

**2011–2016 Greenhouse Gas Reporting Program
Industrial Profile: Miscellaneous
Combustion Sources**

October 2018

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MISCELLANEOUS COMBUSTION SOURCES SECTOR

Highlights

- Greenhouse gas (GHG) emissions from the sector decreased by 5% from 2011 to 2016.
- Food processing has been the highest-emitting subsector in each year, accounting for 35% of GHG emissions from the sector in 2016.
- Natural gas was the predominant fuel used across this sector from 2011 to 2016. During 2016, natural gas provided an estimated 84% of the fuel used by this sector, while contributing only approximately 75% of total GHG emissions.
- Approximately 2,900 combustion configurations were reported in this sector. A configuration is either a single combustion unit or multiple combustion units for which combined emissions were reported. Therefore, the number of individual combustion sources in this sector is greater than 2,900.

All emissions presented here are as of 8/5/2017. The reported emissions exclude biogenic carbon dioxide (CO₂). GHG data displayed in this document in units of carbon dioxide equivalent (CO₂e) reflect the global warming potential (GWP) values from [Table A-1](#) of 40 CFR 98, which is generally based on the [IPCC AR4](#).

About this Sector

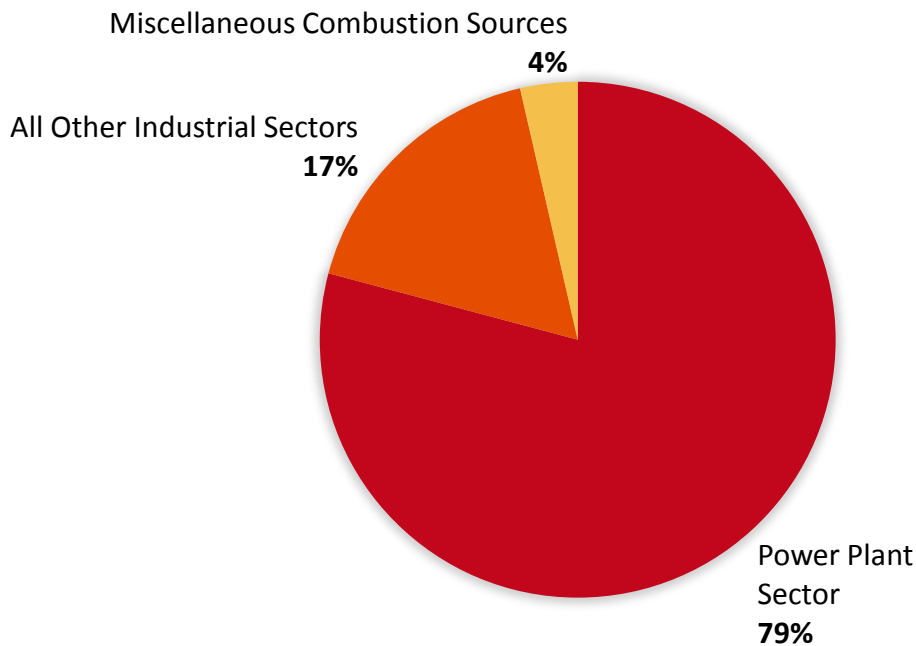
The Miscellaneous Combustion Sources (MCS) sector comprises combustion-only sources that are not part of any other Greenhouse Gas Reporting Program (GHGRP) industry sector.¹ This profile divides the MCS sector into several subsectors that comprise common facility types: Food Processing, Ethanol Production, Other Manufacturing, Military, and Universities. There is also a grouping for “Other” facility types.

Many facilities in other sectors report emissions from the combustion of fossil fuels, and those emissions are attributed to those other sectors. The GHG emissions from the MCS sector represent only a small portion (4%) of the total combustion emissions reported under the GHGRP (Figure 1). Power plants account for 79% of reported combustion emissions.

¹ [Access the GHGRP industry sectors.](#)



Figure 1. Reported GHG Emissions from Fuel Combustion by Sector^a (2016)



^a Figure 1 shows all combustion emissions reported under GHGRP Subpart C (General Stationary Fuel Combustion), Subpart D (Electricity Generation), and Subpart AA (Pulp and Paper Manufacturing), which is 2,371 million metric tons (MMT) CO₂e (about 36% of total U.S. emissions).

Who Reports?

In 2016, combustion operations at 1,110 facilities were included within this sector. Total reported emissions were 85.2 MMT CO₂e. In 2016, the Miscellaneous Combustion Sources Sector represented 15% of the facilities reporting direct emissions to the GHGRP and 1.3% of total U.S. GHG emissions.²

More than half of the reporters in this sector were Food Processing and Other Manufacturing facilities. Tables 1 – 3 and Figure 2 summarize the MSC coverage and number of reporters and emissions totals by subsector.

² Total U.S. GHG emissions are 6,546.28 MMT CO₂e, as reported in the [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2016. U.S. Environmental Protection Agency](#). February 6, 2018. EPA 430-P-18-001.

Table 1: MCS Sector – GHGRP and Industry Coverage

MCS Sector	Source Category	Applicability	First Reporting Year	Estimated Percent of Industry Facilities Covered by GHGRP	Estimated Percent of Industry Emissions Covered by GHGRP	NAICS Codes Included in MCS Sector ^a
Food Processing	Subpart C: Stationary Combustion Sources	All facilities that emit $\geq 25,000$ metric tons CO ₂ e/year from stationary fuel combustion and are not part of any other industrial sector. Learn more about industrial sectors.	2010	Not available ^b	24% ^c	112, 311, 312
Ethanol Production				Not available ^b	65% ^c	325193
Other Manufacturing				Not available ^b	Not available ^d	313, 314, 315, 316, 321, 3252, 325510, 325920, 326, 332, 333, 334, 335, 336, 337, 339
Universities				2% ^e	Not available ^f	611210, 611310, 611519, 611699
Military				10% ^g	Not available ^h	923140, 928
Other Combustion				Not available ^b	Not available ^d	NAICS codes not listed ⁱ

^a Six-digit North American Industry Classification System (NAICS) codes are reported to the GHGRP. All six-digit NAICS codes reported to the GHGRP beginning with the three- and four-digit NAICS codes listed in this table are included in the respective MCS sector.

^b Due to the diversity of facilities and products in this category, the U.S. population of similar facilities is not available.

^c Estimate of the sector's annual emissions is based on the [U.S. Energy Information Administration's Manufacturing Energy Consumption Survey](#) data publication for 2014.

^d Due to the diversity of facilities and products in this category, U.S. emissions from similar facilities are not available.

^e Based on [comparison of 114 universities reporting to GHGRP and 7,236 postsecondary institutions](#).

^f Total emissions from all U.S. colleges and universities are not available.

^g Based on [comparison of 34 military bases reporting to GHGRP and 330 military bases](#).

^h Total emissions from all U.S. military bases are not available.

ⁱ Any NAICS codes that are not listed in this table besides NAICS codes are assigned to the following sectors: Power Plants (2211XX, 221330), Petroleum and Natural Gas Systems (211XXX, 3241XX, 424710, 486210, 486910, 213112), Chemicals (325XXX, except for 325193, 3252XX, 325510, and 325920), Waste (562213), Metals (331XXX), Minerals (327XXX), and Pulp and Paper (322XXX, 323XXX).

Reported Emissions

Table 2: MCS Sector – Number of Reporters (2011–2016)

MCS Sector	Number of Reporters					
	2011	2012	2013	2014	2015	2016
Total MCS Sector	1,083	1,114	1,121	1,152	1,144	1,110
Food Processing	317	327	332	340	344	338
Ethanol Production	163	166	164	172	176	172
Other Manufacturing	287	291	293	297	290	279
Universities	112	115	114	117	116	114

Table 2: MCS Sector – Number of Reporters (2011–2016)

MCS Sector	Number of Reporters					
	2011	2012	2013	2014	2015	2016
Military	43	44	43	43	38	34
Other Combustion	161	171	175	183	180	173

Table 3: MCS Sector – Emissions by Subsector (2011–2016)

MCS Sector	Emissions (MMT CO ₂ e) ^{a, b}					
	2011	2012	2013	2014	2015	2016
Total MCS Sector	89.6	87.3	87.8	90.5	87.4	85.2
Food Processing	31.2	31.1	31.3	32.1	30.9	29.9
Ethanol Production	18.2	17.3	17.1	18.3	18.5	19.1
Other Manufacturing	16.9	16.0	16.5	16.8	15.6	15.1
Universities	9.5	9.0	9.2	9.4	9.0	8.7
Military	2.7	2.6	2.5	2.5	1.9	1.7
Other Combustion	11.0	11.2	11.3	11.3	11.4	10.7

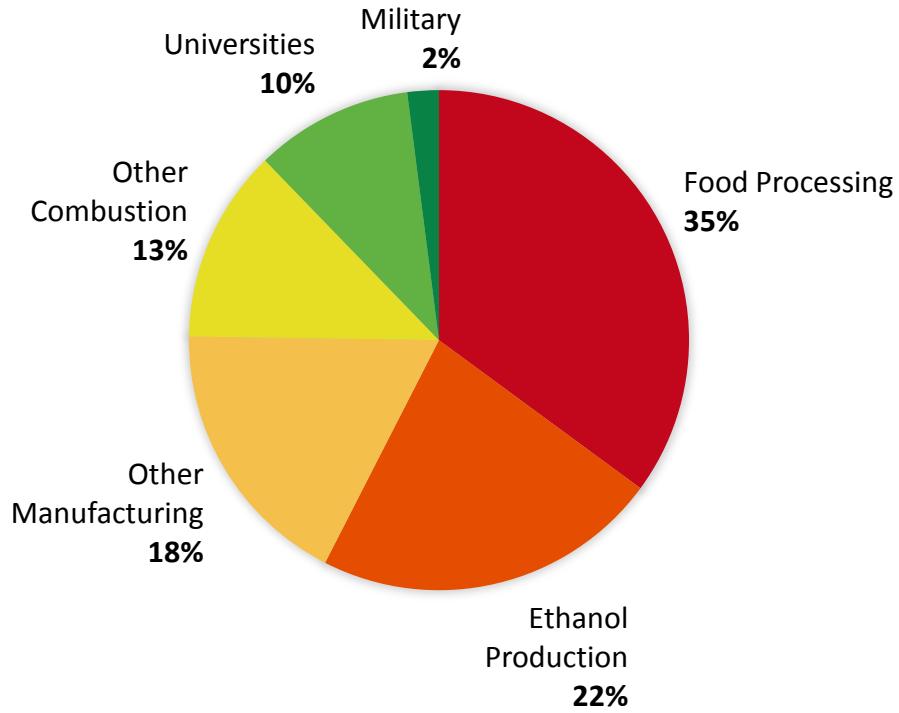
^a Totals may not sum due to rounding.

^b These values represent total emissions reported to the GHGRP in these industry sectors. Additional emissions occur at facilities that have not reported, for example, those below the 25,000 metric ton CO₂e reporting threshold.

Total reported emissions from the MCS Sector in 2016 were 85.2 MMT CO₂e. The two largest emitting subsectors were Food Processing and Ethanol Production, representing more than 50% of reported emissions.



Figure 2: MCS Sector – Emissions by Subsector (2016)



[Access the most current data using FLIGHT.](#)



Figure 3: Location and Emissions Range for Each Reporting Facility in the Miscellaneous Combustion Sources Sector (as of 8/5/2017)

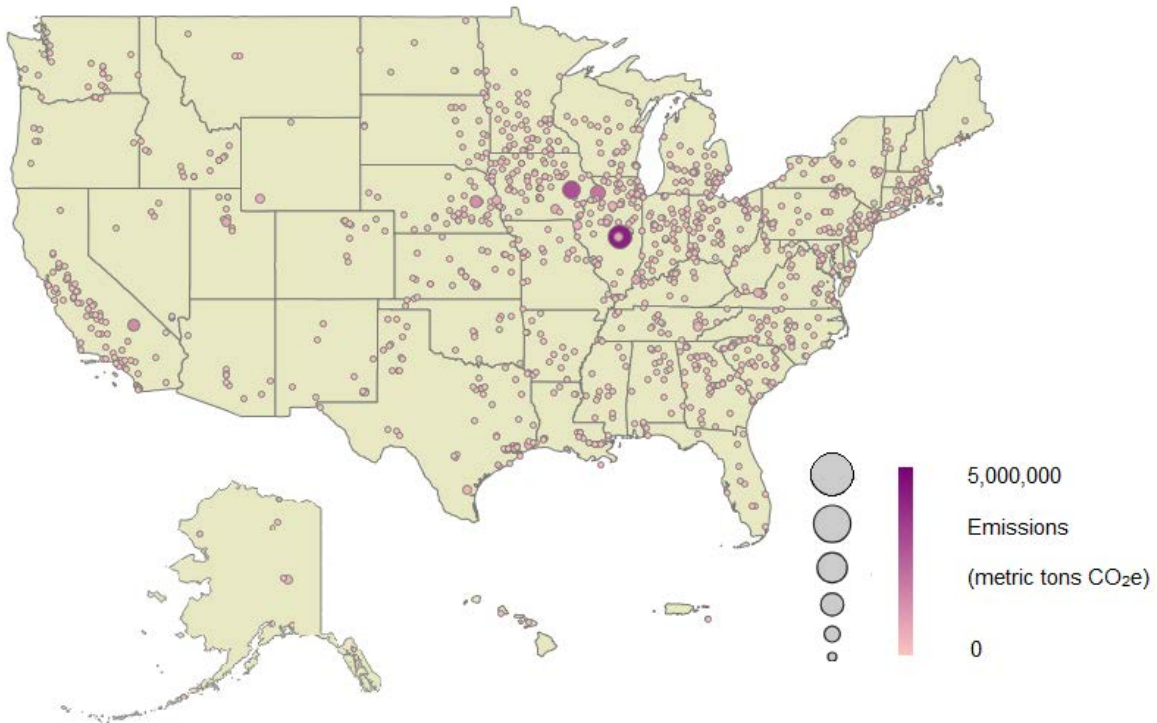
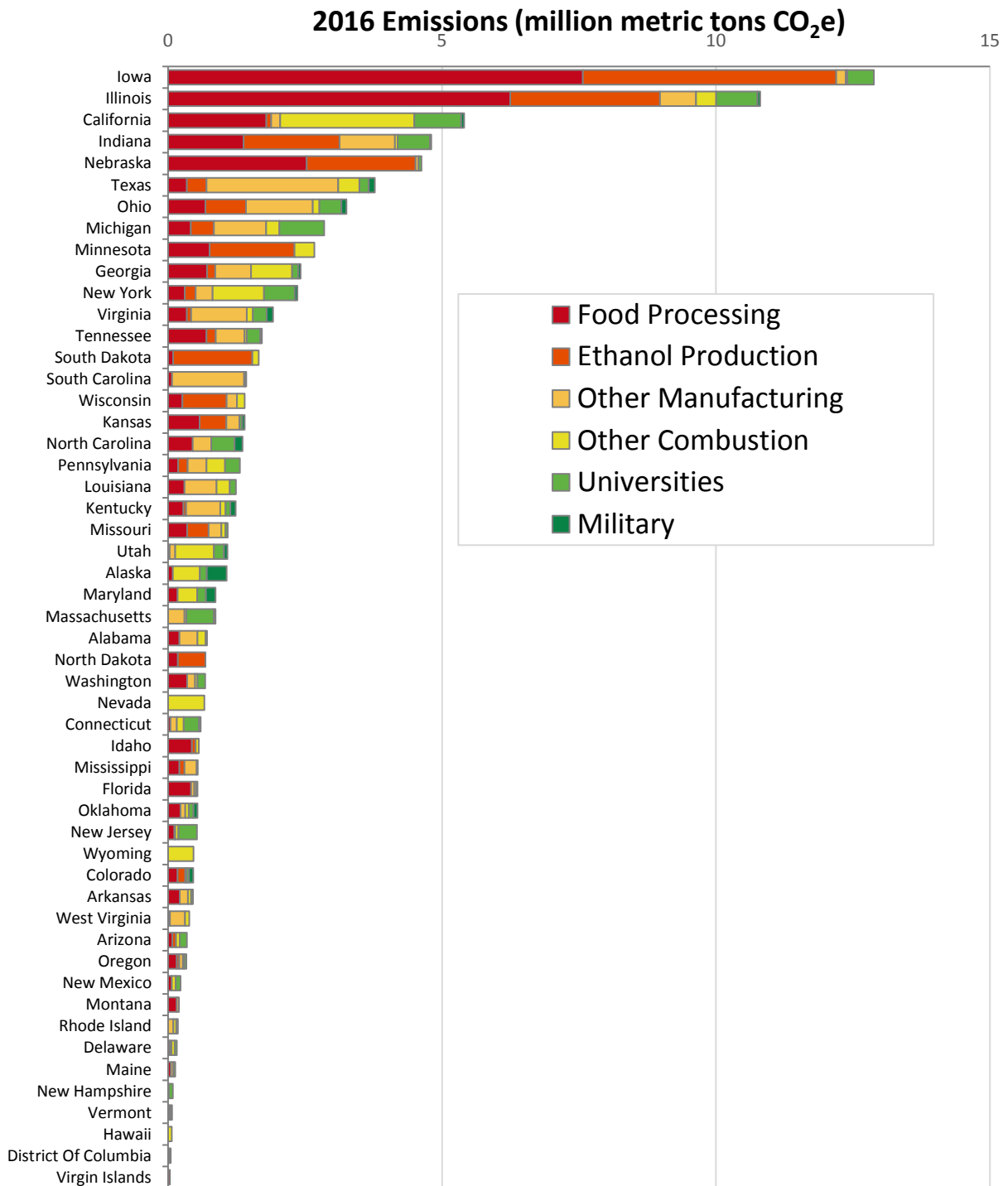


Figure 3 shows the locations of direct-emitting facilities. The size of a circle corresponds to the quantity of emissions reported by that facility. Figure 4 shows 2016 emissions from the MSC sector by state.

Readers can [identify the largest emitting facilities](#) at the Facility-Level Information on the [Greenhouse Gases \(FLIGHT\) website](#).



Figure 4: MCS Sector – Emissions by State (2016)^a



^a Represents total emissions reported to the GHGRP in this sector. Additional emissions occur at facilities that have not reported; for example, those below the 25,000 metric ton reporting threshold. [Access the most current FLIGHT data.](#)

Miscellaneous Combustion Sources Sector Emissions Trends for 2011 to 2016

In 2016, emissions reported for the MCS sector decreased by 4.2 MMT CO₂e (4.7%) from 2011 levels. Emissions from the military subsector had the most significant decrease (37%) between 2011 and 2016. Figure 5 shows direct emissions from the MSCS sector by subsector. Table 4 summarizes emissions by GHG, and Table 5 summarizes combustion emissions by fuel type. Figure 6 shows average emissions per reporter. Figure 7 and Table 6 show the percentage and number of reporters by emission range in 2016, respectively.

Food Processing

Emissions reported for this subsector decreased by 1.3 MMT CO₂e (4.2%) from 2011 to 2016. While reporting facilities for this subsector increased by 21 facilities (6.6%) over this time period, combustion emissions from natural gas increased by 2.8 MMT CO₂e (20.6%), while emissions from coal and petroleum products decreased by 3.9 MMT CO₂e (22.8%) and 0.2 MMT CO₂e (50.0%), respectively, resulting in a net decrease in emissions.

Ethanol Production

Emissions reported for this subsector increased by 0.9.0 MMT CO₂e (4.9%) from 2011 to 2016, with the number of reporting facilities for this subsector increasing by 9 facilities (5.5%) over the same period. Ethanol production volumes and plant capacity have also steadily increased between 2011 and 2016. U.S. weekly ethanol production saw a 10% increase from approximately 899,000 barrels per day in 2011 to 992,000 barrels per day in 2016.³

Other Manufacturing

Emissions reported for this subsector decreased by 1.8 MMT CO₂e (10.7%) from 2011 to 2016, coinciding with a 2.8% (8 facilities) net decrease in the number of reporting facilities for this subsector. Of the 329 total facilities that have reported at least once between 2011 and 2016, 48 facilities (15%) stopped reporting to the GHGRP due to either a facility closure or a reduction of emissions below the applicability threshold.

Universities

Emissions reported for this subsector decreased by 0.8 MMT CO₂e (8.4%) from 2011 to 2016. Although reporting facilities for this subsector increased by 2 facilities (1.8%) from 2011 to 2016, it appears that the switch from coal to natural gas has been the driver of the decrease in emissions. Combustion emissions from coal and petroleum products decreased by 1.9 MMT CO₂e (63.3%) and 0.1 MMT CO₂e (50.0%), respectively, while combustion emissions from natural gas increased by 1.2 MMT CO₂e (19.4%) from 2011 to 2016.

Military

Emissions reported for this subsector decreased by 1.0 MMT CO₂e (37.0%) from 2011 to 2016. Similarly, reporting facilities for this subsector decreased by 9 facilities (20.9%) from 2011 to 2016. Of the 45 total facilities that have reported at least once between 2011 and 2016, 7 facilities (16%) stopped reporting to the GHGRP due to either a facility closure or a reduction of emissions below the applicability threshold. Also, combustion emissions from coal, natural gas, and petroleum products decreased by 0.3 MMT CO₂e (37.5%), 0.4 MMT CO₂e (25.0%), and 0.3 MMT CO₂e (75.0%), respectively, from 2011 to 2016.

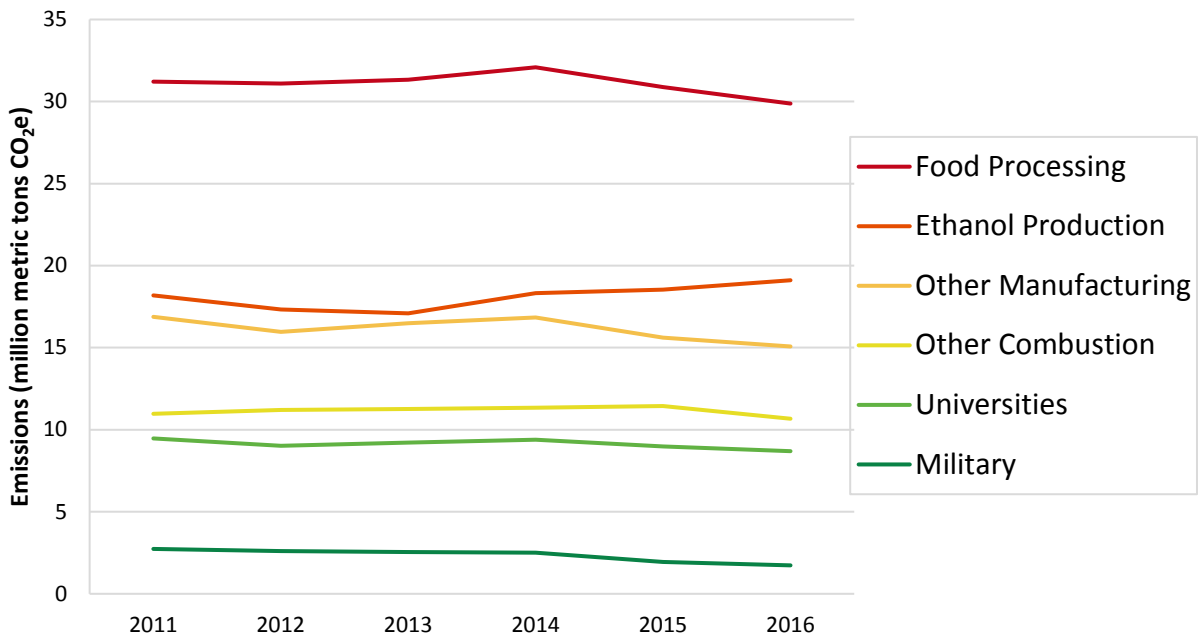
Other Combustion

³ As reported in [“U.S. fuel ethanol production continues to grow in 2017.”](#) U.S. Energy Information Administration. July 21, 2017.

Emissions reported for this subsector decreased by 0.3 MMT CO₂e (2.7%) from 2011 to 2016. Although reporting facilities for this subsector increased by 12 facilities (7.5%) from 2011 to 2016, it appears that the switch from coal to natural gas has been the driver of the decrease in emissions. Combustion emissions from natural gas and other fuels increased by 0.2 MMT CO₂e (3.0%) and 0.3 MMT CO₂e (3,824%), respectively, from 2011 to 2016. Emissions from coal and petroleum products decreased by 0.5 MMT CO₂e (14.3%) and 0.3 MMT CO₂e (37.5%), respectively.



Figure 5: Annual Reported Direct GHG Emissions from the Miscellaneous Combustion Sources Sector



[Access the most current information using FLIGHT.](#)

Table 4: MCS Sector – Emissions by GHG (2011–2016) (MMT CO₂e)

MCS Sector	Reporting Year					
	2011	2012	2013	2014	2015	2016
Number of Facilities	1,083	1,114	1,121	1,152	1,144	1,110
Total Emissions (MMT CO₂e)^b	89.6	87.3	87.8	90.5	87.4	85.2
Emissions by GHG						
Carbon Dioxide						
Food Processing	31.0	30.9	31.1	31.9	30.7	29.7
Ethanol Production	18.2	17.2	17.1	18.3	18.5	19.1
Other Manufacturing	16.8	15.9	16.4	16.8	15.5	15
Universities	9.4	9	9.2	9.4	9	8.7
Military	2.7	2.6	2.5	2.5	1.9	1.7
Other Combustion	10.9	11.2	11.2	11.3	11.4	10.6
Methane						
Food Processing	0.1	0.1	0.1	0.1	0.1	0.1
Ethanol Production	a	a	a	a	a	a
Other Manufacturing	a	a	a	a	a	a
Universities	a	a	a	a	a	a
Military	a	a	a	a	a	a
Other Combustion	a	a	a	a	a	a
Nitrous Oxide						
Food Processing	0.1	0.1	0.1	0.1	0.1	0.1
Ethanol Production	a	0.2	a	a	a	a
Other Manufacturing	0.1	0.1	0.1	0.1	a	a
Universities	a	a	a	a	a	a
Military	a	a	a	a	a	a
Other Combustion	a	a	a	a	a	a

^a Total reported emissions are less than 0.05 MMT CO₂e.

^a Totals may not sum, due to rounding.

Carbon dioxide accounts for the vast majority of emissions from the MCS sector.

Table 5: MCS Sector – Combustion Emissions by Fuel Type^a (2011–2016)

Fuel type	Emissions (MMT CO ₂ e) ^a					
	2011	2012	2013	2014	2015	2016
Food Processing	31.2	31.1	31.3	32.1	30.9	29.9
Coal	17.1	16.1	16.2	16.3	14.7	13.2
Natural Gas	13.6	14.6	14.7	15.4	15.8	16.4
Petroleum Products	0.4	0.4	0.3	0.3	0.4	0.2
Other Fuels ^b	0.1	^c	0.1	^c	0.1	0.1

Table 5: MCS Sector – Combustion Emissions by Fuel Type^a (2011–2016)

Fuel type	Emissions (MMT CO ₂ e) ^a					
	2011	2012	2013	2014	2015	2016
Ethanol Production	18.2	17.3	17.1	18.3	18.5	19.1
Coal	1.8	1.5	1.1	1.0	0.5	0.3
Natural Gas	16.4	15.8	15.5	17.3	18.1	18.9
Petroleum Products	c	c	0.3	c	c	c
Other Fuels ^b	c	c	c	c	c	c
Other Manufacturing	16.9	16.0	16.5	16.8	15.6	15.1
Coal	3.9	3.3	3.3	3.4	2.0	1.4
Natural Gas	12.4	12.0	12.6	13.0	13.2	13.3
Petroleum Products	0.4	0.5	0.3	0.3	0.3	0.2
Other Fuels ^{b, d}	0.2	0.2	0.2	0.1	0.1	0.1
Universities	9.5	9.0	9.2	9.4	9.0	8.7
Coal	3.0	2.1	1.9	2.0	1.5	1.1
Natural Gas	6.2	6.7	6.9	7.0	7.2	7.4
Petroleum Products	0.2	0.2	0.4	0.3	0.3	0.1
Other Fuels ^b	c	c	c	c	c	c
Military	2.7	2.6	2.5	2.5	1.9	1.7
Coal	0.8	0.7	0.6	0.6	0.5	0.5
Natural Gas	1.6	1.6	1.6	1.7	1.2	1.2
Petroleum Products	0.4	0.3	0.3	0.2	0.2	0.1
Other Fuels ^b	c	c	c	c	c	c
Other Combustion	11.0	11.2	11.3	11.3	11.4	10.7
Coal	3.5	3.9	3.3	3.3	3.2	3.0
Natural Gas	6.6	6.5	6.9	7.1	7.1	6.8
Petroleum Products	0.8	0.8	0.9	0.8	0.7	0.5
Other Fuels ^b	c	c	0.1	0.1	0.3	0.3

^a In cases where CO₂ emissions were reported at the unit level [i.e., Continuous Emissions Monitoring System (CEMS) monitored sources], fuel-level CO₂ emissions were estimated by the U.S. Environmental Protection Agency (EPA) based on other data directly reported by facilities, as well as default emissions factors. Fuel-level emissions values presented may differ slightly from other publicly available GHGRP data due to minor differences in the calculation methodology.

^b Excludes biogenic CO₂.

^c Total reported emissions are less than 0.05 MMT CO₂e.

^d Totals may not sum, due to rounding.

[Access the most current information using FLIGHT](#). Select a Fuel Type from the Emissions by Fuel Type filter.



Figure 6: MCS Sector – Average Emissions per Reporter (2016)

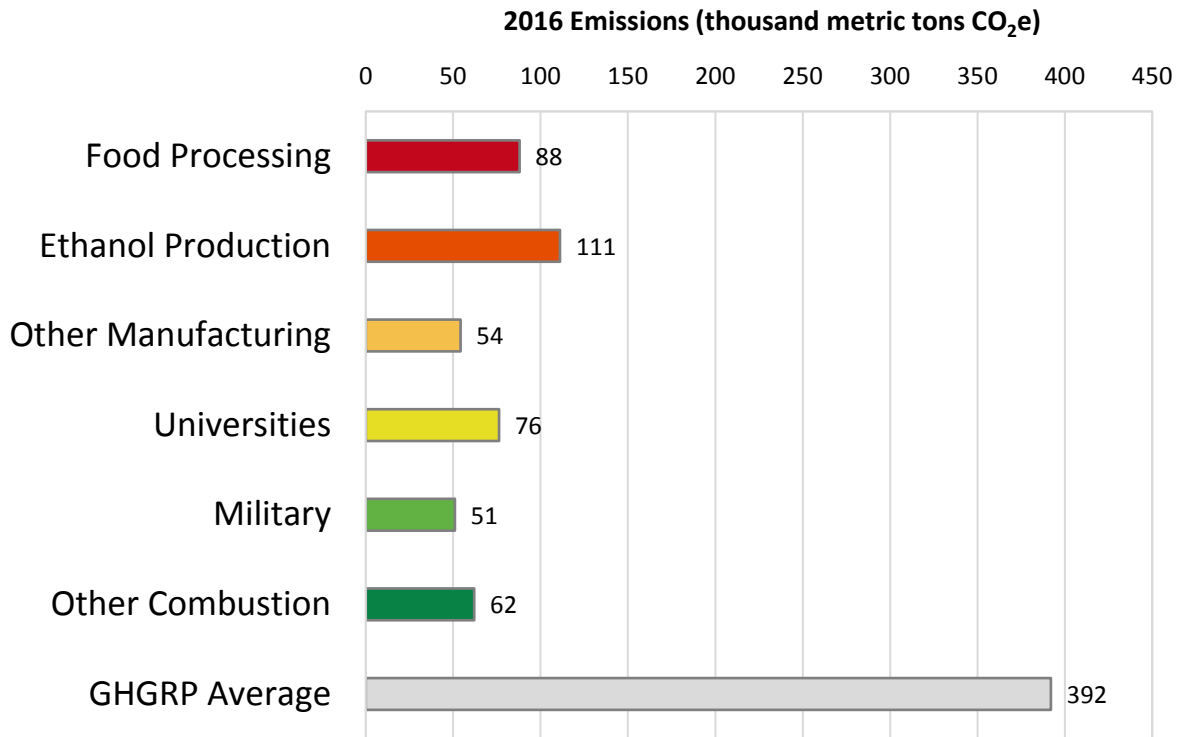




Figure 7: MCS Sector – Percentage of Reporters by Emissions Range (2016)

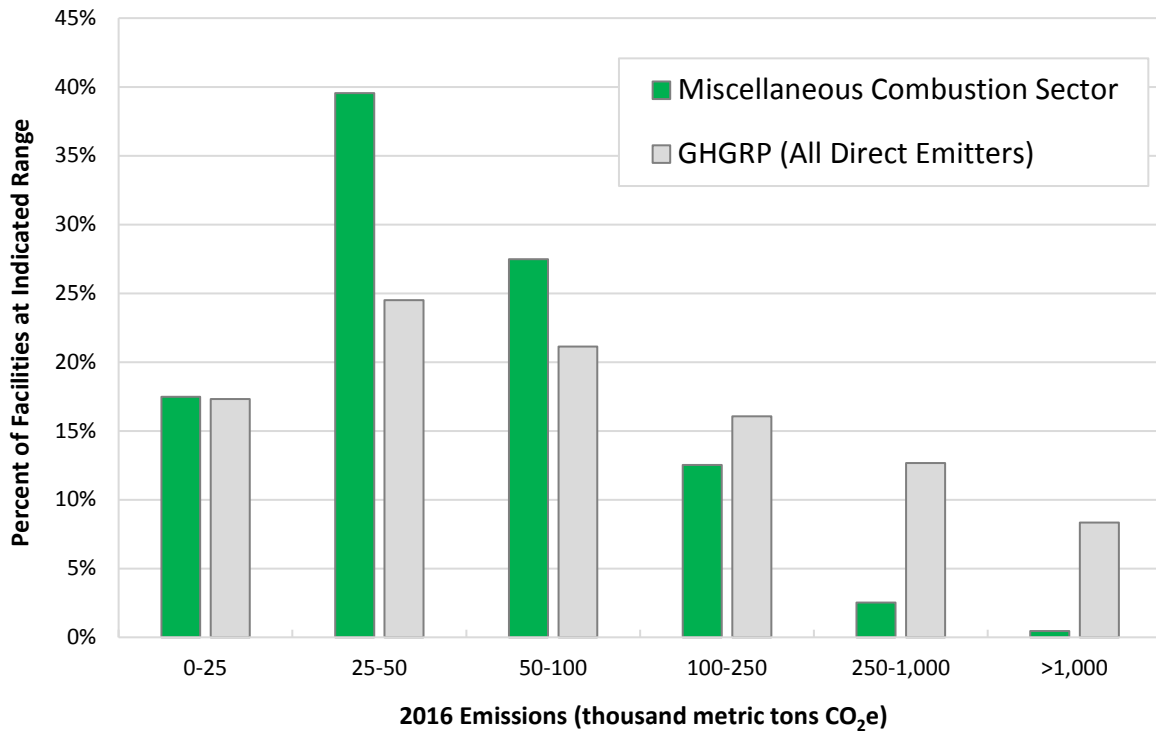


Table 6: MCS Sector – Number of Reporters by Emissions Range (2016)

Subsector	Emissions Range (MMT CO ₂ e)					
	0–0.025	0.025–0.05	0.05–0.1	0.1–0.25	0.25–1	> 1
Total MCS Sector	194	439	305	139	28	5
Food Processing	65	165	74	20	10	4
Ethanol Production	5	16	80	68	3	0
Other Manufacturing	61	127	66	19	6	0
Universities	7	45	37	21	4	0
Military	9	14	10	0	1	0
Other Combustion	47	72	38	11	4	1

Emissions from Combustion of Biomass Fuels

Biomass fuels are non-fossilized and biodegradable organic material originating from plants, animals, or micro-organisms, including products, by-products, residues, and waste from agriculture, forestry, and related industries; as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes, including gases and liquids recovered from the

decomposition of non-fossilized and biodegradable organic material. Table 7 shows emissions of biogenic CO₂ by subsector from 2011 through 2016.

Table 7: MCS Sector – Biogenic CO₂ Emissions by Subsector (2011–2016)

MCS Sector	Emissions (MMT CO ₂)					
	2011	2012	2013	2014	2015	2016
Total MCS Sector	5.3	6.0	5.7	5.4	5.8	5.2
Food Processing	2.2	2.4	2.4	2.2	2.6	2.7
Ethanol Production	0.3	0.1	0.1	0.1	0.3	0.3
Other Manufacturing	2.3	2.8	2.4	2.4	2.2	1.4
Universities	0.1	0.1	0.0	0.1	0.1	0.1
Military	a	a	a	a	a	a
Other Combustion	0.5	0.6	0.8	0.6	0.6	0.6

^a Total reported emissions are less than 0.05 MMT.

Types of Combustion Units Reported

The MCS sector includes a diverse collection of different types of combustion sources. In addition to the individual combustion source reporting requirement, there are three optional “configurations” that allow a facility to group multiple individual combustion sources together, designate them as a single configuration, and report the total emissions for the configuration rather than emissions from each unit. The three allowable optional configurations are as follows: “aggregation of units” for multiple small units each with a maximum rated heat input capacity of 250 mmBtu/hour or less, “common pipe” for multiple units that share a fuel supply line and fuel flow meter, and “common stack” for multiple units that share a common stack in which the combined emissions are measured using a CEMS. In the MCS sector in 2016, multi-unit configurations accounted for a combined 65% of reported configurations and 75% of reported GHG emissions (Table 8). This is not unexpected because this sector generally consists of smaller sources that can use the optional reporting configurations.

Table 8: MCS Sector Reporting Configurations (2016)

Configuration Type	Percentage of Total MCS Sector Configurations	Percentage of Total MCS Sector GHG Emissions
Common Pipe	21%	22%
Aggregation of Units	43%	47%
Common Stack	1%	6%
Individual Unit	35%	25%

Within the reported individual unit configurations, there were 32 different types of combustion units reported in 2016. Table 9 presents the top 10 reported combustion units for the individual unit configurations. [Access additional information on all 32 unit types](#). Multi-unit configurations may include a mixture of different unit types and so a similar table cannot be created for these configurations.

Table 9: Number of Combustion Units Reported in the MCS Sector for the Top 10 Unit Types (2016)

Type of Combustion Unit	Food Processing	Ethanol Production	Other Manufacturing	Military	Universities	Other
Reciprocating Internal Combustion Engines	14	1	11	5	21	89
Stoker Boilers	14	1	15	4	12	10
Comfort Heaters	2	0	7	4	33	7
Product or Intermediate Product Dryers	10	17	1	1	0	10
Combined Cycle Turbines	5	0	9	2	13	10
Simple Cycle Turbines	5	0	1	3	3	16
Circulating Fluidized Bed Boilers	13	0	1	0	6	1
Thermal Oxidizers	2	0	11	2	0	3
Other Types of Boilers	66	19	116	49	68	63
Other Combustion Sources	13	3	57	11	6	10

Emissions Calculation Methods Available for Use

Combustion units report under Subpart C and the reporter generally must use one of four calculation methodologies (tiers) to calculate CO₂ emissions. The primary determinants of the required tier calculation methodology are fuel type and unit size, such that multiple tiers may be used to calculate CO₂ mass emissions from the same unit if more than one fuel is used. The calculation methods are as follows:

- **Tier 4** – The use of a CEMS.
- **Alternative Part 75 methodologies** – Units that are required by states to monitor emissions according to 40 CFR Part 75 can report CO₂ emissions under Subpart C using Part 75 calculation methods and monitoring data that they already collect under Part 75 (e.g., heat input, fuel use).
- **Tier 3** – The use of measured fuel quantity (estimates can be used for solid fuels), carbon content, and molecular weight (gaseous fuels) of the fuel.
- **Tier 2** – The use of estimated fuel quantity, measured high heating value (HHV), and default emissions factor.
- **Tier 1** – The use of estimated fuel quantity, default HHV, and default emissions factors.

Methane (CH₄) and nitrous oxide (N₂O) mass emissions are also required to be reported for fuels that are included in Table C-2 of Part 98; and are calculated using either an estimated or measured fuel quantity, default or measured HHV, and default emissions factors. The calculation method depends on the tier used to calculate CO₂ emissions.

For units with acid gas emission controls, facilities must report CO₂ emissions resulting from sorbent use if the CO₂ emissions are not measured with CEMS (Tier 4).

[Access additional information on the calculation methodologies for combustion emissions.](#)

Tables 10 through 15 show, for each industry subsector, the percentage of reported emissions calculated using each method.

Table 10: Miscellaneous Combustion Sources – Food Processing Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	CEMS (Tier 4)	42.6%	42.0%	32.8%	42.1%	41.1%	40.2%
	Measured carbon content, and, if applicable, molecular weight (Tier 3)	0.3%	0.2%	0.2%	0.3%	0.3%	0.5%
	Measured HHVs and default emission factors (Tier 2)	21.7%	21.5%	21.7%	16.1%	16.8%	13.8%
	Default HHVs and emission factors (Tier 1)	35.3%	36.2%	45.4%	41.5%	41.9%	45.4%
	Sorbent emissions	0.1%	a	a	a	a	a

^a Value is between 0 and 0.05%.

Table 11: Miscellaneous Combustion Sources – Ethanol Production Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	CEMS (Tier 4)	3.5%	3.6%	3.3%	3.1%	2.7%	2.1%
	Alternative Part 75 Methodology	2.0%	1.7%	0.0%	0.0%	0.0%	0.0%
	Measured HHVs and default emission factors (Tier 2)	31.7%	28.6%	26.3%	24.6%	23.9%	19.9%
	Default HHVs and emission factors (Tier 1)	62.8%	66.1%	70.4%	72.3%	73.4%	78.0%
	Sorbent emissions	a	a	a	a	a	0.0%

^a Value is between 0 and 0.05%.

Table 12: Miscellaneous Combustion Sources – Other Manufacturing Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	CEMS (Tier 4)	1.6%	1.3%	1.2%	1.1%	0.1%	0.0%
	Measured carbon content, and, if applicable, molecular weight (Tier 3)	2.5%	1.7%	1.0%	1.2%	1.0%	1.1%
	Measured HHVs and default emission factors (Tier 2)	50.2%	49.7%	43.7%	42.8%	41.7%	40.5%
	Default HHVs and emission factors (Tier 1)	45.7%	47.4%	54.1%	54.9%	57.1%	58.4%
	Sorbent emissions	a	0.0%	0.0%	0.0%	0.0%	a

^a Value is between 0 and 0.05%.

Table 13: Miscellaneous Combustion Sources – Universities Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	CEMS (Tier 4)	9.0%	8.4%	8.2%	7.6%	8.0%	7.6%
	Alternative Part 75 Methodology	5.9%	6.0%	5.3%	5.1%	4.9%	5.0%
	Measured carbon content, and, if applicable, molecular weight (Tier 3)	0.8%	0.2%	a	a	a	a
	Measured HHVs and default emission factors (Tier 2)	36.0%	35.2%	34.2%	30.2%	31.6%	28.1%
	Default HHVs and emission factors (Tier 1)	48.0%	49.9%	52.1%	56.8%	55.2%	59.1%
	Sorbent emissions	0.2%	0.2%	0.3%	0.3%	0.3%	0.2%

^a Value is between 0 and 0.05%.

Table 14: Miscellaneous Combustion Sources – Military Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	Measured carbon content, and, if applicable, molecular weight (Tier 3)	a	a	0.0%	0.0%	0.0%	0.0%
	Measured HHV and default emission factors (Tier 2)	44.8%	44.8%	45.1%	39.3%	24.6%	23.8%
	Default HHVs and emission factors (Tier 1)	55.2%	55.2%	54.9%	60.7%	75.4%	76.2%

^a Value is between 0 and 0.05%.

Table 15: Miscellaneous Combustion Sources – Other Facility Methodologies (2011–2016)

Type of Emissions	Methodology	Portion of Emissions Monitored by Method					
		2011	2012	2013	2014	2015	2016
Combustion Emissions	CEMS (Tier 4)	15.2%	16.1%	16.1%	16.1%	16.5%	17.9%
	Alternative Part 75 Methodology	0.0%	0.0%	a	1.2%	1.3%	1.6%
	Measured carbon content, and, if applicable, molecular weight (Tier 3)	6.9%	7.3%	8.0%	6.6%	7.5%	7.0%
	Measured HHVs and default emission factors (Tier 2)	23.0%	25.5%	20.7%	22.8%	22.8%	20.0%
	Default HHVs and emission factors (Tier 1)	53.9%	51.1%	55.2%	53.4%	50.5%	53.5%
	Sorbent emissions	1.0%	a	a	a	1.5%	a

^a Value is between 0 and 0.05%.

Data Verification and Analysis

As a part of the reporting and verification process, EPA evaluates annual GHG reports with electronic checks. EPA contacts facilities regarding potential reporting issues and facilities resubmit reports if errors are identified. [Access additional information on EPA's verification process.](#)

Glossary

CEMS means a continuous emissions monitoring system.

CO₂e means carbon dioxide equivalent, which is a metric used to compare the emissions from various GHGs based upon their GWP. The CO₂e for a gas is calculated by multiplying the quantity of tons of the gas by the associated GWP.

Direct emitters are facilities that combust fuels or otherwise put GHGs into the atmosphere directly from their facilities. Alternatively, **suppliers** are entities that supply certain fossil fuels or fluorinated gases into the economy that—when combusted, released or oxidized—emit GHGs into the atmosphere.

FLIGHT refers to EPA's GHG data publication tool, named the [Facility Level Information on Greenhouse Gases Tool](#).

GHGRP means EPA's Greenhouse Gas Reporting Program (40 CFR Part 98).

GHGRP vs. GHG Inventory: EPA's GHGRP collects and disseminates annual GHG data from individual facilities and suppliers across the U.S. economy. EPA also develops the annual Inventory of U.S. Greenhouse Gas Emissions and Sinks (GHG Inventory) to track total national emissions of GHGs to meet U.S. government commitments to the United Nations Framework Convention on Climate Change. The GHGRP and GHG Inventory datasets are complementary and may inform each other over time. However, there are also important differences in the data and approach. [Access more information.](#)

GWP (Global Warming Potential) is a measure of the total energy that a gas absorbs over a particular period of time (usually 100 years), compared to CO₂.

IPCC AR4 refers to the Fourth Assessment Report by the Intergovernmental Panel on Climate Change. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K. and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 2007. The AR4 values also can be found in the current version of Table A-1 in Subpart A of 40 CFR Part 98.

MCS means miscellaneous combustion sources.

MMT means million metric tons.