2011-2019 Greenhouse Gas Reporting Program Industrial Profile: Natural Gas and Natural Gas Liquids Suppliers Sector

Table of Contents

NATURAL GAS AND NATURAL GAS LIQUIDS SUPPLIERS SECTOR

All emissions presented here are as of 9/26/2020. Natural gas and NGL suppliers do not report actual emissions from a facility. Suppliers report the quantity of product placed into the economy and the emissions that would result if the products were completely combusted, oxidized, or released when used.

Highlights

- The reported greenhouse gas (GHG) quantity associated with Natural Gas Liquids (NGL) supply has increased from 211.5 to 403.0 million metric tons (MMT) of CO_2e from 2011 to 2019.
- The reported GHG quantity associated with natural gas supplied by local distribution companies (LDCs) increased from 715.9 to 822.4 (MMT) of CO_2e from 2011 to 2019.

About this Sector

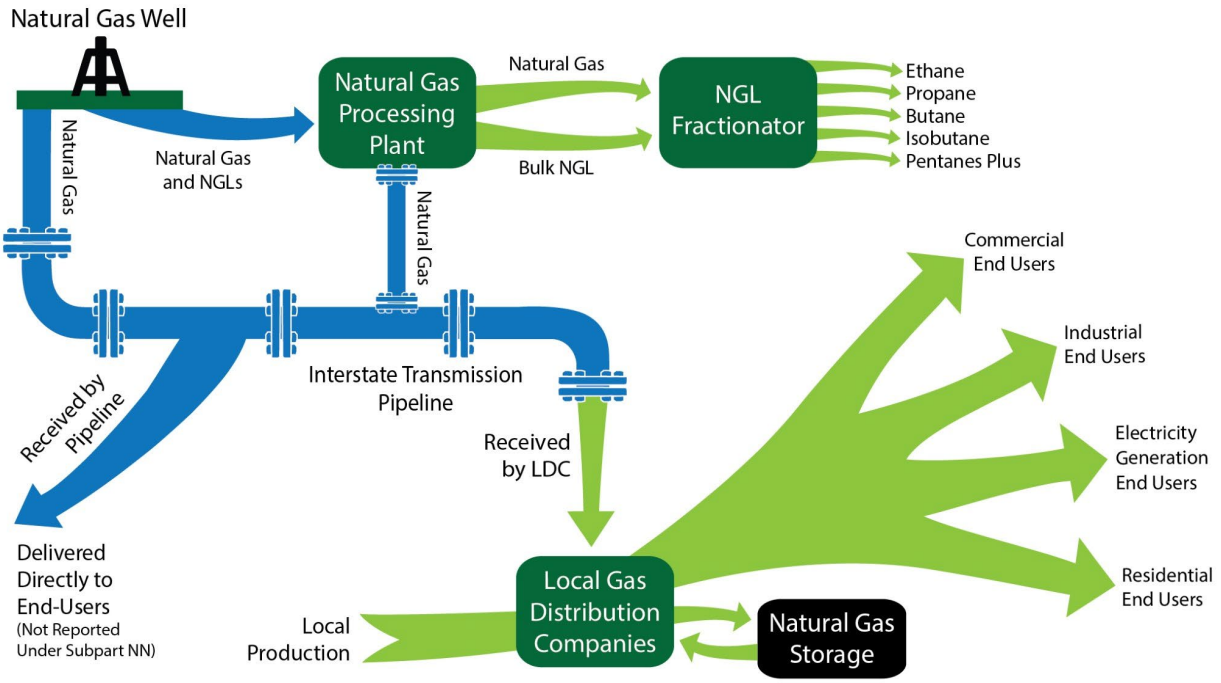
This sector comprises NGL fractionators and LDCs.

- NGL fractionators are defined as installations that receive bulk natural gas or natural gas liquids from producers and then fractionated at least some of these raw inputs into individual liquid products (ethane, propane, normal butane, isobutane, or pentanes plus) and supplied those products into the economy during the reporting year.
- LDCs are generally the same companies to which you pay your gas bill every month. They receive natural gas from a transmission pipeline company and physically deliver the gas to end users.

Some facilities in the Natural Gas and Natural Gas Liquids Supply sector also submit GHG reports for their direct emissions (i.e. emissions from fuel combustion, process vents, and equipment leaks). Direct emissions data reported by these facilities are available in the industrial profiles for Petroleum and Natural Gas Systems and Petroleum Refineries. Greenhouse gas information associated with imports and exports of natural gas liquids is reported by suppliers of petroleum products.

Figure 1 shows the natural gas and natural gas liquid supply chain and highlights the information reported by LDCs and NGL fractionators.

Figure 1: Flows of Natural Gas and Natural Gas Liquids[a]



[a] Quantities marked with green arrows are reported to EPA by NGL Fractionators or Local Distribution Companies under Subpart NN.

Although most natural gas consumers receive their natural gas from LDCs, some natural gas is delivered directly to end-users by other distributers, including transmission pipeline companies, producers, gatherers, and storage companies. These companies mostly supply large-volume end users, such as large industrial and electric power generation customers. The natural gas delivered directly to end users is not reported to the Greenhouse Gas Reporting Program (GHGRP) by transportation pipeline companies or LDCs. Based on information from the U.S. GHG Inventory for 2018, roughly 52.5% of CO_2e associated with natural gas combustion is being reported to GHGRP by LDCs (see Table 1).[1] However, most of the CO_2e associated with the combustion of gas that is not reported by LDCs is combusted at large installations that are themselves required to report their GHG emissions to EPA. Therefore, the GHGRP covers the vast majority of emissions associated with natural gas use in reporting by either the supplier or the end-user.

[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018. U.S. Environmental Protection Agency. Available at: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Table 1: Natural Gas Supplied to End-Users in 2019

End-Use Sector	Total CO_2e associated with gas supply reported to the GHGRP by LDCs (MMT)[a]	Total CO_2e associated with U.S. natural gas consumption (MMT)[b]	Percentage of natural gas consumption reported to the GHGRP by LDCs
Commercial Customers	187.7	192.6	97.5%
Electricity Generating Facilities	140.3	577.4	24.3%
Industrial Customers	219.5	514.8	42.6%
Residential Customers	270.9	273.7	99%
All Sectors	**818.4[c]**	**1,558.5**	**52.5%**

[a] Estimated by multiplying total reported gas deliveries by 0.000000055, the average CO_2 emissions from combustion of 1 Mscf of natural gas, and by the global warming potential (GWP) of 1 for CO_2, measured in MMT CO_2e.
[b] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018. U.S. Environmental Protection Agency. April 13, 2020. EPA 430-R-20-002. Available at: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2018.
[c] The CO_2e quantity for all sectors shown in this table differs from that presented in Table 5. The value in this table is calculated using the default CO_2e emissions per unit of natural gas, whereas the value provided in Table 5 is calculated using supplier specific values for CO_2e per unit of natural gas delivered, where reported.

Who Reports?

Table 2 includes applicability information for the Natural Gas and Natural Gas Liquids Supply Sector as well as their corresponding reporting schedules. Table 3 summarizes the number of suppliers in the Natural Gas and Natural Gas Liquids Sector that submitted a GHG report from 2011 to 2019. In 2019, 488 suppliers in the sector submitted a report to GHGRP. Out of all suppliers reporting to the GHGRP, 51.4% are in the Natural Gas and Natural Gas Liquids Supply Sector. Table 2 includes details of the applicability of each reporter category as well as their corresponding reporting schedules. Table 4 shows the GHGRP coverage for Natural Gas and Natural Gas Liquids Supply.

Table 2: Natural Gas and Natural Gas Liquids Supply Sector Reporting Schedule

Subpart	Source Category	Applicability	First Reporting Year
NN	Local Distribution Companies	LDCs that deliver >= 460,000 Mscf of natural gas annually.	2010
NN	NGL Fractionators	All NGL Fractionators are required to report. [a]	2010

[a] All NGL fractionators are required to report to the GHGRP. However, suppliers may discontinue reporting if the quantity of GHG supplied is less than 25,000 metric tons CO_2e per year for five consecutive years or less than 15,000 metric tons CO_2e per year for three consecutive years.

Table 3: Natural Gas and Natural Gas Liquids Supply Sector – Number of Reporters (2011–2019)

Subsector	2011	2012	2013	2014	2015	2016	2017	2018	2019
Local Distribution Companies	381	386	385	383	383	381	379	376	365
NGL Fractionators	116	119	126	130	126	125	125	124	123
Total Natural Gas and Natural Gas Liquids Sector	**497**	**505**	**511**	**513**	**509**	**506**	**504**	**500**	**488**

Table 4: Natural Gas and Natural Gas Liquids Supply Sector – GHGRP Coverage (2019)

Subsector	GHGRP Applicability	Estimated Percent of Suppliers Covered by GHGRP	Estimated Percent of CO_2e Associated with Products Covered by GHGRP
Local Distribution Companies	LDCs that deliver >=460,000 Mscf of natural gas annually.	30%[a]	99%[a]
NGL Fractionators	All Fractionators	97.6%[b]	~100%

[a] Estimate of size of industry and estimate of total CO_2e coverage are based on reports submitted by LDCs to EIA via form 176, 2019. All operating LDCs are required to submit this form to EIA regardless of the size of their operations. The form contains the quantity of gas delivered by the LDC to end-users. The estimated total CO_2e covered by the GHGRP was calculated by taking the total deliveries reported to EIA and subtracting the fraction of natural gas supplied by LDCs below the GHGRP reporting threshold.

[b] All natural gas liquids fractionators are required to report to the GHGRP; since 2012, 3 facilities have ceased reporting because they met the criteria for off-ramping. See FAQ: When is a Facility Eligible to Stop Reporting? Available at: http://www.ccdsupport.com/confluence/pages/viewpage.action?pageId=243139271.

Reported Greenhouse Gas Information

Table 5 includes the CO_2e quantities (MMT) for the Natural Gas and Natural Gas Liquids Supply Sector from 2011 to 2019. The total quantity of CO_2e reported by Natural Gas and Natural Gas Liquids Suppliers was 1,225.4 MMT in 2019 (Table 5). This excludes the quantity reported by 22 NGL fractionators that supply only one product, because their production quantities are considered to be confidential business information and are not published by EPA. The total CO_2e quantity reported by these 22 fractionators is relatively small.

Table 5: Natural Gas and Natural Gas Liquids Supply Sector CO_2e Quantity (2011-2019)

Subsector	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Natural Gas and Natural Gas Liquids Supply Sector (MMT)[a]	**927.3**	**943.7**	**994.7**	**1,055.5**	**1,058.9**	**1,061.4**	**1,063.3**	**1,173.5**	**1,225.4**
NGL Fractionators[a]	211.5	234.3	222.8	263.3	293.2	308.8	320.2	358.8	403.0
Local Distribution Companies	715.9	709.5	771.9	792.2	765.7	752.7	743.1	814.6	822.4
CO_2e associated with LDC deliveries to large end-users	*206.5*	*242.0*	*236.8*	*247.1*	*261.0*	*260.6*	*256.3*	*275.3*	*276.8*

[a] Excludes CO_2e reported by 22 NGL Fractionators whose reported quantities are classified as confidential business information (CBI). Note: GHGRP data differs from EIA data in that EIA emission estimates are based on products supplied (which considers imports and exports) whereas GHGRP data is based on products produced at fractionating facilities.

Because CO_2e emissions associated with each product does not occur until the product is combusted or otherwise used, not all of the total reported 1,225.4 MMT CO_2e was necessarily emitted to the atmosphere in 2019. Some of the products may be in storage for use in future years. Additionally, some natural gas and about 69% of NGLs [2] are used for non-energy purposes such as feedstocks for petrochemical production. Table 6 shows the percentage of NGLs used for fuel and non-fuel purposes, by product. Some carbon emissions from these products will be released at downstream chemical plants, and the remaining carbon emissions do not occur until the petrochemical product (e.g., plastic) decomposes or is combusted, such as in a landfill or a waste incinerator.

Some CO_2e associated with natural gas supplied by LDCs is also reported to EPA by end-users of the gas. To quantify the amount of CO_2e that is reported twice to EPA, LDCs are required to report the quantity of gas delivered to large end-users, defined as those who receive greater than 460 million scf of gas per year. This threshold was selected as it is roughly equivalent to 25,000 metric tons CO_2e; facilities that emit above this level are required to report their direct GHG emissions to the EPA.

[2] Value was calculated by dividing the total heat content of NGLs (ethane, propane, butane/isobutane, and pentane plus) used for fuel purposes in 2019 by the total heat content of all NGLs supplied in 2019, multiplying by 100 to convert to percentage and then subtracting from 100 to determine the percentage of NGLs used for non-energy purposes. Data source: EIA, Petroleum & Other Liquids, Supply and Disposition. Annual, 2019. Available here: https://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbbl_a_cur.htm

Table 6: Percentage of NGL Used for Fuel and Non-Fuel Purposes

Natural Gas Liquid	Percent Used for Fuel Purposes [a]	Percent Used for Non-Fuel Purposes
Ethane	0%	100%[b]
Propane	68%	32%[c]
Butane/Isobutane	15%	85%[b]
Pentane Plus	50%	50%[b]

[a] Percent used for fuel purposes was calculated by subtracting the amount used for non-fuel purposes from 100%.

[b] Ethane, butane/isobutane, and pentane plus values were obtained from Monthly Energy Review, July 2020. U.S. Energy Information Administration, pg. 27, Hydrocarbon Gas Liquids (HGL) definition. Available here: https://www.eia.gov/totalenergy/data/monthly/archive/00352007.pdf.

*[c] Propane for non-fuel purposes was calculated using total odorized propane sales data in 2018 from PERC (Available here: https://www.propanesalessurvey.com/sites/default/files/public/2018-Annual-Retail-Propane-Sales-Report-FINAL.PDF; p1) and propane products supplied in 2018 (Available here: https://www.eia.gov/dnav/pet/pet_sum_snd_d_nus_mbbl_a_cur-1.htm). The percentage was calculated as follows: (1-Propane Sales/Propane Products Supplied)*100.*

Figure 2 shows the locations of LDCs that reported to the GHGRP, their service areas (if available), and the CO_2e associated with natural gas supplied. The color of the shading corresponds to the quantity of CO_2e reported by that LDC. There are also LDCs reporting CO_2e associated with natural gas supplied located in Alaska and Hawaii.

Readers can view maps and identify the LDCs reporting the largest CO_2e quantity by visiting the Facility Level Information on Greenhouse Gases (FLIGHT) website (http://ghgdata.epa.gov).

Figure 2: Location and Reported CO_2e Quantity (metric tons) for Each LDC in the Natural Gas and Natural Gas Liquids Supply Sector

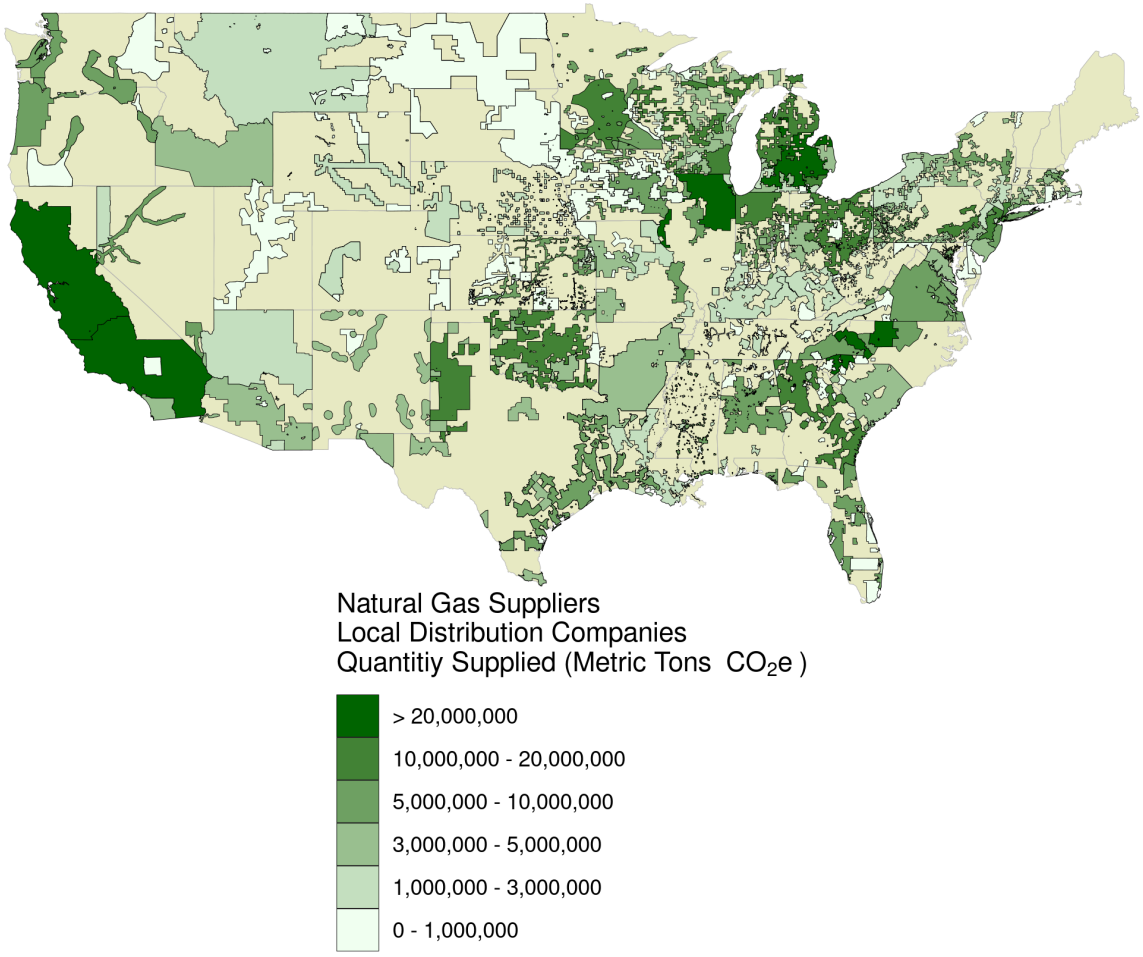
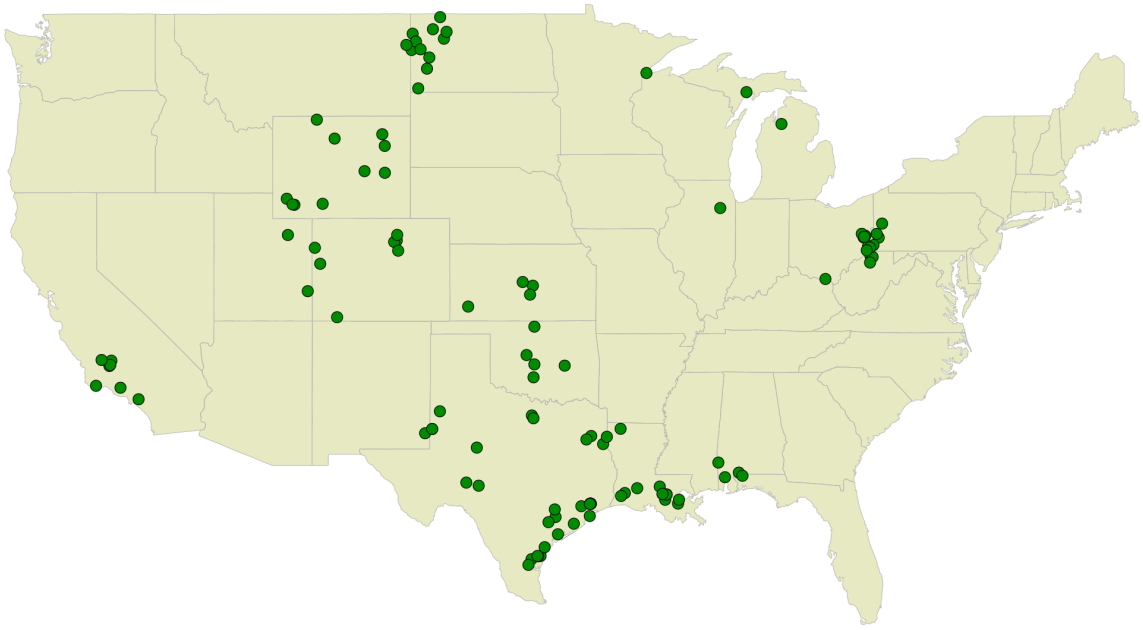


Figure 3 shows the locations of NGL fractionators that reported. The reported CO_2e is not emitted at these locations. These products are supplied into the economy and are either combusted or used as a chemical feedstock by down-stream users. Readers can identify the NGL fractionators reporting the largest CO_2e quantity by visiting the Facility Level Information on Greenhouse Gases (FLIGHT) website (http://ghgdata.epa.gov).

Figure 3: Location of NGL Fractionators in the Natural Gas and Natural Gas Liquids Supply Sector



Natural Gas and Natural Gas Liquids Supply Sector Trend in Total Reported GHG Quantity 2011 to 2019

The quantity of CO_2e associated with natural gas liquids supply increased from 211 to 403 (MMT) of CO_2e from 2011 to 2019.

The quantity of CO_2e associated with natural gas supply (i.e. LDCs) increased by 14.9% from 2011 to 2019. Natural gas is primarily consumed by end-users in the residential, commercial, industrial, and electricity generating sectors. The primary reason for the increase is likely the relatively low natural gas prices due to high levels of natural gas production, and greater reliance on natural gas to fuel power plants.[3] Year-to-year fluctuations in natural gas consumption is also impacted by weather. Weather is typically a driver of gas consumption in the residential and commercial

[3] U.S. Department of Energy, Today in Energy, More than 100 Coal-fired Plants have been Replaced or Converted to Natural Gas Since 2011, August 5, 2020. Available at: https://www.eia.gov/todayinenergy/detail.php?id=44636.

sectors (because of its extensive use as a heating fuel) and in the electric power sector. Table 7 shows the heating and cooling degree days as well as the natural gas consumption quantities for these sectors from 2011 to 2019. Table 8 includes the amount of natural gas deliveries that are reported to GHGRP by LDCs from 2011 to 2019.

Table 7: Weather Data and Natural Gas Consumption

Year	Heating Degree Days [a]	Natural Gas Consumption: Residential and Commercial Sector (MMcf) [b]	Cooling Degree Days [a]	Natural Gas Consumption: Electric Power Sector (MMcf) [b]
2011	4,324	7,869,096	1,456	7,835,473
2012	3,780	7,044,444	1,479	9,380,065
2013	4,491	8,192,673	1,287	8,198,389
2014	4,594	8,553,779	1,272	8,193,449
2015	4,128	7,814,622	1,457	9,731,656
2016	3,921	7,456,172	1,528	10,313,964
2017	3,876	7,577,938	1,390	9,599,491
2018	4,340	8,511,508	1,547	10,918,248
2019	4,373	8,528,210	1,454	11,617,903
Percent Change (2011-2019)	**1.1%**	**8.4%**	**-0.1%**	**48.3%**

[a] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service. Available at: https://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp

[b] U.S. Department of Energy, Energy Information Administration, total natural gas consumption by sector. These numbers differ from Table 8 because they represent all gas consumption, based on EIA data, which includes gas not delivered by an LDC. Available at: https://www.eia.gov/naturalgas/ngqs/#?year1=2015&year2=2019&company=Name

Table 8: Natural Gas Deliveries Reported to GHGRP by LDCs (Bcf)

Point in the Supply Chain	2011	2012	2013	2014	2015	2016	2017	2018	2019
Commercial Customers	3,040	2,807	3,196	3,372	3,110	3,022	3,074	3,390	3,413
Electricity Generating Facilities	1,860	2,403	2,242	2,236	2,540	2,493	2,165	2,475	2,551
Industrial Customers	3,294	3,518	3,674	3,788	3,689	3,764	3,842	4,018	3,991
Residential Customers	4,639	4,086	4,848	5,006	4,546	4,289	4,350	4,917	4,925
Total Reported Deliveries	**12,833**	**12,814**	**13,960**	**14,402**	**13,885**	**13,568**	**13,431**	**14,800**	**14,879**

Calculation Methods Used

Suppliers in the Natural Gas and Natural Gas Liquids Suppliers sector can choose one of two different methodologies for calculating the CO_2e quantity associated with the combustion or oxidation of the quantities of natural gas and natural gas liquids supplied.

- Calculation Methodology 1 – Multiply the volume of product supplied by the higher heating value (HHV) and a CO_2e emission factor (EF). Use either measured or default fuel HHVs and CO_2e emission factors.
- Calculation Methodology 2 – Multiply the volume of product supplied by a CO_2e emission factor. Use either measured or default CO_2e emission factors.

Table 9 shows the portion of reported CO_2e associated with natural gas supplied by different calculation methodologies in GHGRP. For NGL Fractionators, more than 90% of reporters used the default HHV and emission factor values as opposed to measured values.

Table 9: Portion of Reported CO_2e Associated with Natural Gas Supplied by Calculation Method

Methodology	2011	2012	2013	2014	2015	2016	2017	2018	2019
Measured Higher Heating Value (HHV) & Measured Emission Factor (EF)[a, b]	1.7%	1.7%	3%	2.1%	2%	8.8%	10%	8.7%	8.6%
Measured HHV & Default EF[b, c]	17.9%	23.6%	15%	21.8%	21.1%	12.3%	14.9%	14.6%	10.9%
Default HHV & Default EF[b,d]	80.5%	74.7%	81.9%	76.1%	77%	78.9%	75.1%	76.7%	80.5%

[a] Includes LDCs that used Calculation Methodology 1 with both a measured CO_2 emission factor and HHV and those who used Methodology 2 with a measured CO_2 emission factor.
[b] CO_2 calculated using Calculation Methodology 1 and 2 is converted to CO_2e by multiplying by a GWP of 1.
[c] Includes LDCs that used Calculation Methodology 1 with a measured HHV and default CO_2 emission factor.
[d] Includes LDCs that used Calculation Methodology 1 with a default HHV and CO_2 emission factor and those that used Methodology 2 with a default CO_2 emission factor.

Data Verification and Analysis

As a part of the reporting and verification process, EPA evaluates annual GHG reports with electronic verification checks. EPA contacts facilities regarding potential reporting issues. Additional information on EPA's verification process is available here.

Some of the information reported by LDCs and NGL fractionators is similar to data reported to the U.S. Energy Information Administration (EIA). EPA and EIA have collaborated to use some of this data to help verify that information submitted to each agency is correct.

GLOSSARY

Bcf means Billion standard cubic feet.

CBI means confidential business information.

Direct emitters are facilities that combust fuels or otherwise put greenhouse gases into the atmosphere directly from their facility. Alternatively, **Suppliers** are entities that supply certain

fossil fuels or fluorinated gases into the economy that—when combusted, released or oxidized—emit greenhouse gases into the atmosphere.

EIA means the U.S. Energy Information Administration, which is an independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and analyzes and models energy issues.

GHGRP means the Greenhouse Gas Reporting Program under 40 CFR part 98.

HHV means higher heating value of a fuel.

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.

LDC means a local distribution company for natural gas.

MMT means million metric tons.

MMcf means million cubic feet.

Mscf means thousand standard cubic feet.

NGL means natural gas liquid (ethane, propane, butane, isobutene, and pentanes plus).

scf means standard cubic feet.