NATURAL GAS AND NATURAL GAS LIQUIDS SUPPLIERS SECTOR

All GHG data presented here are as of 9/1/2013.

Highlights

- The reported greenhouse gas (GHG) quantity associated with Natural Gas Liquids (NGL) supply has increased from 206 to 242 million metric tons (MMT) of CO_2 from 2010 to 2012. This increase was primarily a result of increased domestic NGL production.
- The reported GHG quantity associated with natural gas supplied by local distribution companies (LDCs) decreased from 716 to 705 MMT of CO_2 from 2010 to 2012.
- While the volume of natural gas supplied to the industrial and electricity generating sectors over that time period has increased, this was more than offset by decreased supply to the residential and commercial sectors.

About this Sector

This sector comprises natural gas liquids (NGL) fractionators and local natural gas distribution companies (LDCs).

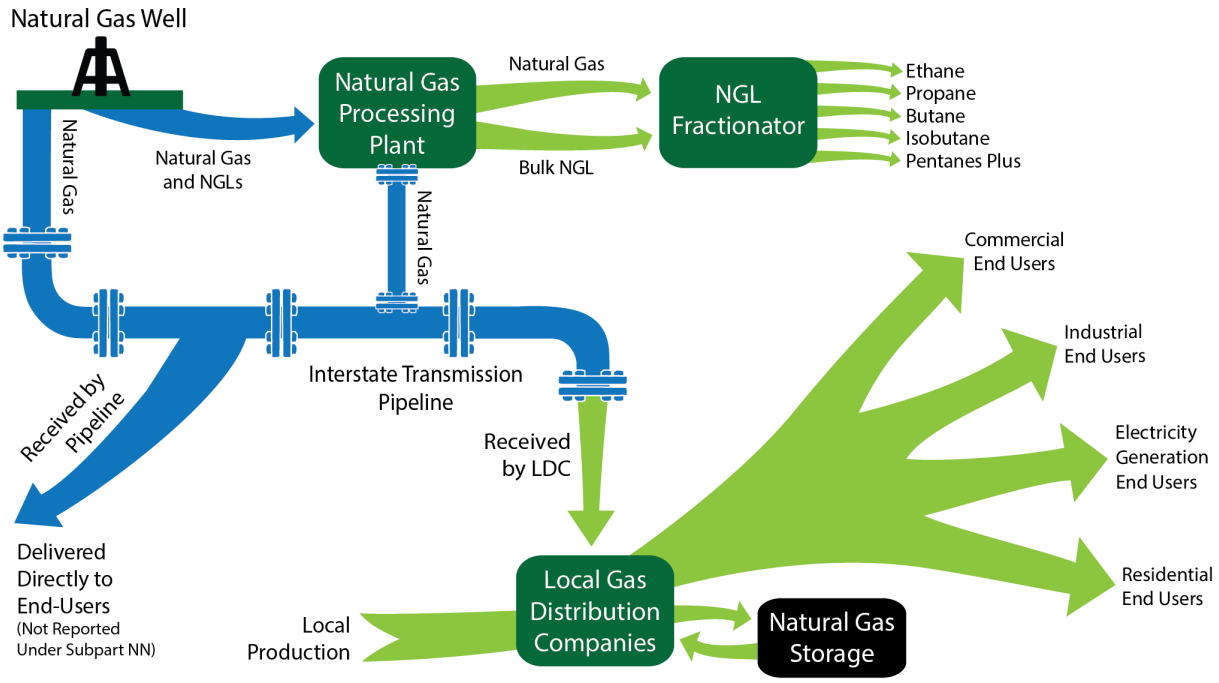
- NGL fractionators are defined by the regulation as installations that receive bulk natural gas or natural gas liquids from producers and then fractionated at least some of these raw inputs into individual liquid products (ethane, propane, normal butane, isobutane, or pentanes plus) and supplied those 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.

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.

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.

The diagram below 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 GHGRP by transportation pipeline companies or LDCs. Based on information from the U.S. GHG Inventory for 2012, roughly 54% of CO_2 associated with natural gas combustion is being reported to EPA by LDCs (see Table 1).[1] However, most of the CO_2 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: 1990-2012.* U.S. Environmental Protection Agency. April 15, 2014. EPA 430-R-14-003. Available at: http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.

Table 1: Natural Gas Supplied to End-Users in 2012

End-Use Sector	Total CO_2 associated with gas supply reported to the GHGRP by LDCs[a] (MMT)	Total CO_2 associated with U.S. natural gas consumption (MMT)[b]	Percentage of natural gas consumption reported by LDCs
Residential	224.3	225.8	99.3%
Commercial	153.4	157.0	97.7%
Industrial	189.0	428.5	44.1%
Electricity Generation	132.9	492.2	27.0%
All sectors	699.6[c]	1,303.5	53.7%

[a] Estimated by multiplying total reported gas deliveries by 0.000000055, the average CO_2 emissions from combustion of 1 Mscf of natural gas, measured in MMT CO_2.

[b] *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012.* U.S. Environmental Protection Agency. April 15, 2014. EPA 430-R-14-003. Available at: http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.

[c] The CO_2 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_2 emissions per unit of natural gas, whereas the value provided in Table 5 is calculated using supplier specific values for CO_2 per unit of natural gas delivered, where reported.

Who Reports?

In 2012, 484 suppliers in the Natural Gas and Natural Gas Liquids Sector submitted a GHG report. 51.7% of all suppliers reporting to the GHGRP are in the Natural Gas and Natural Gas Liquids Supply Sector.

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.	2010

Table 3: Natural Gas and Natural Gas Liquids Supply Sector – Number of Reporters (2010–2012)

Sector	Number of Reporters		
	2010	2011	2012
Total Natural Gas and Natural Gas Liquids Sector	**480**	**483**	**484**
Local Distribution Companies	372	370	365
NGL Fractionators	108	113	119

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

Subsector	GHGRP Applicability	Estimated Percent of Suppliers Covered by GHGRP	Estimated Percent of CO_2 Associated with products Covered by GHGRP
Local Distribution Companies	LDCs that deliver ≥ 460,000 Mscf of natural gas annually.	28.2%[a]	99.92%[a]
NGL Fractionators	All Fractionators	100%[b]	100%[b]

[a] Estimate of size of industry and estimate of total CO_2 coverage are based on reports submitted by LDCs to EIA via form 176. All operating LDCs are required to submit this form 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_2 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.

Reported Greenhouse Gas Information

The total quantity of CO_2 reported by Natural Gas and Natural Gas Liquids Suppliers was 946.6 MMT in 2012. This excludes the quantity reported by 18 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_2 quantity reported by these 18 fractionators is relatively small, totaling less than one million metric tons.

Because CO_2 emissions associated with these products do not occur until the product is combusted or otherwise used, not all of the total reported 946.6 MMT CO_2 was necessarily emitted to the atmosphere in 2012. Some of the products may be in storage for use in future years. Additionally, some natural gas and about 58% of NGLs[2] are used for non-energy purposes such as for use as a feedstock for petrochemical production (Table 6). 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_2 associated with natural gas supplied by LDCs is also reported to EPA by end-users of the gas. To quantify the amount of CO_2 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 cf of gas per year. This threshold was selected as it is roughly equivalent to 25,000 metric tons CO_2; facilities that emit above this level are required to report their direct GHG emissions to the EPA.

[2] From API: "2000-2007 Sales of Natural Gas Liquids and Liquefied Refinery Gases."

Table 5: Natural Gas and Natural Gas Liquids Supply Sector CO_2 Quantity (2010–2012)

Natural Gas and Natural Gas Liquids Supply Sector	CO_2 Quantity (MMT)		
	2010	2011	2012
Total Natural Gas and Natural Gas Liquids Supply Sector[a]	**921.8**	**936.9**	**946.6**
NGL Fractionators[a]	**206.2**	**218.5**	**242.1**
Estimated CO_2 from NGLs used for fuels[b]	85.9	91.0	102.8
Estimated CO_2 associated with NGLs used for non-fuel purposes[b]	120.3	127.5	139.3
Local Distribution Companies	**715.6**	**718.4**	**704.5**
CO_2 associated with deliveries to large end-users	203.7	205.8	241.8

[a] Excludes CO_2 reported by 18 NGL Fractionators whose reported quantities are classified as confidential business information (CBI).

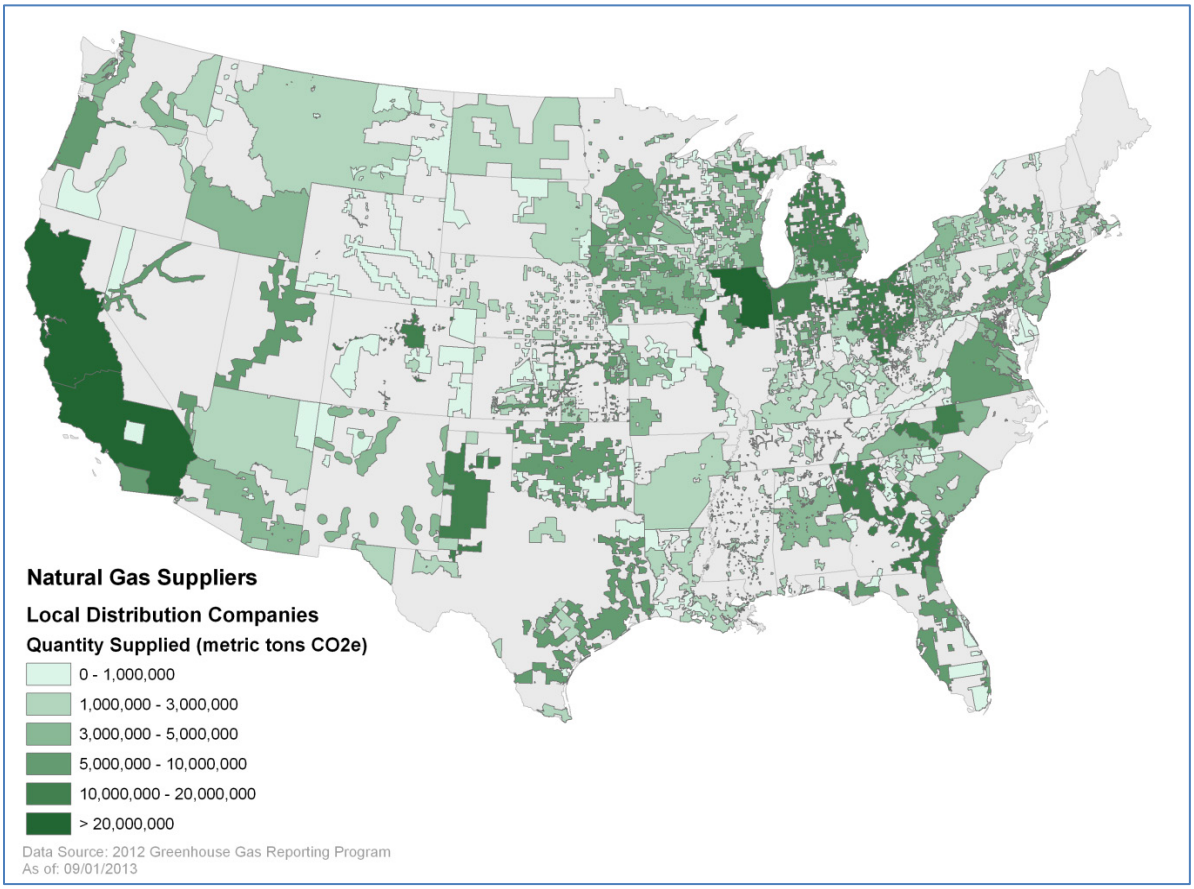
[b] Based on information from API: "2000-2007 Sales of Natural Gas Liquids and Liquefied Refinery Gases" (Table 6).

Table 6: Percentage of NGL Used for Fuel and Non-Fuel Purposes (2007)[a]

Natural Gas Liquid	Percent Used for Fuel Purposes	Percent Used for Non-Fuel Purposes
Ethane	8.9%	91.1%
Propane	54.3%	45.7%
Butane/Isobutane	84.3%	15.8%
Pentanes Plus	60.8%	39.2%

[a] From API: "2000-2007 Sales of Natural Gas Liquids and Liquefied Refinery Gases." Reported sales to Residential/Commercial, Internal Combustion Fuel, Gasoline Blending, Industrial, Agricultural are considered Fuel purposes while sales to Chemical and Other are considered Non-Fuel.

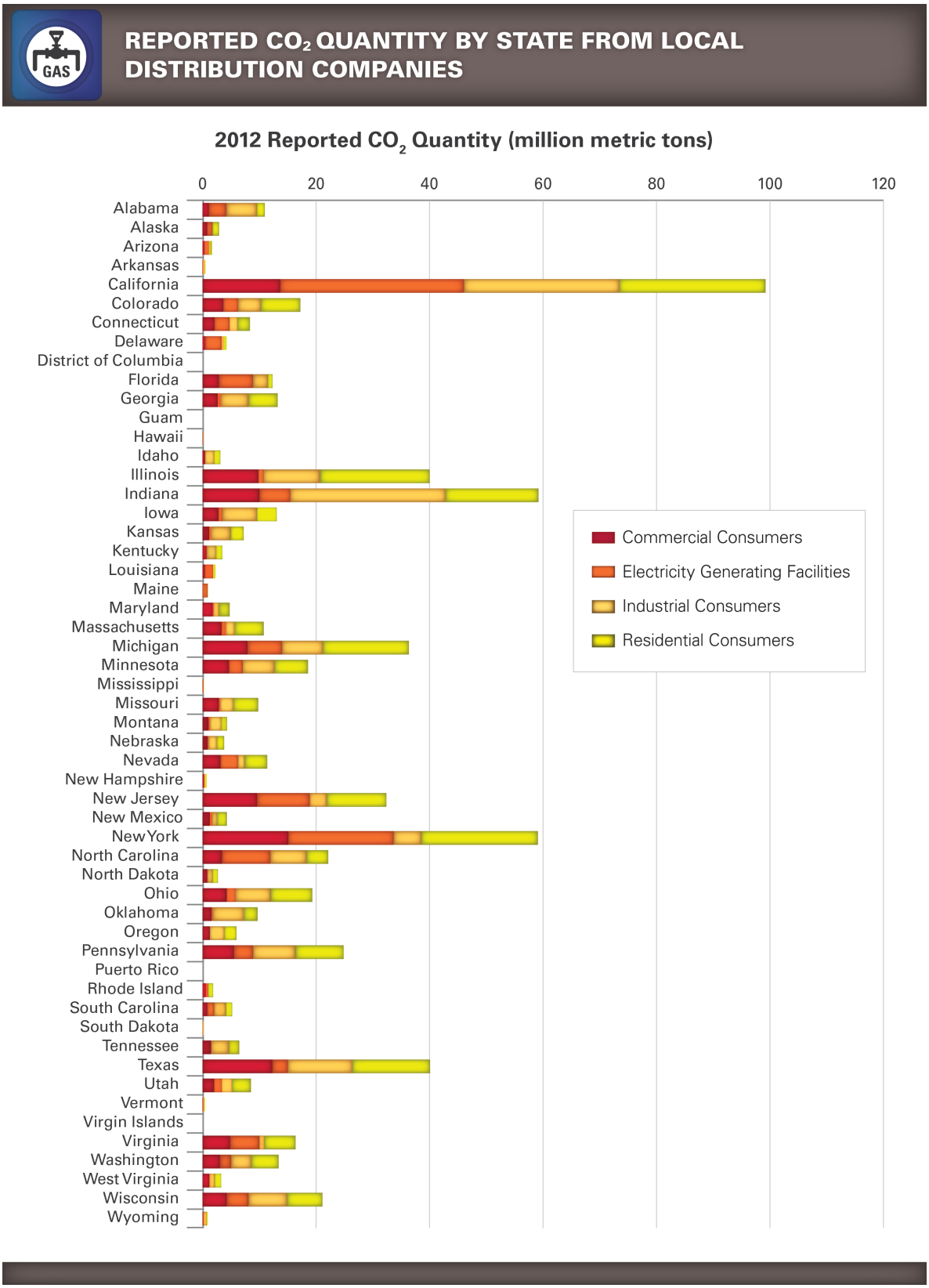
Figure 2: Location and Reported CO_2 Quantity (metric tons) for Each LDC in the Natural Gas and Natural Gas Liquids Supply Sector (as of 9/1/13)



This map shows the locations of LDCs that reported to the GHGRP, their service areas (if available), and the CO_2 associated with natural gas supplied. The color of the shading corresponds to the quantity of CO_2 reported by that LDC. There are also LDCs reporting CO_2 associated with natural gas supplied located in Alaska and Hawaii.

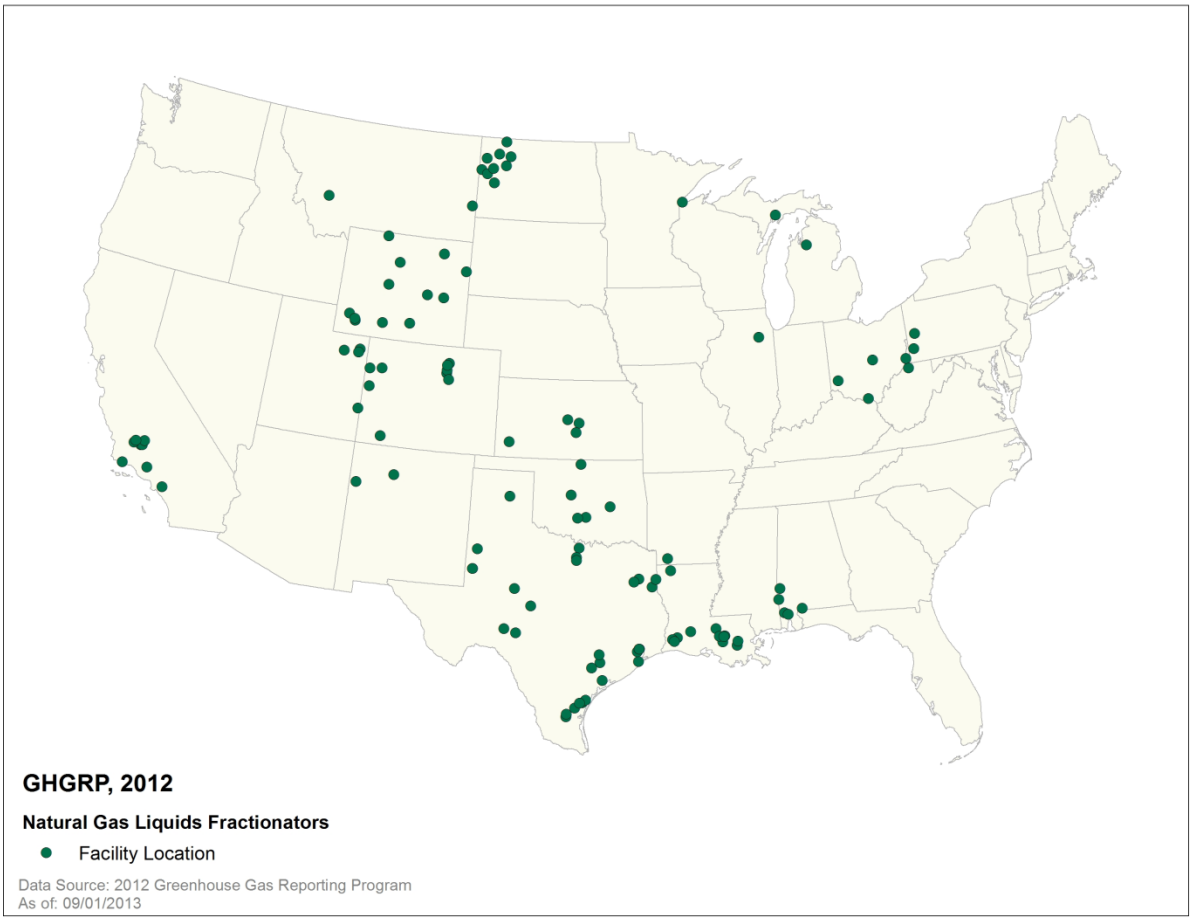
Readers can view maps and identify the LDCs reporting the largest CO_2 quantity by visiting the Facility Level Information on Greenhouse Gases (FLIGHT) website (http://ghgdata.epa.gov).

Figure 3: Natural Gas and Natural Gas Liquids Supply Sector – LDC Reported CO_2 Quantity by State (2012)



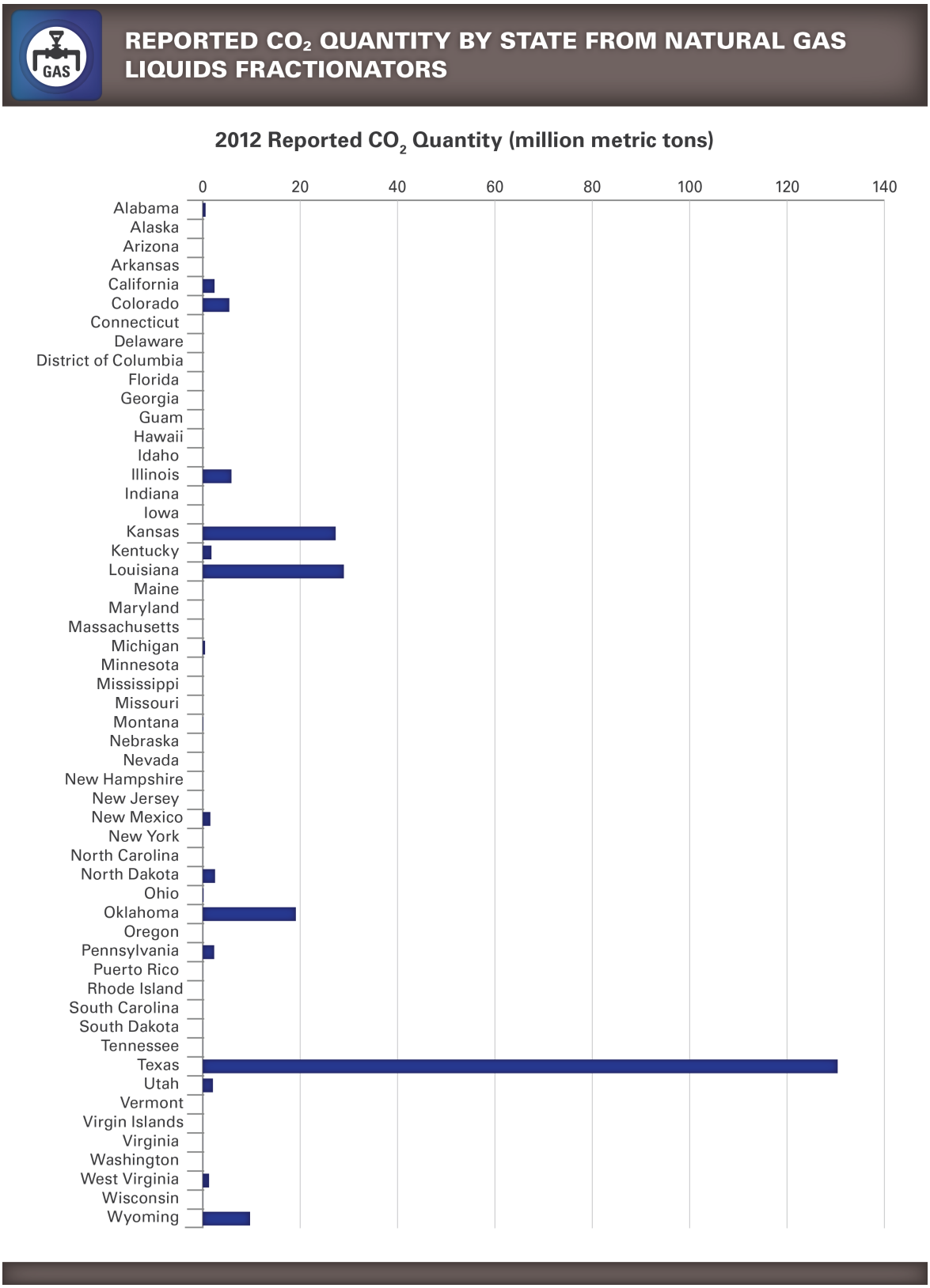
* Represents total CO_2 quantity associated with natural gas supply reported to the GHGRP by LDCs. Additional CO_2 supply occurs from LDCs that have not reported, for example those below the 460,000 Mscf reporting threshold.

Figure 4: Location of NGL Fractionators in the Natural Gas and Natural Gas Liquids Supply Sector (as of 9/1/13)



This map shows the locations of NGL fractionators that reported. The reported CO_2 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_2 quantity by visiting the Facility Level Information on Greenhouse Gases (FLIGHT) website (http://ghgdata.epa.gov).

Figure 5: Natural Gas and Natural Gas Liquids Supply Sector – NGL Fractionator Reported CO_2 Quantity by State (2012)



* Note that use of these compounds does not necessarily occur within the state where the NGL fractionator operates. This information is provided to give a general idea of the areas of the country in which most NGL production occurs.

** Does not include CO_2 reported by NGL Fractionators whose total is CBI.

Natural Gas and Natural Gas Liquids Supply Sector Trend in Total Reported GHG Quantity 2010 to 2011

The quantity of CO_2 associated with natural gas liquids supply increased by nearly six percent from 2010 to 2011. The quantity of NGLs produced is tied to the amount of natural gas and NGLs being produced domestically and the demand for NGL products. In 2011, natural gas prices hit lows not seen since the early 2000s.[3] At the same time, crude oil prices continued to climb.[4] NGL prices are linked to oil prices as they can be used as a substitute to petroleum products in some cases.[5] The higher oil prices have resulted in higher prices for some NGLs and incentivized production of these compounds. The widening spreads between U.S. domestic wellhead gas prices and NGL product prices have incentivized producers, particularly those working in shale basins, to shift activity to those sections of the shale resources known to produce liquids-rich gas. This trend is seen in the EIA rig counts for the Eagle Ford, Marcellus, Bakken, and Utica shale plays, which produce liquids-rich gas. [6] All of these regions saw rising rig counts in 2011, particularly throughout the second half of the year. Meanwhile, shale plays that produce "dry" natural gas saw decreasing rig counts during 2011.

The quantity of CO_2 associated with natural gas supply (i.e. LDCs) decreased by less than one percent from 2010 to 2011. Natural gas is primarily consumed by end-users in the residential, commercial, industrial, and electricity generating sectors. Weather is the most important driver of gas consumption in the residential sector because of its extensive use as a heating fuel. Throughout 2011, the Northeast, West and Midwest regions experienced slightly colder weather than they did in 2010. However, the South experienced much warmer weather during 2011. Overall, total heating degree days in the United States fell by 3.5% from 2010 to 2011, leading to decreased demand from the residential sector. Within the electricity generating sector, demand for fuel over short-time scales is often impacted by weather, and the amount of natural gas used to meet that demand is primarily based on the relative price of natural gas compared to coal. Since the deployment of hydraulic fracturing technology to recover gas from shale formations in the United States, the level of gas available has reached unprecedented levels. With plentiful gas supplies, natural gas prices have reached historic lows. The current price environment for natural gas has encouraged coal-to-gas switching in the power sector, increasing the quantity of gas delivered by LDCs to this sector which off-set the decrease in demand from residential sources in 2010 (Table 8).

Natural Gas and Natural Gas Liquids Supply Sector Trend in Total Reported GHG Quantity 2011 to 2012

From 2011 to 2012, the trends that were observed from 2010 to 2011 continued and intensified. High NGL prices in previous years likely led oil and gas producers to focus on areas with wet natural gas (i.e. natural gas high in NGL content) reserves, thereby increasing NGL well production.

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[3] U.S. Department of Energy, Energy Information Administration, http://www.eia.gov/todayinenergy/detail.cfm?id=5910.

[4] U.S. Department of Energy, Energy Information Administration, http://www.eia.gov/todayinenergy/detail.cfm?id=9530

[5] U.S. Department of Energy, Energy Information Administration, *Today in Energy,* www.eia.gov/todayinenergy/detail.cfm?id=5930.

[6] See U.S. Department of Energy, Energy Information Administration, Drilling Productivity Report for Key Tight Oil and Shale Gas Regions, November 2014, http://www.eia.gov/petroleum/drilling/pdf/dpr-full.pdf.

Most NGL prices remained high relative to natural gas in 2012, and increased well production led to increased production of finished products at fractionation facilities. The increased throughput at these facilities led to an increase in the reported CO_2 quantity. Weather conditions in 2012 were even warmer than those experienced in 2011, which led to a continued decline in demand for natural gas from the residential sector.

The number of heating degree days throughout the country dropped by 14.4% in 2012, which decreased demand for natural gas; total natural gas consumption in the residential and commercial sectors dropped by over ten percent (Table 7). The primary driver of the increase in consumption by the electric power sector was the historically low price of natural gas relative to other fuels such as coal.

Table 7: Weather Data and Associated Impacts on Natural Gas Supply

Year	Heating Degree Days[a]	Residential and Commercial Sectors (MMcf)[b]	Cooling Degree Days[a]	Electric Power Sector (MMcf)[b]
2010	4,471	7,885,005	1,445	7,250,236
2011	4,321	7,869,096	1,457	7,835,473
2012	3,778	7,044,328	1,480	9,466,343
Percent change (2010-2011)	-3.5%	-0.2%	0.82%	7.5%
Percent change (2011-2012)	-14.4%	-10.5%	1.6%	20.8%

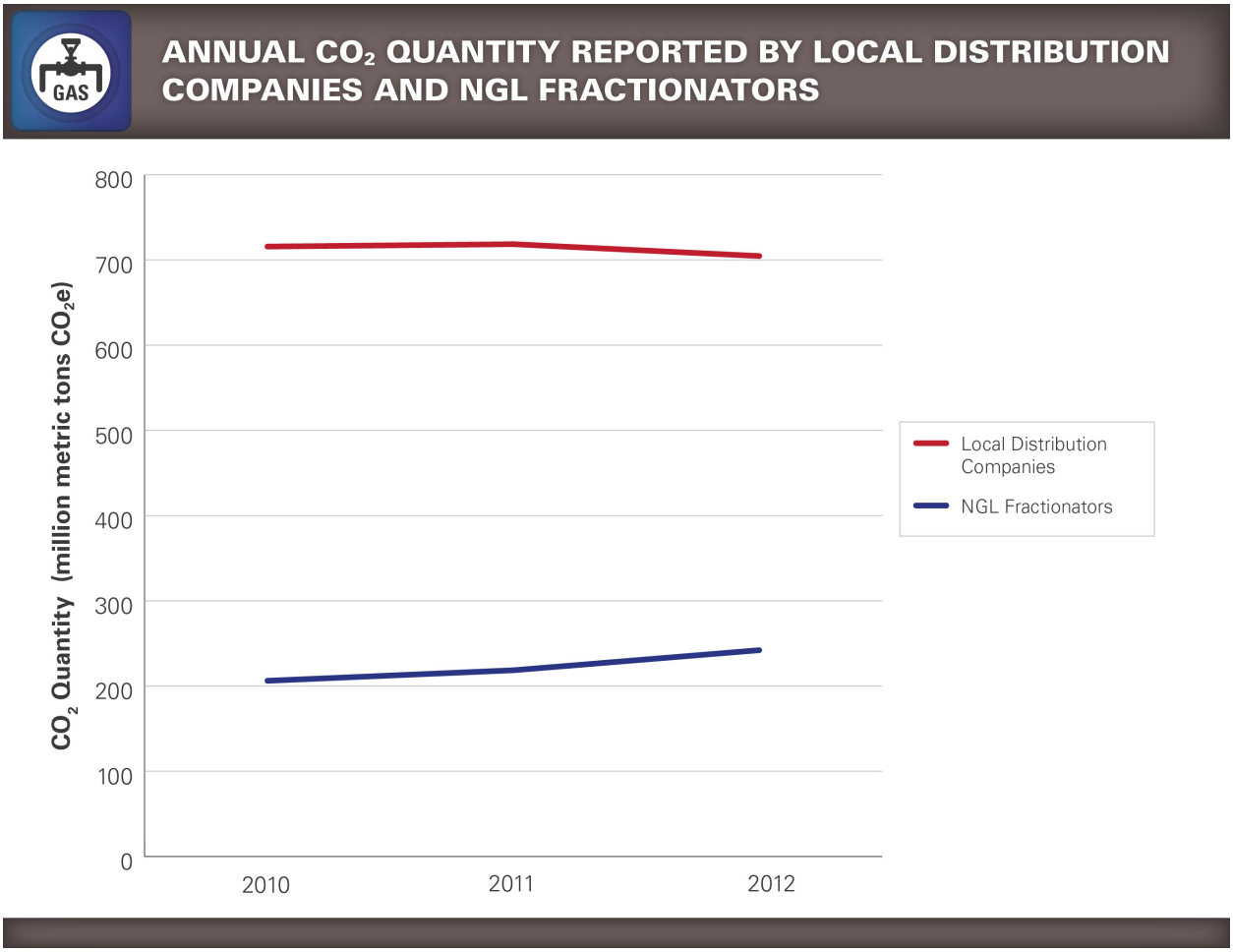
[a] U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, http://www.ncdc.noaa.gov/oa/documentlibrary/hcs/hcs.html.

[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: http://www.eia.gov/cfapps/ngqs/ngqs.cfm?f_report=RP1.

Table 8: Natural Gas Deliveries Reported to GHGRP by LDCs

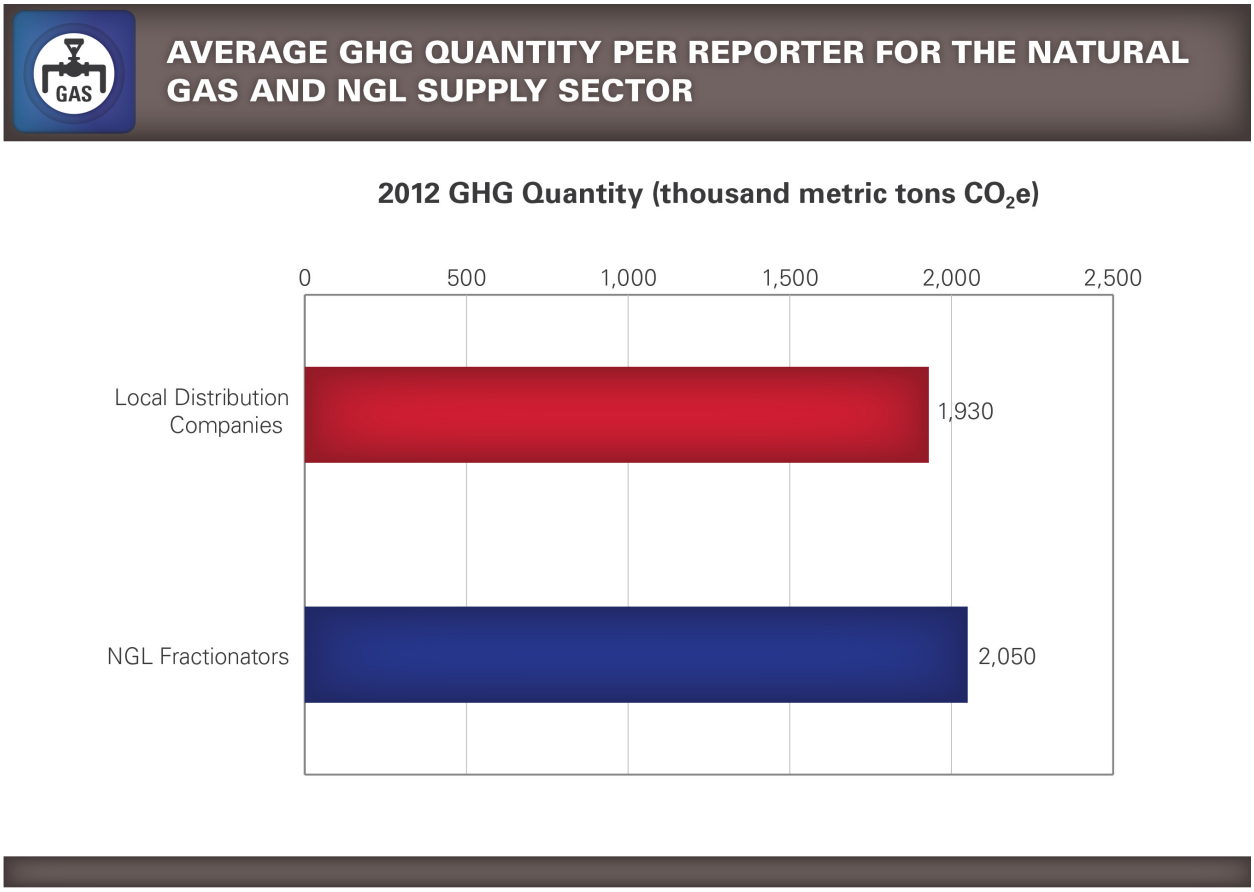
Point in the Supply Chain	2010	2011	2012
Total Reported Deliveries (Mscf)	**12,773,016,503**	**12,768,837,601**	**12,738,553,240**
Residential Customers (Mscf)	4,681,611,446	4,631,261,922	4,078,702,157
Commercial Customers (Mscf)	2,929,714,709	3,033,644,755	2,792,796,677
Industrial Customers (Mscf)	3,382,614,478	3,245,078,743	3,450,910,172
Electricity Generating Facilities (Mscf)	1,779,075,869	1,858,852,181	2,416,144,234

Figure 6: Trend in CO_2 Quantity Reported by LDCs and NGL Fractionators (2010–2012)



** Does not include CO_2 reported by NGL Fractionators whose total is CBI.

Figure 7: Natural Gas and NGL Supply – Average CO_2 Quantity per Reporter



** Does not include CO_2 reported by NGL Fractionators whose total is CBI.

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_2 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_2 emission factor (EF). Use either measured or default fuel HHVs and CO_2 emission factors.
- **Calculation Methodology 2** – Multiply the volume of product supplied by a CO_2 emission factor. Use either measured or default CO_2 emission factors.

Table 9: Local Distribution Company Calculation Methodologies

Type of CO_2	Methodology	Portion of Reported CO_2 Monitored by Method (by Type)		
		2010	2011	2012
CO_2 associated with natural gas supplied	Measured Higher Heating Value (HHV) & Measured Emission Factor (EF)[a]	0.2%	1.5%	1.6%
	Measured HHV & Default EF[b]	22.7%	21.7%	24.2%
	Default HHV & Default EF[c]	77.1%	76.8%	74.2%

[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] Includes LDCs that used Calculation Methodology 1 with a measured HHV and default CO_2 emission factor.

[c] 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.

Table 10: NGL Fractionator Calculation Methodologies

Type of CO_2	Methodology	Portion of Reported CO_2 Monitored by Method (by Type)		
		2010	2011	2012
CO_2 associated with natural gas liquids supplied	Measured Higher Heating Value (HHV) & Measured Emission Factor (EF)[a]	4.4%	0.3%	0.3%
	Measured HHV & Default EF[b]	0.1%	0.1%	1.8%
	Default HHV & Measured EF[c]	3.5%	0.2%	**
	Default HHV & Default EF[d]	92.0%	99.4%	97.9%

[a] Includes NGL Fractionators 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] Includes NGL Fractionators that used Calculation Methodology 1 with a measured HHV and default CO_2 emission factor.

[c] Includes NGL Fractionators that used Calculation Methodology 1 with a default HHV and measured CO_2 emission factor.

[d] Includes NGL Fractionators 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.

** 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 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 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.

All LDCs are required to submit both monthly and annual reports on deliveries and transfers to consumers under the Federal Energy Administration Act of 1974. The reporting forms EIA 176 and EIA 857 are used for this process. On form EIA 176, LDCs report the total quantity of gas received and the total quantity of gas delivered to six end-use consumer categories: residential, commercial, industrial, electric power, vehicle fuel and other. The GHGRP also collects the total quantity of gas received and the volumes delivered to residential, commercial, industrial, and the electric power sector from LDCs. During EPA's verification process, reported quantities of gas delivered to the four end-use sectors for which EPA collects data are compared to the values reported to EIA. When

discrepancies are identified, the reporter is made aware of the inconsistency, and the reporter will often re-submit their data to the agency to which they made a reporting error.

All natural gas processing plants are required to report on EIA Form 816. Fractionators that hold NGL stocks are also required to report. This form is used to collect information on inputs, stocks, receipts, production, and shipment of products.

Other Information

While EPA could have used the reported EIA data to estimate CO_2 quantities supplied, the GHGRP collects similar data for several reasons. First, EIA data are subject to different legal authorities for handling confidential business information. These authorities are more restrictive than the Clean Air Act regarding what data can be released to the public. Second, EPA seeks some data that is beyond what EIA collects, such as quality assurance information, verification data, and information on odorized propane. Lastly, the GHGRP allows facilities the option to use site-specific emission factors to report more accurate CO_2 estimates than if EPA applied default emissions factors to reported EIA gas volumes to make the estimate.

The GHGRP also collects data regarding the quantity of gas delivered to all large end-users (i.e. those customers that receive 460,000 Mscf natural gas or greater per year) from LDCs. Large end-users are themselves required to report emissions from the natural gas they consume under other Part 98 subparts. By requiring LDCs to report the quantity of all deliveries and the gas consumed by all large end-users, EPA is able to determine the total CO_2 emissions associated with natural gas combustion, including emissions by small facilities that are not required to report their direct emissions to the GHGRP.

GLOSSARY

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 high 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.

Mscf means thousand standard cubic feet.

MMcf means million standard cubic feet.

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