuel sulfur levels (unchanged from the reference case) are converted directly from MOVES to NMIM. Nonroad diesel fuel sulfur levels are retained from NMIM.

Section 2.3.1.3 provides a cross-walk of the nonroad mobile NMIM emission scenarios used in the Tier 3 NPRM modeling; the only difference between the calendar year scenarios are the increases in activity (based on NONROAD model default growth estimates of future-year equipment population) and changes in fuels and engines that reflect implementation of national regulations and local control programs that impact each year differently due to engine turnover. For year 2017, EPA assumed that nonroad equipment would use only E10. The 2030 modeling, EPA assumed use of E15 fuels. For both control scenario years, the NONROAD gasoline sulfur level was set to equal the level in the onroad fuel. Although the NONROAD model estimates changes in VOC production from E15, NMIM calculates toxics as if the fuel were E10. EPA calculated adjustment factors based on highway effects to apply to certain toxic emissions to correct for the use of E15 in 2030. Emission estimates for ethanol come from speciation of VOC in the SMOKE model. These ethanol adjustments for nonroad engines running on E15 came from the EPAct Phase 1 data for highway gasoline vehicles.

6 Tier 3 emissions summaries

Once developed, the emissions inventories were processed to provide the hourly, gridded emissions for the model-species needed by CMAQ. Table 6-1 provides national-level summaries of the 2005 U.S. CAP emissions inventories modeled for this rule by sector for the lower 48-states and D.C.

Table 6-2 and Table 6-3 provide these national summaries of the 2017 and 2030 Reference case U.S. CAP inventories by sector. Table 6-4 and

Table 6-5 provide national summaries of the 2017 and 2030 Tier 3 Control case U.S. CAP inventories by sector. Alaska and Hawaii emissions summaries are not included in this TSD because they are outside of the air quality modeling domain and modeling sectors that utilize domain-specific meteorology, such as onroad mobile, are needed to compute model-ready emissions.

Table 6-1. National (49-state) 2005 U.S. emissions (tons/year) by sector

Emissions Sector	NO_X	SO_2	$PM_{2.5}$	PM_{10}	NH_3	CO	VOC
Agriculture					3,251,990		
Area fugitive Dust			1,030,391	8,858,992			
Average fires	189,428	49,094	684,035	796,229	36,777	8,554,551	1,958,992
Commercial marine Category 3 (US)	130,164	97,485	10,673	11,628		11,862	4,570
EGU	3,729,161	10,380,883	496,877	602,236	21,995	603,788	41,089
Locomotive/ marine	1,922,723	153,068	56,666	59,342	773	270,007	67,690
Non-EGU Point	2,213,471	2,030,759	433,346	647,873	158,342	3,201,418	1,279,308
Nonpoint	1,696,902	1,216,362	1,079,906	1,349,639	133,962	7,410,946	7,560,061
Nonroad	2,031,527	196,277	201,406	210,767	1,971	20,742,873	2,806,422
Onroad	8,235,002	168,480	301,073	369,911	144,409	41,117,658	3,267,931
US TOTAL	**20,148,378**	**14,292,410**	**4,294,373**	**12,906,616**	**3,750,218**	**81,913,104**	**16,986,064**

Table 6-2. National (49-state) 2017 Reference Case U.S. emissions (tons/year) by sector

Emissions Sector	NO_X	SO_2	$PM_{2.5}$	PM_{10}	NH_3	CO	VOC
Agriculture					3,505,410		
Area fugitive Dust			1,037,079	8,904,386			
Average fires	189,428	49,094	684,035	796,229	36,777	8,554,551	1,958,992
Commercial marine Category 3 (US)	155,281	5,880	2,201	2,417		18,274	7,028
EGU	1,930,769	3,281,364	276,430	371,101	40,259	873,344	46,050
Locomotive/ marine	1,302,445	7,143	35,648	36,770	957	299,265	46,664
Non-EGU Point	2,003,736	1,534,991	411,437	618,157	159,867	2,995,095	1,169,826
Nonpoint	1,713,238	1,125,985	875,678	1,145,768	130,258	5,854,632	7,167,620
Nonroad	1,140,942	2,736	112,372	118,463	2,403	13,551,846	1,509,698
Onroad	3,204,871	29,288	129,416	194,597	85,378	18,690,890	1,397,668
US TOTAL	**11,640,709**	**6,036,480**	**3,564,297**	**12,187,889**	**3,961,309**	**50,837,897**	**13,303,546**

Table 6-3. National (49-state) 2030 Reference Case U.S. emissions (tons/year) by sector

Emissions Sector	NO_X	SO_2	$PM_{2.5}$	PM_{10}	NH_3	CO	VOC
Agriculture					3,702,527		
Area fugitive Dust			1,039,699	8,922,577			
Average fires	189,428	49,094	684,035	796,229	36,777	8,554,551	1,958,992
Commercial marine Category 3 (US)	115,719	9,740	3,619	3,933		29,906	11,479
EGU	2,028,844	3,746,573	296,789	394,471	48,773	1,091,438	53,468
Locomotive/ marine	741,611	3,951	18,467	19,049	1,129	338,728	25,006
Non-EGU Point	2,013,274	1,519,548	411,693	617,377	161,546	3,065,975	1,171,769
Nonpoint	1,837,589	1,137,029	986,447	1,267,217	132,659	6,728,522	7,290,413
Nonroad	765,026	3,154	68,308	72,989	2,902	12,921,772	1,209,534
Onroad	1,846,571	30,526	88,516	166,158	90,104	17,021,674	911,513
US TOTAL	**9,538,062**	**6,499,615**	**3,597,572**	**12,260,000**	**4,176,416**	**49,752,567**	**12,632,174**

Table 6-4. National (49-state) 2017 Tier 3 Control Case U.S. emissions (tons/year) by sector

Emissions Sector	NO_X	SO_2	$PM_{2.5}$	PM_{10}	NH_3	CO	VOC
Agriculture					3,505,410		
Area fugitive Dust			1,037,079	8,904,386			
Average fires	189,428	49,094	684,035	796,229	36,777	8,554,551	1,958,992
Commercial marine Category 3 (US)	155,281	5,880	2,201	2,417		18,274	7,028
EGU	1,930,769	3,281,364	276,430	371,101	40,259	873,344	46,050
Locomotive/ marine	1,302,445	7,143	35,648	36,770	957	299,265	46,664
Non-EGU Point	2,003,736	1,534,991	411,437	618,157	159,867	2,995,095	1,169,213
Nonpoint	1,713,238	1,125,985	875,678	1,145,768	130,258	5,854,632	7,145,569
Nonroad	1,140,942	1,969	112,372	118,463	2,403	13,551,846	1,498,122
Onroad	2,966,589	14,621	130,778	196,150	85,378	18,055,099	1,353,170
US TOTAL	**11,402,428**	**6,021,046**	**3,565,659**	**12,189,442**	**3,961,309**	**50,202,106**	**13,224,807**

Table 6-5. National (49-state) 2030 Tier 3 Control Case U.S. emissions (tons/year) by sector

Emissions Sector	NO_X	SO_2	$PM_{2.5}$	PM_{10}	NH_3	CO	VOC
Agriculture					3,702,527		
Area fugitive Dust			1,039,699	8,922,577			
Average fires	189,428	49,094	684,035	796,229	36,777	8,554,551	1,958,992
Commercial marine Category 3 (US)	115,719	9,740	3,619	3,933		29,906	11,479
EGU	2,028,844	3,746,573	296,789	394,471	48,773	1,091,438	53,468
Locomotive/ marine	741,611	3,951	18,467	19,049	1,129	338,728	25,006
Non-EGU Point	2,013,274	1,519,548	411,693	617,377	161,546	3,065,975	1,171,769
Nonpoint	1,837,589	1,137,029	986,447	1,267,217	132,659	6,728,522	7,290,410
Nonroad	765,026	2,257	68,308	72,989	2,902	12921772.4	1,209,452
Onroad	1,371,925	15,068	83,842	161,173	90,104	11984061.3	699,592
US TOTAL	**9,063,416**	**6,483,260**	**3,592,898**	**12,255,016**	**4,176,416**	**44,714,954**	**12,420,167**

7 References

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Emissions Inventory for Air Quality Modeling Technical Support Document: Proposed Tier 3 Emissions Standards

Appendix A

Ancillary Datasets and Parameters Used for Each Tier 3 Modeling Case

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, NC 27711
March 2013

The ancillary data files used for the Tier 3 NPRM cases are shown in Table A-1. The Input name column gives a brief designator for the dataset. The Environment Variable column gives the name of the environment variable that is used by SMOKE to specify the input. The Sector column specifies the modeling sector for the dataset. The remaining columns show the data set name and version used in the 2005 base case and 2017 and 2030 reference and control cases. Most ancillary data sets are the same for all future year scenarios; we indicate where data sets differ.

To match the Datasets and Versions listed in this table to actual data files, combine the Dataset name and the version number in the following pattern: <Dataset Name>_<Date>_<Version number>.txt, where <Date> is the last date of change for that version and will have a unique value for the combination of Dataset Name and Version number.

Table A-2 shows the parameters used for the Tier 3 NPRM modeling cases; these parameters are the same for all future year scenarios. The columns are the same as in Table A-1 except that the Program is not shown. Many of the parameters apply to all programs, or all programs for the specified processing sector.

Table A-1. List of ancillary data sets associated with the Tier 3 NPRM modeling cases.

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
Area-to-point data	ARTOPNT	smkinven		artopnt_2002detroit [v0]	artopnt_2002detroit [v0]
BEIS3 emission factors	B3FAC	Tmpbeis3	beis	beis3_efac_v3.14 [v0]	beis3_efac_v3.14 [v0]
Biogenic gridding surrogate for reports 12EUS1	BGPRO	Smkmerge	beis	bgpro_12EUS1 (/garnet/oaqps) [v0]	bgpro_12EUS1 (/garnet/oaqps) [v0]
Biogenic gridding surrogate for reports 36US1	BGPRO	Smkmerge	beis	bgpro_36US1 (/garnet/oaqps) [v0]	bgpro_36US1 (/garnet/oaqps) [v0]
Biogenic land use, file A, 12EUS1	BELD3_A	Normbeis3	beis	LANDA_EUS12_279X240 (/garnet/oaqps) [v0]	LANDA_EUS12_279X240 (/garnet/oaqps) [v0]
Biogenic land use, file A, 36US1	BELD3_A	Normbeis3	beis	LANDA_US36_148X112 (/garnet/oaqps) [v0]	LANDA_US36_148X112 (/garnet/oaqps) [v0]
Biogenic land use, file B, 12EUS1	BELD3_B	Normbeis3	beis	LANDB_EUS12_279X240 (/garnet/oaqps) [v0]	LANDB_EUS12_279X240 (/garnet/oaqps) [v0]
Biogenic land use, file B, 36US1	BELD3_B	Normbeis3	beis	LANDB_US36_148X112 (/garnet/oaqps) [v0]	LANDB_US36_148X112 (/garnet/oaqps) [v0]
Biogenic land use, totals, 12EUS1	BELD3_TOT	Normbeis3	beis	LAND_TOTALS_EUS12_279X240 (/garnet/oaqps) [v0]	LAND_TOTALS_EUS12_279X240 (/garnet/oaqps) [v0]
Biogenic land use, totals, 36US1	BELD3_TOT	Normbeis3	beis	LAND_TOTALS_US36_148X112 (/garnet/oaqps) [v0]	LAND_TOTALS_US36_148X112 (/garnet/oaqps) [v0]
Bioseasons file 12EUS1	BIOSEASON	Tmpbeis3	beis	bioseason.cmaq.2005b_12km (/garnet/oaqps) [v0]	bioseason.cmaq.2005b_12km (/garnet/oaqps) [v0]
Bioseasons file 36US1 mcip v3.4 beta4 b	BIOSEASON	Tmpbeis3	beis	bioseason.cmaq.2005b_36km (/garnet/oaqps) [v0]	bioseason.cmaq.2005b_36km (/garnet/oaqps) [v0]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
CEM annually summed data	CEMSUM	smkinven	ptipm	cemsum_ptipm_2005 (/orchid/share) [v0]	cemsum_ptipm_2005 (/garnet/oaqps) [v0]
Combination profiles	GSPRO_COMBO	Spcmat		gspro_combo_2005 [v6]	gspro_combo_2005 [v6]
Combination profiles - nonpt	GSPRO_COMBO	Spcmat	nonpt	gspro_combo_tier3_2005_base_nonpt_v2 [v2]	2017 Reference and Control: gspro_combo_tier3_2017_ref_nonpt [v1]
Combination profiles – onroad	GSPRO_COMBO	Spcmat	onroad	gspro_combo_tier3_2005_base_onroad_v2 [v0]	2017 Reference and Control: gspro_combo_tier3_2017_ref_onroad [v2]
Combination profiles - ptnonipm (same as nonpt)	GSPRO_COMBO	Spcmat	ptnonipm	gspro_combo_tier3_2005_base_nonpt_v2 [v2]	2017 Reference and Control: gspro_combo_tier3_2005_base_nonpt_v2 [v2]
Country, State, County Information	COSTCY	smkinven		costcy_for_2002 [v5]	costcy_for_2002 [v5]
Elevation Configuration File for Point Sources	PELVCONFIG	Laypoint		pelvconfig_inline_allpts [v1]	pelvconfig_inline_allpts [v1]
Elevation Configuration File for seca_c3 sector	PELVCONFIG	Laypoint	seca_c3	pelvconfig_seca_c3 [v1]	pelvconfig_seca_c3 [v1]
Grid Description List	GRIDDESC	Grdmat		griddesc_lambertonly [v39]	griddesc_lambertonly [v39]
Gridding surrogates CAN-MEX 12km	SRGPRO	Grdmat	othon	Canada_12km_revised (/garnet/oaqps) [v0]	Canada_12km_revised (/garnet/oaqps) [v0]
Gridding surrogates CAN-MEX 12km	SRGPRO	Grdmat	othar	Canada_12km_revised (/garnet/oaqps) [v0]	Canada_12km_revised (/garnet/oaqps) [v0]
Gridding surrogates CAN-MEX 36km	SRGPRO	Grdmat	othar	Canada_36km_revised (/garnet/oaqps) [v0]	Canada_36km_revised (/garnet/oaqps) [v0]
Gridding surrogates CAN-MEX 36km	SRGPRO	Grdmat	othon	Canada_36km_revised (/garnet/oaqps) [v0]	Canada_36km_revised (/garnet/oaqps) [v0]
Gridding surrogates USA 12km	SRGPRO	Grdmat		USA-CAN-MEX_12km (/garnet/oaqps) [v0]	USA-CAN-MEX_12km (/garnet/oaqps) [v0]
Gridding surrogates USA 36km	SRGPRO	Grdmat		USA-CAN-MEX_36km (/garnet/oaqps) [v0]	USA-CAN-MEX_36km (/garnet/oaqps) [v0]
GSCNV - pollutant to pollutant conversions	GSCNV	Spcmat		gscnv_cb05_soa [v2]	2017 Reference & Control: gscnv_cb05_soa [v3] 2030 Reference & Control: gscnv_cb05_soa [v4]
GSPRO speciated MOVES PM	GSPROTMP_L	Spcmat		gspro_speciated_pm [v3]	gspro_speciated_pm [v3]
GSREF speciated PM	GSREFTMP_L	Spcmat		gsref_speciated_pm [v2]	gsref_speciated_pm [v2]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
Holidays table	HOLIDAYS	Temporal		holidays [v0]	holidays [v0]
Inventory Table - HAPCAP EBAFM integration CMAQ-lite v4.7 N1e HDGHG	INVTABLE	smkinven	onroad	invtable_hapcap_cb05soa [v13]	invtable_hapcap_cb05soa [v13]
Inventory Table - HAPCAP EBAFM integration CMAQ-lite v4.7 N1e HDGHG	INVTABLE	smkinven	nonpt	invtable_hapcap_cb05soa [v13]	invtable_hapcap_cb05soa [v13]
Inventory Table - HAPCAP integration CMAQ-lite v4.7 N1e HDGHG	INVTABLE	smkinven		invtable_hapcap_cb05soa [v12]	invtable_hapcap_cb05soa [v12]
Inventory Table -no-BAFM CMAQ-lite v4.7 N1e HDGHG	INVTABLE	smkinven	avefire	invtable_hapcap_cb05_no_bafm [v3]	invtable_hapcap_cb05_no_bafm [v3]
Inventory Table -no-BAFM CMAQ-lite v4.7 N1e HDGHG	INVTABLE	smkinven	ptipm	invtable_hapcap_cb05_no_bafm [v3]	invtable_hapcap_cb05_no_bafm [v3]
List of sectors for mrggrid	SECTORLIST	Mrggrid		sectorlist_2005ct_05b [v3]	2017 Reference: sectorlist_2017ct_ref_05b [v1] 2017 Control: sectorlist_2017ct_ctla_05b [v1] 2030 Reference: sectorlist_2030ct_ref_csapr_05b [v1] 2030 Control: sectorlist_2030ct_ctl_csapr_05b [v1]
MACT Description	MACTDESC	Smkreport		mactdesc_2002v3 [v1]	mactdesc_2002v3 [v1]
Meteorology temperature profiles	METMOVES	movesmrg	onroad	SMOKE_DAILY_12MERGEUS1_2005 [v0]	SMOKE_DAILY_12MERGEUS1_2005 [v0]
Mobile codes file default	MCODES	smkinven		mcodes [v1]	mcodes [v1]
MOVES county cross-reference	MCXREF	movesmrg	onroad	MCXREF_tier3 [v0]	MCXREF_tier3 [v0]
MOVES Emission Factor Table list	MRCLIST	movesmrg	onroad	mrclist_RPV_05jul2011_2005ct_05b [v0]	2017 Reference: mrclist_RPV_01jul2011_2017ct_ref_05b [v0] 2017 Control: mrclist_RPV_08aug2011_2017ct_ctla_05b [v0] 2030 Reference: mrclist_RPV_06jul2011_2030ct_ref_05b [v0] 2030 Control: mrclist_RPV_03aug11_2030ct_ctl_05b [v0]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
MOVES Emission Factor Table list	MRCLIST	movesmrg	onroad	mrclist_RPD_20may2011_2005ct_05b [v0]	2017 Reference: mrclist_RPD_10jun2011_2017ct_ref_05b [v0] 2017 Control: mrclist_RPD_08aug2011_2017ct_ctla_05b [v0] 2030 Reference: mrclist_RPD_06jul2011_2030ct_ref_05b [v0] 2030 Control: mrclist_RPD_03aug11_2030ct_ctl_05b [v0]
MOVES Emission Factor Table list	MRCLIST	movesmrg	onroad	mrclist_RPP_20may2011_2005ct_05b [v0]	2017 Reference: mrclist_RPP_10jun2011_2017ct_ref_05b [v0] 2017 Control: mrclist_RPP_08aug2011_2017ct_ctla_05b [v0] 2030 Reference: mrclist_RPP_06jul2011_2030ct_ref_05b [v0] 2030 Control: mrclist_RPP_03aug11_2030ct_ctl_05b [v1]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
MOVES Emission Factor Tables	EFTABLES	movesmrg	onroad	EFtables_20110520_Tier3Base2005 [v0] EFtables_20110705_Tier3Base2005_RPVfix [v0]	2017 Reference: EFtables_20110610_Tier3Ref2017 [v0] EFtables_20110701_Tier3Ref2017_RPVfix [v0] 2017 Control: EFtables_20110830_Tier3Ctla2017 [v0] 2030 Reference: EFtables_20110706_Tier3Ref2030_RPP [v0] EFtables_20110706_Tier3Ref2030_RPD [v0] EFtables_20110706_Tier3Ref2030_RPV [v0] 2030 Control: EFtables_20110803_Tier3Ctl2030 [v0]
MOVES processes and pollutants	MEPROC	movesmrg	onroad	meproc_RPP_mplite [v0]	meproc_RPP_mplite [v0]
MOVES processes and pollutants	MEPROC	movesmrg	onroad	meproc_RPV_mplite [v1]	meproc_RPV_mplite [v1]
MOVES processes and pollutants	MEPROC	movesmrg	onroad	meproc_RPD_mplite [v2]	meproc_RPD_mplite [v2]
MOVES reference county fuel month	MFMREF	movesmrg	onroad	MFMREF_tier3 [v0]	MFMREF_tier3 [v0]
NAICS descriptions	NAICSDESC	Smkreport		naicsdesc [v0]	naicsdesc [v0]
NHAPEXCLUDE alm_no_c3	NHAPEXCLUDE	smkinven	alm_no_c3	nhapexclude_alm_no_c3_pf4 [v1]	nhapexclude_alm_no_c3_pf4 [v1]
NHAPEXCLUDE avefire	NHAPEXCLUDE	smkinven	avefire	nhapexclude_everything [v0]	nhapexclude_everything [v0]
NHAPEXCLUDE nonpt	NHAPEXCLUDE	smkinven	nonpt	nhapexclude_nonpt_pf4_addpesticides [v3]	nhapexclude_nonpt_pf4_addpesticides [v3]
NHAPEXCLUDE NONROAD	NHAPEXCLUDE	smkinven	nonroad	nhapexclude_nonroad_pf4 [v0]	nhapexclude_nonroad_pf4 [v0]
NHAPEXCLUDE ptnonipm	NHAPEXCLUDE	smkinven	ptnonipm	nhapexclude_ptnonipm_include_30125010 [v0]	nhapexclude_ptnonipm_include_30125010 [v0]
NHAPEXCLUDE seca_c3	NHAPEXCLUDE	smkinven	seca_c3	nhapexclude_nothing [v0]	nhapexclude_nothing [v0]
nonpoint & nonroad surrogate xref	AGREF	Grdmat		amgref_us_can_mex_revised [v11]	amgref_us_can_mex_revised [v15]
onroad surrogate xref default	MGREF	Grdmat		amgref_us_can_mex_revised [v11]	amgref_us_can_mex_revised [v15]
ORIS Description	ORISDESC	smkinven		orisdesc [v0]	orisdesc [v0]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
SCC descriptions	SCCDESC	smkinven		sccdesc_pf31 [v12]	sccdesc_pf31 [v12]
SIC descriptions	SICDESC	Smkreport		sic_desc [v0]	sic_desc [v0]
Smkmerge representative dates files	MRGDATE_FILES	Run script		merge_dates_2005 (/garnet/oaqps) [v0]	merge_dates_2005 (/garnet/oaqps) [v0]
Speciation profiles additional for SMOKE-MOVES	GSPROTMP_O	Spcmat	onroad	gspro_new_for_smoke-moves [v0]	gspro_new_for_smoke-moves [v0]
Speciation profiles Canada PM	GSPROTMP_J	Spcmat	othpt	gspro_pm25_canada_2006_point [v0]	gspro_pm25_canada_2006_point [v0]
Speciation profiles for biogenics	GSPROTMP_K	Spcmat	beis	gspro_biogenics [v1]	gspro_biogenics [v1]
Speciation profiles for HG	GSPROTMP_H	Spcmat		gspro_hg [v2]	gspro_hg [v2]
Speciation profiles for INTEGRATE HAPS	GSPROTMP_F	Spcmat		gspro_integratehaps_cb05_tx_pf4 [v1]	gspro_integratehaps_cb05_tx_pf4 [v1]
Speciation profiles for NONHAPTOG	GSPROTMP_E	Spcmat		gspro_nonhaptog_cb05 [v3]	gspro_nonhaptog_cb05 [v3]
Speciation profiles for NONHAPTOG w/ETOH integration	GSPROTMP_E	Spcmat	onroad	gspro_nonhaptog_cb05_eprofiles [v0]	gspro_nonhaptog_cb05_eprofiles [v0]
Speciation profiles for NONHAPTOG w/ETOH integration	GSPROTMP_E	Spcmat	nonpt	gspro_nonhaptog_cb05_eprofiles [v0]	gspro_nonhaptog_cb05_eprofiles [v0]
Speciation profiles for NOX	GSPROTMP_G	Spcmat		gspro_nox_hono_pf4 [v0]	gspro_nox_hono_pf4 [v0]
Speciation profiles for PM2.5	GSPROTMP_C	Spcmat		gspro_pm25 [v2]	gspro_pm25 [v2]
Speciation profiles for SO2-SULF	GSPROTMP_B	Spcmat		gspro_sulf [v1]	gspro_sulf [v1]
Speciation profiles for TOG	GSPROTMP_D	Spcmat		gspro_tog_cb05_soa [v3]	gspro_tog_cb05_soa [v3]
Speciation profiles Other VOC HAP	GSPROTMP_M	Spcmat		gspro_other_hapvoc_no_benz-benz [v0]	gspro_other_hapvoc_no_benz-benz [v0]
Speciation profiles speciated VOC	GSPROTMP_I	Spcmat		gspro_speciated_voc [v0]	gspro_speciated_voc [v0]
Speciation profiles static	GSPROTMP_A	Spcmat		gspro_static_cmaq [v12]	gspro_static_cmaq [v12]
Speciation xref CAP static	GSREFTMP_A	Spcmat		gsref_static_cap_pf4 [v1]	gsref_static_cap_pf4 [v1]
Speciation xref for Canada PM	GSREFTMP_N	Spcmat	othpt	gsref_pm25_canada_2006_point [v3]	gsref_pm25_canada_2006_point [v3]
Speciation xref for Integrate-HAPs static	GSREFTMP_J	Spcmat		gsref_static_integratehap_emv4 [v2]	gsref_static_integratehap_emv4 [v2]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
Speciation xref for NONHAPVOC, not year-specific	GSREFTMP_H	Spcmat	nonpt		2017 Reference & Control: gsref_nonhapvoc_general_hdghg [v3]
Speciation xref for NONHAPVOC, not year-specific	GSREFTMP_H	Spcmat		gsref_nonhapvoc_general_hdghg [v2]	2017 Reference & Control: gsref_nonhapvoc_general_hdghg [v2] 2030 Reference & Control: gsref_nonhapvoc_general_tier3_2030_ref [v1]
Speciation xref for NONHAPVOC, year-specific	GSREFTMP_I	Spcmat		gsref_nonhapvoc_2005_hdghg [v2]	2017 Reference & Control: gsref_nonhapvoc_2017_ref_tier3 [v1] 2030 Reference & Control: gsref_nonhapvoc_2030_ref_tier3 [v3]
Speciation xref for NONHAPVOC, year-specific	GSREFTMP_I	Spcmat	nonpt		2017 Reference & Control: gsref_nonhapvoc_2017_ref_tier3 [v2]
Speciation xref for PM2.5 diesel SCCs but do not produce diesel	GSREFTMP_D	Spcmat		gsref_no_dieselpm [v3]	gsref_no_dieselpm [v3]
Speciation xref for PM2.5 non-diesel SCCs	GSREFTMP_E	Spcmat		gsref_pm25_pf4_nondiesel [v14]	gsref_pm25_pf4_nondiesel [v14]
Speciation xref for SMOKE-MOVES not TOG	GSREFTMP_P	Spcmat	onroad	gsref_new_for_smoke-moves_otherthantog [v0]	gsref_new_for_smoke-moves_otherthantog [v0]
Speciation xref for SMOKE-MOVES TOG	GSREFTMP_O	Spcmat	onroad	gsref_new_for_smoke-moves_tog [v1]	2017 Reference and Control: gsref_2017_for_smoke_moves_tog [v1] 2030 Reference and Control: gsref_2030_ref_for_smoke_moves_tog [v1]
Speciation xref for SO2-SULF	GSREFTMP_B	Spcmat		gsref_sulf [v0]	gsref_sulf [v0]
Speciation xref for speciated VOC	GSREFTMP_M	Spcmat	onroad	gsref_speciated_voc [v2]	gsref_speciated_voc [v2]
Speciation xref for speciated VOC	GSREFTMP_M	Spcmat	othpt	gsref_speciated_voc [v2]	gsref_speciated_voc [v2]
Speciation xref for VOC, not year-specific	GSREFTMP_F	Spcmat		gsref_voc_general_hdghg [v3]	2017 Reference and Control: gsref_voc_general_hdghg [v3] 2030 Reference & Control: gsref_voc_general_tier3_2030_ref [v1]
Speciation xref for VOC, year-specific	GSREFTMP_G	Spcmat		gsref_voc_2005_hdghg [v4]	2017 Reference & Control: gsref_voc_2017_ref_tier3 [v3] 2030 Reference & Control: gsref_voc_2030_ref_tier3 [v1]

Input Name	Environment Variable	Program	Sector	2005 Base Case	2017 & 2030 Reference/Control Cases
Speciation xref HG	GSREFTMP_K	Spcmat		gsref_hg [v8]	gsref_hg [v8]
Speciation xref static NOX -- HONO for mobile sources	GSREFTMP_C	Spcmat		gsref_static_nox_hono_pf4 [v6]	gsref_static_nox_hono_pf4 [v6]
Stack replacement	PSTK	smkinven		pstk [v0]	pstk [v0]
surrogate descriptions (works for all grids)	SRGDESC	Grdmat	othon	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]
surrogate descriptions (works for all grids)	SRGDESC	Grdmat		srgdesc_12km [v2]	srgdesc_12km [v2]
surrogate descriptions (works for all grids)	SRGDESC	Grdmat	othar	srgdesc_36km_revised [v1]	srgdesc_36km_revised [v1]
Temporal profiles, all nonpoint and nonroad	ATPRO	Temporal		amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]
Temporal profiles, all point	PTPRO	Temporal		amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]
Temporal profiles, onroad default	MTPRO	Temporal		amptpro_2005_us_can_revised [v2]	amptpro_2005_us_can_revised [v2]
Temporal xref, all nonpoint and nonroad	ATREF	Temporal		amptref_v3_3_revised [v12]	amptref_v3_3_revised [v12]
Temporal xref, onroad mobile default	MTREF	Temporal		amptref_v3_3_revised [v12]	amptref_v3_3_revised [v12]
Temporal xref, othpt	PTREF	Temporal	othpt	ptref_othpt [v4]	ptref_othpt [v4]
Temporal xref, point default	PTREF	Temporal		amptref_v3_3_revised [v12]	amptref_v3_3_revised [v12]
Temporal xref, ptipm only	PTREF	Temporal	Ptipm	ptref_ptipm_us [v0]	ptref_ptipm_us [v0]

Table A-2. Parameters used in the Tier 3 NPRM cases

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
All months across all sectors	ALL_MONTHS		1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
BEIS3 version	BEIS3_VERSION	beis	3.14	3.14
Biogenics land area surrogate	AREA_SURROGATE_NUM	beis	340	340
Biogenics speciation profile code	BIOG_SPRO	beis	B10C5	B10C5
Check for duplicate sources	RAW_DUP_CHECK	ptfire	N	N
Check for duplicate sources	RAW_DUP_CHECK	ptnonipm	N	N
Check for duplicate sources	RAW_DUP_CHECK	ptipm	N	N
Check for duplicate sources	RAW_DUP_CHECK		Y	Y
Check for duplicate sources	RAW_DUP_CHECK	alm_no_c3		N
Check for duplicate sources	RAW_DUP_CHECK	nonpt		N

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Check for duplicate sources	RAW_DUP_CHECK	othon	N	N
Check for duplicate sources	RAW_DUP_CHECK	othpt	N	N
Check for duplicate sources	RAW_DUP_CHECK	othar	N	N
Check stack parameters for missing	CHECK_STACKS_YN	ptfire	N	N
Convective rainfall variable for Pleim-Xiu	RC_VAR	beis	RC	RC
Count of underscores for Daily data prefix	NAMEBREAK_DAILY	ptipm	9	10
Custom merge output	SMKMERGE_CUSTOM_OUTPUT		Y	Y
Custom merge output - MOVES	MOVESMRG_CUSTOM_OUTPUT	onroad	Y	Y
Default surrogate code	SMK_DEFAULT_SRGID		100	100
Default surrogate code	SMK_DEFAULT_SRGID	afdust	340	340
Don't need spinup for most sectors	SPINUP_DURATION	ptipm		0
Don't need spinup for most sectors	SPINUP_DURATION	nonpt	0	0
Don't need spinup for most sectors	SPINUP_DURATION	ptipm		
Don't need spinup for most sectors	SPINUP_DURATION	ptnonipm	0	0
Don't need spinup for most sectors	SPINUP_DURATION	nonroad	0	0
Don't need spinup for most sectors	SPINUP_DURATION	othpt	0	0
Don't need spinup for most sectors	SPINUP_DURATION	seca_c3		
Don't need spinup for most sectors	SPINUP_DURATION	seca_c3		0
Don't speciate zero emission SCCs	NO_SPC_ZERO_EMIS	ptnonipm	Y	Y
Don't speciate zero emission SCCs	NO_SPC_ZERO_EMIS	nonpt	Y	Y
Don't use day-specific emission	DAY_SPECIFIC_YN	ptipm	N	N
Don't use pollutant conversion	POLLUTANT_CONVERSION	onroad	N	N
EGU daily type	EGU_TYPE		model_performance	model_performance
EMF queue options	EMF_QUEUE_OPTIONS		#NAME?	#NAME?
Emission rate model	SMK_EF_MODEL	onroad	MOVES	MOVES
Fill annual values	FILL_ANNUAL	nonroad	Y	Y
Fill annual values	FILL_ANNUAL		N	N
Fill annual values	FILL_ANNUAL	nonpt	Y	Y

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Fire-specific plume rise calculations	FIRE_PLUME_YN	ptfire	Y	Y
Formula for Smkinven	SMKINVEN_FORMULA		PMC=PM10-PM2_5	PMC=PM10-PM2_5
Formula for Smkinven	SMKINVEN_FORMULA	ag		
Formula for Smkinven	SMKINVEN_FORMULA	nonroad	EXH__PMC=EXH__PM10-EXH__PM2_5	EXH__PMC=EXH__PM10-EXH__PM2_5
Formula for Smkinven	SMKINVEN_FORMULA	onroad		
Include market penetration	MRG_MARKETPEN_YN		N	N
I/O API Sphere type	IOAPI_ISPH		19	19
Laypoint uses Elevpoint to set sources for plume rise calc	SMK_SPECELEV_YN		Y	Y
Match full SCCs	FULLSCC_ONLY		Y	Y
Maximum errors printed	SMK_MAXERROR		10000	10000
Maximum warnings printed	SMK_MAXWARNING		10	10
MCIP name abbreviation	MCIPNAME		MCIP_v3.4beta4	MCIP_v3.4beta4
Merge by day	MRG_BYDAY	ptnonipm	P	P
Merge by day	MRG_BYDAY	seca_c3	P	P
Merge by day	MRG_BYDAY	othpt	P	P
Merge type	M_TYPE		Mwdss	Mwdss
Merge type	M_TYPE	ptipm	All	All
Merge type	M_TYPE	ptnonipm	Mwdss	Mwdss
Merge type	M_TYPE	ptfire	All	All
Merge type	M_TYPE	avefire	Aveday	Aveday
Merge type	M_TYPE	ag	Aveday	Aveday
Merge type	M_TYPE	afdust	Week	Week
Merge type	M_TYPE	onroad	All	All
Merge type	M_TYPE	nonptfire	Aveday	Aveday
Merge type	M_TYPE	othpt	Mwdss	Mwdss
Merge type	M_TYPE	othon	Week	Week
Merge type	M_TYPE	seca_c3	Aveday	Aveday
Merge type	M_TYPE	beis	All	All
Model output format	OUTPUT_FORMAT		$EMF_AQM	$EMF_AQM

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Nonhap Type	NONHAP_TYPE	nonpt	VOC	VOC
Nonhap Type	NONHAP_TYPE	ptnonipm	VOC	VOC
Nonhap Type	NONHAP_TYPE	avefire	VOC	VOC
Nonhap Type	NONHAP_TYPE	nonroad	VOC	VOC
Nonhap Type	NONHAP_TYPE	onroad	TOG	TOG
Nonhap Type	NONHAP_TYPE	alm_no_c3	VOC	VOC
Nonhap Type	NONHAP_TYPE	seca_c3	VOC	VOC
Number of emissions layers	SMK_EMLAYS		10	10
Ocean Chlorine filename extension	EXT	mrggrid	.ncf	.ncf
Output county biogenic totals	BIO_COUNTY_SUMS	beis	Y	Y
Output county/SCC totals	MRG_REPSRC_YN	onroad	Y	Y
Output county totals	MRG_REPCNY_YN		N	N
Output county totals	MRG_REPCNY_YN		Y	
Output county totals	MRG_REPCNY_YN	onroad	Y	Y
Output SCC totals	MRG_REPSCC_YN	onroad	Y	Y
Output state biogenic totals	BIO_STATE_SUMS	beis	Y	Y
Output state totals	MRG_REPSTA_YN		Y	Y
Output state totals	MRG_REPSTA_YN		N	
Output state totals	MRG_REPSTA_YN	onroad	N	N
Output time zone	OUTZONE		0	0
Platform name	PLATFORM		v4.3	v4.3
Pleim-Xiu land surface used?	PX_VERSION	beis	Y	Y
Plume-in-grid method	SMK_PING_METHOD		0	0
Pressure variable name	PRES_VAR	beis	PRSFC	PRSFC
PTDAY file name case	DAILY_CASE	ptipm	2005ck	2005ck
Radiation/cloud variable name	RAD_VAR	beis	RGRND	RGRND
Renormalize temporal profiles	RENORM_TPROF		Y	Y
Report default profiles used	REPORT_DEFAULTS		Y	Y
Run holidays	RUN_HOLIDAYS	ag	N	N
Run holidays	RUN_HOLIDAYS	avefire	N	N

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Run holidays	RUN_HOLIDAYS		Y	Y
Run holidays	RUN_HOLIDAYS	seca_c3	N	N
Run holidays	RUN_HOLIDAYS	alm_no_c3	N	N
Run holidays	RUN_HOLIDAYS	othon	N	N
Run holidays	RUN_HOLIDAYS	othpt	N	N
Run holidays	RUN_HOLIDAYS	othar	N	N
Run holidays	RUN_HOLIDAYS	nonptfire	N	N
Run holidays	RUN_HOLIDAYS	afdust	Y	Y
Run in inline mode	INLINE_MODE		Both	Both
Run in inline mode SECA_C3	INLINE_MODE	seca_c3	Only	Only
Run script for Smkmerge annual totals	RUN_PYTHON_ANNUAL		Y	Y
Smkmerge reports units	MRG_TOTOUT_UNIT		tons/dy	
SMOKE-MOVES processing mode	MOVES_TYPE	onroad	RPD	RPD
SMOKE-MOVES processing mode	MOVES_TYPE	onroad	RPP	RPP
SMOKE-MOVES processing mode	MOVES_TYPE	onroad	RPV	RPV
Soil moisture variable for Pleim-Xiu	SOIM1_VAR	beis	SOIM1	SOIM1
Soil temperature variable for Pleim-Xiu	SOILT_VAR	beis	SOIT1	SOIT1
Soil type variable for Pleim-Xiu	ISLTYP_VAR	beis	SLTYP	SLTYP
Sort inventory EVs by letter	SORT_LIST_EVS	othpt	Y	Y
Sort inventory EVs by letter	SORT_LIST_EVS	avefire	Y	Y
Sort inventory EVs by letter	SORT_LIST_EVS	ptipm	Y	Y
Speciation type name	SPC		$EMF_SPC	$EMF_SPC
Spinup Duration	SPINUP_DURATION		10	10
Spinup Duration	SPINUP_DURATION		3	3
Temperature variable name	TMPR_VAR	beis	TEMP2	TEMP2
Temperature variable name - MOVES	TVARNAME	onroad	TEMP2	TEMP2
Temporal type	L_TYPE		Mwdss	Mwdss
Temporal type	L_TYPE	ptipm	All	All
Temporal type	L_TYPE	ptfire	All	All
Temporal type	L_TYPE	avefire	Aveday	Aveday

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Temporal type	L_TYPE	ag	Aveday	Aveday
Temporal type	L_TYPE	afdust	Week	Week
Temporal type	L_TYPE	onroad	All	All
Temporal type	L_TYPE	nonptfire	Aveday	Aveday
Temporal type	L_TYPE	othon	Week	Week
Temporal type	L_TYPE	seca_c3	Aveday	Aveday
Temporal type	L_TYPE	beis	All	All
Use area-to-point	SMK_ARTOPNT_YN	alm_no_c3	Y	Y
Use area-to-point	SMK_ARTOPNT_YN	nonpt	Y	Y
Use area-to-point	SMK_ARTOPNT_YN	nonroad	Y	Y
Use average day emissions	SMK_AVEDAY_YN		N	N
Use day-specific emission	DAY_SPECIFIC_YN	ptipm	Y	Y
Use day-specific emission	DAY_SPECIFIC_YN	ptfire	Y	Y
Use hourly plume rise data	HOURLY_FIRE_YN	ptfire	Y	Y
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	alm_no_c3	PARTIAL	PARTIAL
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	seca_c3	ALL	ALL
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	onroad	ALL	ALL
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	nonroad	PARTIAL	PARTIAL
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	avefire	NONE	NONE
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	ptnonipm	PARTIAL	PARTIAL
Use NHAPEXCLUDE file	SMK_PROCESS_HAPS	nonpt	PARTIAL	PARTIAL
Use pollutant conversion	POLLUTANT_CONVERSI ON		Y	Y
Western hemisphere?	WEST_HSPHERE		Y	Y
Write zero emissions	WRITE_ANN_ZERO	ptfire	Y	Y
Write zero emissions	WRITE_ANN_ZERO	ptipm	Y	Y
Zip merged model-ready files	GZIP_OUTPUTS	mrggrid	Y	Y
Base Year			2005	2005
Downstream Model			CMAQ v4.7 N5c	CMAQ v4.7 N5c
End Date & Time			12/31/2005 23:59	12/31/2005 23:59

Parameter Name	Environment Variable	Sector	2005 Base Case	2017/2030 Reference and Control Cases
Future Year			0	2017
Last Modified Date			13:57.7	22:39.1
Meteorological Year			2005	2005
Model			SMOKE	SMOKE
Modeling Region			National	National
# of emission layers			14	14
# of met layers			14	14
Speciation			cmaq_cb05_tx	cmaq_cb05_tx
Start Date			1/1/2005 0:00	1/1/2005 0:00
Version			2.7	2.7

Emissions Inventory for Air Quality Modeling Technical Support Document: Proposed Tier 3 Emissions Standards

Appendix B

Inventory Data Files Used for Each Tier 3 Modeling Case – SMOKE Input Inventory Datasets

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Assessment Division
Research Triangle Park, NC 27711
March 2013

The emissions inventory data files used for the Tier 3 cases are shown in Table B-1. The Input name column gives a brief designator for the inventory. The Sector column specifies the modeling sector for the inventory. The remaining columns show the data set name and version used in the 2005 base case and 2017 reference cases. The datasets used for the 2017 and 2030 control cases are identical to the 2017 and 2030 reference cases, respectively, except for the following replacements:

- Onroad mobile inventories (onroad sector)
- Onroad refueling inventories (nonpt sector)
- Nonroad mobile inventories (nonroad sector)

To match the Datasets and Versions listed in this table to actual data files, combine the Dataset name and the version number in the following pattern: <Dataset Name>_<Date>_<Version number>.txt, where <Date> is the last date of change for that version and will have a unique value for the combination of Dataset Name and Version number.

Table B-1. List of inventory data sets associated with the Tier 3 NPRM modeling cases.

Input name	**Sector**	**2005 Base Case**	**2017 Reference/Control Cases**	**2030 Reference/Control Cases**
Inventory afdust CAP	afdust	afdust_2002ad_xportfrac [v0]	afdust_2017ct_ref [v0]	afdust_2030ct_ref [v0]
Inventory ag CAP	ag	ag_cap2002nei [v0]	ag_cap2017ct_ref [v0]	ag_cap2030ct_ref [v0]
Inventory alm_no_c3 CAP	alm_no_c3	lm_no_c3_cap2002v3 [v1]	lm_no_c3_cap2017ct_lowE [v0]	lm_no_c3_cap2030cs [v0]
Inventory alm_no_c3 HAP	alm_no_c3	lm_no_c3_hap2002v4 [v0]	lm_no_c3_hap2017ct_lowE [v0]	lm_no_c3_hap2030cs [v0]
Inventory avefire CAP	avefire	avefire_2002ce [v0]	avefire_2002ce [v0]	avefire_2002ce [v0]
Inventory avefire HAP	avefire	avefire_2002_hap [v0]	avefire_2002_hap [v0]	avefire_2002_hap [v0]
Inventory C1/C2 additional CAP/HAP	alm_no_c3		c1c2_additional_2017ct_ref_caphap_25jul2011 [v0]	c1c2_additional_2030ct_ref_caphap_25jul2011 [v0]
Inventory nonpt CAP and HAP (PFC only)	nonpt	pfc_2002_caphap_wETOH [v1]	pfc_2017_ref_caphap_23aug2011 [v0]	pfc_2030_ref_caphap_23aug2011 [v0]
Inventory nonpt CAP/HAP Cellulosic Biodiesel plants for Tier3	nonpt		cellulosic_ETOH_Biodiesel_2017ct_ref_caphap_29jul2011 [v0]	cellulosic_ETOH_Biodiesel_2030ct_ref_caphap_29jul2011 [v0]
Inventory nonpt CAP/HAP Ethanol Transport for Tier3	nonpt		Ethanol_transport_vapor_2017ct_ref_caphap_25jul2011 [v0]	Ethanol_transport_vapor_2030ct_ref_caphap_25jul2011 [v0]
Inventory nonpt CAP (no PFC, no refueling)	nonpt	nonpt_pf4_cap_nopfc [v6]	nonpt_pf4_cap_nopfc_2017ct_ref [v0]	nonpt_pf4_cap_nopfc_2030ct_ref [v0]
Inventory nonpt CAP: TX and OK Oil and Gas	nonpt	nonpt_cap_2005_TCEQ_Oklahoma_OilGas [v0]	nonpt_cap_2017ct_lowE_TCEQ_Oklahoma_OilGas [v0]	nonpt_cap_2030ct_lowE_TCEQ_Oklahoma_OilGas [v0]
Inventory nonpt CAP: WRAP Oil and Gas	nonpt	nonpt_cap_2005_WRAP_OilGas [v0]	nonpt_cap_2018PhaseII_WRAP_OilGas [v0]	nonpt_cap_2018PhaseII_WRAP_OilGas [v0]

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
Inventory nonpt HAP (no PFC, no refueling)	nonpt	nonpt_pf4_hap_nopfc_nobafmpesticidesplus [v4]	nonpt_pf4_hap_nopfc_nobafmpesticidesplus_2017ct_ref [v0]	nonpt_pf4_hap_nopfc_nobafmpesticidesplus_2030ct_ref [v0]
Inventory nonpt Refueling from MOVES, April	nonpt	rfl_moves_wETOH_2005ct_apr_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_apr_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_apr_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_apr_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, August	nonpt	rfl_moves_wETOH_2005ct_aug_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_aug_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_aug_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_aug_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, December	nonpt	rfl_moves_wETOH_2005ct_dec_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_dec_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_dec_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_dec_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, February	nonpt	rfl_moves_wETOH_2005ct_feb_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_feb_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_feb_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_feb_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, January	nonpt	rfl_moves_wETOH_2005ct_jan_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_jan_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_jan_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_jan_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, July	nonpt	rfl_moves_wETOH_2005ct_jul_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_jul_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_jul_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_jul_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, June	nonpt	rfl_moves_wETOH_2005ct_jun_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_jun_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_jun_27jul2011 [v0]

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
				2030 Control: rfl_moves_wETOH_2030ct_ctl_jun_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, March	nonpt	rfl_moves_wETOH_2005ct_mar_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_mar_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_mar_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_mar_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, May	nonpt	rfl_moves_wETOH_2005ct_may_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_may_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_may_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_may_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, November	nonpt	rfl_moves_wETOH_2005ct_nov_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_nov_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_nov_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_nov_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, October	nonpt	rfl_moves_wETOH_2005ct_oct_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_oct_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_oct_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_oct_28jul2011 [v0]
Inventory nonpt Refueling from MOVES, September	nonpt	rfl_moves_wETOH_2005ct_sep_18may2011 [v0]	rfl_moves_wETOH_2017ct_ref_sep_27jul2011 [v0]	2030 Reference: rfl_moves_wETOH_2030ct_ref_sep_27jul2011 [v0] 2030 Control: rfl_moves_wETOH_2030ct_ctl_sep_28jul2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif April	nonroad	nonroad_cmaq_lite_2005ct_apr_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_apr_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_apr_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_apr_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_apr_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif August	nonroad	nonroad_cmaq_lite_2005ct_aug_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_aug_20	2030 Reference: nonroad_cmaq_lite_2030ct_ref_aug_03

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
			jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_aug_08sep2011 [v0]	aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_aug_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif December	nonroad	nonroad_cmaq_lite_2005ct_dec_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_dec_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_dec_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_dec_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_dec_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif February	nonroad	nonroad_cmaq_lite_2005ct_feb_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_feb_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_feb_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_feb_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_feb_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif January	nonroad	nonroad_cmaq_lite_2005ct_jan_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_may_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_may_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_may_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_may_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif July	nonroad	nonroad_cmaq_lite_2005ct_jul_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_jul_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_jul_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_jul_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_jul_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif June	nonroad	nonroad_cmaq_lite_2005ct_jun_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_jun_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_jun_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_jun_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_jun_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif March	nonroad	nonroad_cmaq_lite_2005ct_mar_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_mar_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_mar_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_mar_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_mar_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite	nonroad	nonroad_cmaq_lite_2005ct_may_19	2017 Reference:	2030 Reference:

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
HAPs US, incl Calif May		may2011 [v0]	nonroad_cmaq_lite_2017ct_ref_may_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_may_08sep2011 [v0]	nonroad_cmaq_lite_2030ct_ref_may_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_may_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif November	nonroad	nonroad_cmaq_lite_2005ct_nov_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_nov_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_nov_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_nov_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_nov_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif October	nonroad	nonroad_cmaq_lite_2005ct_oct_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_oct_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_oct_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_oct_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_oct_03aug2011 [v0]
Inventory nonroad cap+CMAQ-lite HAPs US, incl Calif September	nonroad	nonroad_cmaq_lite_2005ct_sep_19may2011 [v0]	2017 Reference: nonroad_cmaq_lite_2017ct_ref_sep_20jul2011 [v0] 2017 Control: nonroad_cmaq_lite_2017ct_ctla_sep_08sep2011 [v0]	2030 Reference: nonroad_cmaq_lite_2030ct_ref_sep_03aug2011 [v0] 2030 Control: nonroad_cmaq_lite_2030ct_ctl_sep_03aug2011 [v0]
Inventory onroad RPD	onroad	VMT_tier3_2005 [v0]	VMT_tier3_2017_ref_cntl [v3]	VMT_tier3_2030_ref_cntl [v1]
Inventory onroad RPD	onroad	SPEED_tier3 [v0]	SPEED_tier3 [v0]	SPEED_tier3 [v0]
Inventory onroad RPP	onroad	VPOP_tier3_2005 [v0]	VPOP_tier3_2017 [v0]	VPOP_tier3_2030 [v0]
Inventory onroad RPV	onroad	VPOP_tier3_2005 [v0]	VPOP_tier3_2017 [v0]	VPOP_tier3_2030 [v0]
Inventory othar nonpoint CAP Mexico border states	othar	nonpt mexico border1999 [v0]	nonpt mexico border1999 [v0]	nonpt mexico border1999 [v0]
Inventory othar nonpoint CAP Mexico interior states	othar	nonpt mexico interior1999 [v0]	nonpt mexico interior1999 [v0]	nonpt mexico interior1999 [v0]
Inventory othar nonroad CAP Mexico border states	othar	nonroad mexico border1999 [v0]	nonroad mexico border1999 [v0]	nonroad mexico border1999 [v0]
Inventory othar nonroad CAP Mexico interior states	othar	nonroad mexico interior1999 [v0]	nonroad mexico interior1999 [v0]	nonroad mexico interior1999 [v0]
Inventory othon CAP Mexico border states	othon	onroad mexico border1999 [v0]	onroad mexico border1999 [v0]	onroad mexico border1999 [v0]
Inventory othon CAP Mexico interior states	othon	onroad mexico interior1999 [v0]	onroad mexico interior1999 [v0]	onroad mexico interior1999 [v0]

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
Inventory othon CAP onroad Canada	othon	canada_onroad_cap_2006 [v0]	canada_onroad_cap_2006 [v0]	canada_onroad_cap_2006 [v0]
Inventory othpt CAP Mexico border states	othpt	mexico_border99 [v1]	mexico_border99 [v1]	mexico_border99 [v1]
Inventory othpt CAP Mexico interior states	othpt	mexico_interior99 [v0]	mexico_interior99 [v0]	mexico_interior99 [v0]
Inventory othpt CAP offshore	othpt	ptnonipm_offshore_oil_cap2005v2_20nov2008 [v0]	ptnonipm_offshore_oil_cap2005v2_20nov2008 [v0]	ptnonipm_offshore_oil_cap2005v2_20nov2008 [v0]
Inventory ptipm CAP	ptipm	ptipm_2005cs_cap_27dec2010.txt [v1]	PTINV_EPA410FINAL_BC_58_summer_2020_21MAY2011_ORL [v0]	2030 Reference Case: PTINV_EPA410FINAL_BC_58_summer_2030_27MAY2011_ORL [v0] 2030 Control Case: PTINV_EPA410_BC_15b_summer_2030_02FEB2011_ORL [v0]
Inventory ptipm daily data (CEM sources)	ptipm	ptday_ptipm_caphap_cem_2005cs_05b (/garnet/oaqps) [v0]	ptday_ptipm_caphap_cem_2017ct_05b [v0]	2030 Reference Case: ptday_ptipm_caphap_cem_2030ct_lowE [v0] 2030 Control: ptday_ptipm_caphap_cem_2030cs_hdghg_ref_05b [v0]
Inventory ptipm daily data (nonCEM sources)	ptipm	ptday_ptipm_caphap_noncem_2005cs_05b (/garnet/oaqps) [v0]	ptday_ptipm_caphap_noncem_2017ct_05b [v0]	2030 Reference: ptday_ptipm_caphap_noncem_2030ct_lowE [v0] 2030 Control: ptday_ptipm_caphap_noncem_2030cs_hdghg_ref_05b [v0]
Inventory ptipm HAP	ptipm	ptipm_2005cs_hap_27dec2010.txt [v0]		
Inventory ptnonipm CAP	ptnonipm	ptnonipm_xportfrac_cap2005v2_2005cs_orl [v7]	ptnonipm_xportfrac_cap2017ct_ref [v0]	ptnonipm_xportfrac_cap2030ct_ref [v0]
Inventory ptnonipm CAPHAP biodiesel plant additions forTier3	ptnonipm		biodiesel_plants_2017ct_ref_caphap_29jul2011 [v0]	biodiesel_plants_2030ct_ref_caphap_29jul2011 [v0]
Inventory ptnonipm CAPHAP ethanol plant additions forTier3	ptnonipm	ethanol_plants_2005ct_2017ct_lowE_caphap [v0]	ethanol_plants_2017ct_ref_caphap_19jul2011 [v0]	ethanol_plants_2030ct_ref_caphap_19jul2011 [v0]
Inventory ptnonipm cement capHg	ptnonipm		ptnonipm_capHG_cementISIS_2016cr_16AUG2010 [v0]	ptnonipm_capHG_cementISIS_2016cr_16AUG2010 [v0]
Inventory ptnonipm HAP	ptnonipm	ptnonipm_hap2005v2_2005cs_orl [v6]	ptnonipm_hap2017ct_ref [v0]	ptnonipm_hap2030ct_ref [v0]
Inventory rail additional CAP/HAP for Tier3 ref/ctl	alm_no_c3		rail_additional_2017ct_ref_caphap_26jul2011 [v0]	rail_additional_2030ct_ref_caphap_26jul2011 [v0]
Inventory seca_c3 BAF HAPs Canada	seca_c3	eca_imo_CANADA_SCC_fix_voch	eca_imo_CANADA_SCC_fix_vochaps	eca_imo_CANADA_SCC_fix_vochaps

Input name	Sector	2005 Base Case	2017 Reference/Control Cases	2030 Reference/Control Cases
		aps_2005_09DEC2010 [v0]	_2017 [v0]	_2030_08FEB2011 [v0]
Inventory seca_c3 BAF HAPs US includes EEZ and offshore FIPS	seca_c3	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2005_09DEC2010 [v0]	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2017 [v0]	eca_imo_fixFIPS_US_andSCC_fix_vochaps_2030_08FEB2011 [v0]
Inventory seca_c3 CAP Canada	seca_c3	eca_imo_CANADA_SCC_fix_caps_2005_09DEC2010 [v0]	eca_imo_CANADA_SCC_fix_caps_2017 [v0]	eca_imo_CANADA_SCC_fix_caps_2030_08FEB2011 [v0]
Inventory seca_c3 CAP US + EEZ + Offshore non-Canada	seca_c3	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2005_09DEC2010 [v0]	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2017 [v0]	eca_imo_fixFIPS_US_wDE_andSCC_fix_caps_2030_08FEB2011 [v0]
ORL Nonpoint Inventory - Afdust Canada 2006	othar	canada_afdust_xportfrac_cap_2006 [v0]	canada_afdust_xportfrac_cap_2006 [v0]	canada_afdust_xportfrac_cap_2006 [v0]
ORL Nonpoint Inventory - Ag Canada 2006	othar	canada_ag_cap_2006 [v0]	canada_ag_cap_2006 [v0]	canada_ag_cap_2006 [v0]
ORL Nonpoint Inventory - Aircraft Canada 2006	othar	canada_aircraft_cap_2006 [v0]	canada_aircraft_cap_2006 [v0]	canada_aircraft_cap_2006 [v0]
ORL Nonpoint Inventory - Commercial Marine Canada 2006	othar	canada_marine_cap_2006 [v0]	canada_marine_cap_2006 [v0]	canada_marine_cap_2006 [v0]
ORL Nonpoint Inventory - Nonroad Canada 2006	othar	canada_offroad_cap_2006 [v0]	canada_offroad_cap_2006 [v0]	canada_offroad_cap_2006 [v0]
ORL Nonpoint Inventory - Oarea Canada 2006	othar	canada_oarea_cap_2006 [v3]	canada_oarea_cap_2006 [v3]	canada_oarea_cap_2006 [v3]
ORL Nonpoint Inventory - Rail Canada 2006	othar	canada_rail_cap_2006 [v0]	canada_rail_cap_2006 [v0]	canada_rail_cap_2006 [v0]
ORL Point Inventory - Point 2006	othpt	canada_point_2006_orl [v2]	canada_point_2006_orl [v2]	canada_point_2006_orl [v2]
ORL Point Inventory - Point CB5 2006	othpt	canada_point_cb5_2006_orl [v0]	canada_point_cb5_2006_orl [v0]	canada_point_cb5_2006_orl [v0]
ORL Point Inventory - Upstream Oil & Gas 2006	othpt	canada_point_uog_2006_orl [v0]	canada_point_uog_2006_orl [v0]	canada_point_uog_2006_orl [v0]

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Air Quality Assessment Division Research Triangle Park, NC	Publication No. EPA-454/R-13-002 March, 2013