2018 Propane Industry's Economic Impact Report

Impact of the U.S. Consumer Propane Industry on U.S. and State Economies in 2018

April 2020

Prepared for the Propane Education & Research Council (PERC)

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1. Introduction and Summary

1.1. Introduction

Propane is third most widely used fuel in the U.S. by the number of households, second to electricity and natural gas. All told, propane is used in roughly 50 million American homes, with 11.9 million households using propane for either space or water heating, 5.8 million of which depend on propane as their primary space heating fuel.[1] In addition, over 42 million homes use propane for outdoor grilling activities.[2]

In addition to the significant role propane plays in the residential sector, the propane industry directly serves 1.1 million commercial accounts, 184,700 industrial accounts, and 504,700 agricultural accounts.[3] Propane also continues to be the most common internal combustion fuel for forklifts and has rapidly become the third most common fuel for school buses behind gasoline and diesel fuels.

Transportation demand accounts for 9 percent of global propane consumption,[4] while in the U.S. internal combustion demand accounts for 10 percent of domestic retail consumption. The prevalence of propane demand in the transportation sector highlights the mass appeal of this clean burning and cheap alternative to traditional transportation fuels like gasoline and diesel. Propane is the third most widely used transportation fuel globally and ICF estimates that in the U.S. nearly 155,000 vehicles used propane as fuel in 2018.[5]

In recognition of the important role propane plays in the U.S. energy marketplace, the Propane Education and Research Council (PERC) has commissioned ICF to perform what is now the fifth analysis of the impact of the odorized propane industry on the national and state economies. Previous iterations of the report were released in 2004 (reporting estimates for 2002), in 2011 (reporting estimates for 2009), in 2014 (reporting estimates for 2012), and in 2017 (reporting estimates for 2015). [6,] As with past releases, the focus of this report is to estimate the aggregate GDP impacts due to propane industry activity, as well as the contribution of the odorized propane industry to employment and wages both on the national level and from a state-by-state perspective. This iteration of the study also includes a supplemental assessment of capital spending for the retail propane sector and purchases of propane appliances by consumers.

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[1] *American Community Survey 2018 1-year estimates*, U.S. Census Bureau, Washington, DC, December 2019.
[2] Estimate based on data from the *Residential Energy Consumption Survey (2015)*, Energy Information Administration, Washington, DC, October 2019.
[3] *2018 Retail Propane Sales Report*, ICF and the Propane Education and Research Council, Washington, DC January 2020.
[4] Statistical Review of Global LPG 2018, Argus Media, http://www.argusmedia.com, November 2019.
[5] *Ibid*
[6] Eric Kuhle, Michael Sloan, 2015 *Study of the Propane Industry's Impact on U.S. and State Economics,* ICF.

1.2. Change from 2015 to 2018

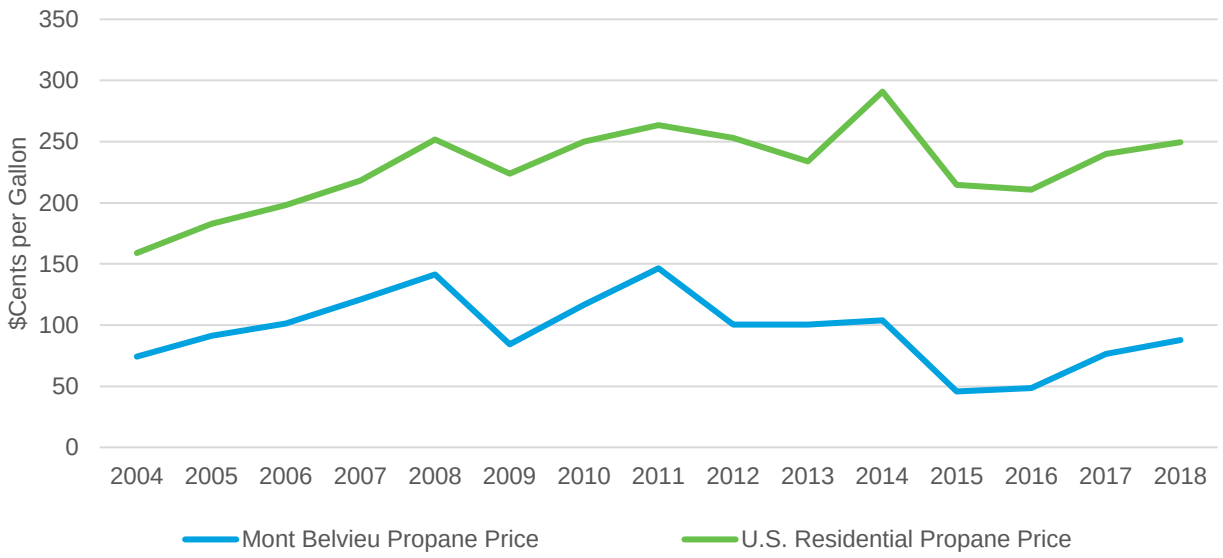
The ICF/reported odorized propane sales increased 13.6 percent between 2015 and 2018, from 8.3 billion gallons to 9.3 billion gallons. The majority of the increase can be attributed to increases in residential and commercial consumption, primarily driven by colder weather, with some growth in the number of propane heated households. The number of propane heated households increased by 4% during this period, from 5.57 million in 2015 to 5.79 million in 2018. Demand in other sectors increased by 73 million gallons.

Relative to 2015, the odorized propane industry's direct economic impact increased, from $40.5 billion in 2015 to $46.4 billion in 2018 – a 14.7 percent increase in nominal terms. Total employee count attributed to the odorized propane industry increased 5.8 percent, while growth in consumption and propane prices supported increased sales for the retail propane sector.

The increases were primarily attributable to growth in the domestic component of the odorized propane market, a sector whose value increased from $45.4 billion in 2015 to $54.6 billion in 2018. These gains were supported by a 13.4 percent increase in domestic propane/propylene production and a 13.6 percent increase in retail consumption, from 8.32 billion gallons in 2015 to 9.3 billion gallons in 2018.

From 2015 to 2018, Mont Belvieu propane prices increased by 92 percent, from 45.70 ¢/gallon in 2015 to 87.80¢/gallon in 2018, due to both increased crude oil prices and a higher relative propane price to global oil prices. This increased price in wholesale propane supplies was not directly passed on to consumers, however, the average national residential price for propane increased 16 percent, increasing by 35 ¢/gallon to average 249 ¢/gallon in 2018.

Figure 1. U.S. Residential Propane Price and Mont Belvieu Propane Prices



Source: EIA

Improvements in energy efficiency and fuel switching technologies continue to impact the propane market, resulting in an increase in the average fuel efficiency for in-home appliances. However, weather remains the dominant factor influencing annual per-household consumption and accounts

for the majority of the 911 million gallon increase in residential and commercial propane consumption between 2015 and 2018.

Agricultural demand experienced an increase of 10.5 percent from 2017 to 2018, to reach a total of 965.9 million gallons in 2018. This estimate is well above the 2015 agricultural demand levels of 866 million gallons.[7] Wet weather and spring flooding delayed crop plantings in 2018 and resulted in larger than normal agricultural demand in the Midwestern U.S., while new propane applications and irrigation engines also accounted for year-on-year growth from the sector. Compared to 2015, which was one of the warmest years on record for the continental U.S., temperatures in 2018 were somewhat closer to the 20-year average. Temperatures in 2018 were 0.7 percent colder than the 20-year average, while in 2015 they were 5.8 percent warmer.[8]

Table 1. Propane Production and Consumption

Million Gallons	2009	2012	2015	2018	Change from 2015 to 2018
Domestic Propane/Propylene Production	16,607	19,447	26,111	30,585	17.1%
Propane Imports	2,254	1,783	1,896	2,403	26.8%
Propane Exports	1,299	2,625	9,426	14,553	54.4%
Propane Consumption	9,600	7,739	8,451	9,600	10.4%
Residential	5,565	4,074	4,579	5,565	13.2%
Commercial	1,499	1,482	1,619	1,499	18.9%
Industrial	501	508	469	501	-12.2%
Agricultural	1,188	809	866	1,188	37.2%
Internal Combustion	484	615	623	484	-21.3%
Cylinder Markets (Resell)	361	251	284	361	25.0%
Heating Degree Days (Annual)	4,488	3,792	4,111	4,333	5.4%
Mont Belvieu Propane Price (¢/gallon)	84.06	100.15	45.70	87.80	92.1%

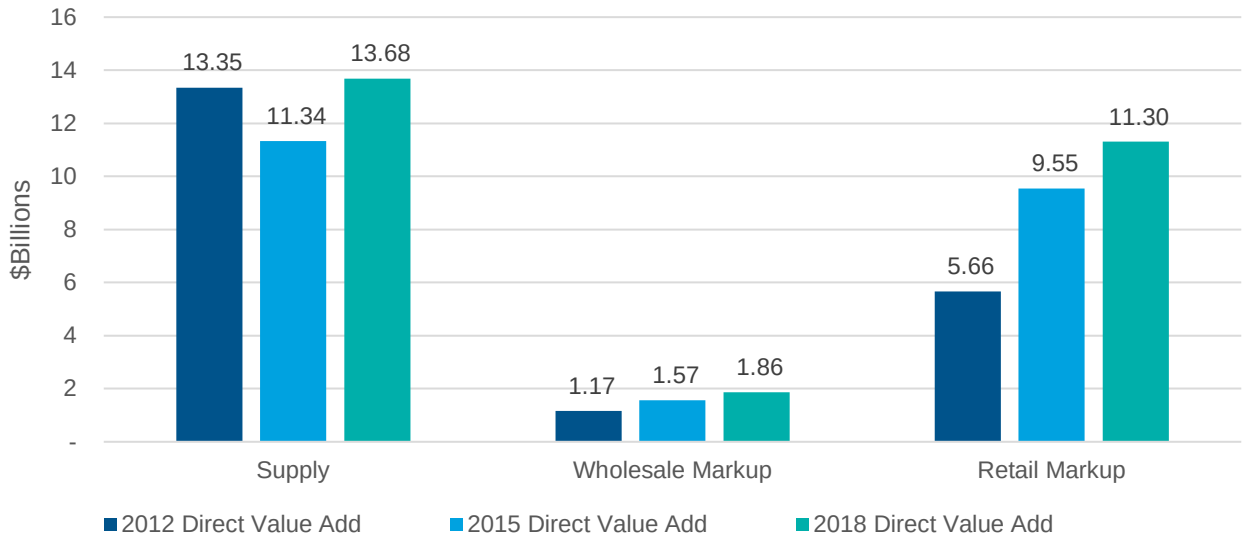
Source: ICF, EIA, API, ICF, Bloomberg, NOAA

Since 2015, the majority of the added value generated by the propane industry to the national economy has shifted further downstream, with the retail sector increasing the direct value added from $9.6 billion in 2015 to $11.3 billion in 2018. The wholesale sector also experienced an increase in the direct value added to the national economy, though one that was proportionally smaller, with its increase from $1.6 billion direct value added in 2015 to $1.9 billion in 2018. Propane supply remained the largest contributor of direct value by the propane sector, accounting for 51 percent of the sector's direct added value in 2018, similar to 2015 levels. In 2018, the added economic value attributed to the retail propane industry was concentrated in the downstream – or retail – sector, where 42 percent of all direct value was created.

[7] There are minor methodology and demand categorization issues of sectoral propane demand from 2015 to 2018 that may impact annual comparisons.

[8] As defined by the National Oceanic and Atmospheric Administration (NOAA), a heating degree day (HDD) is "*a quantitative index demonstrated to reflect demand for energy to heat… houses and businesses. Heating degree days are summations of negative differences between the mean daily temperature and the 65°F base;* …. For more information, see NOAA's explanation page at http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ddayexp.shtml

Figure 2. Direct Value Added from Propane Value Chain Components



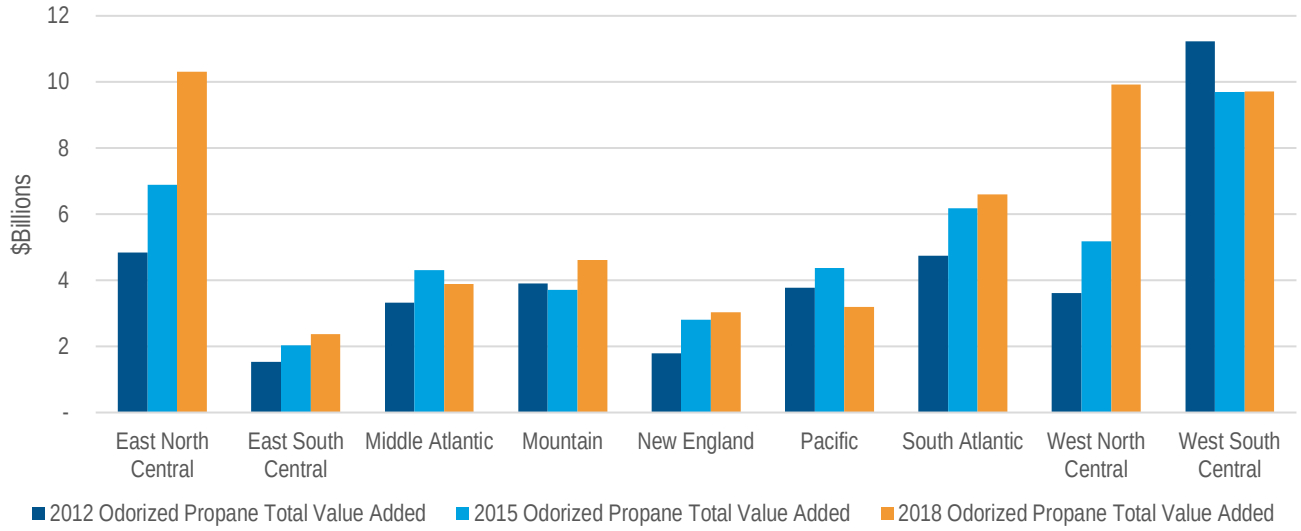
Source: ICF Propane Value Study (2015 and 2018)

The shift in value generation was also geographic in nature, with increases in the value added from retail propane increasing most dramatically in the Northeast and Midwest, while the Rocky Mountain and Gulf Coast states have experienced declines. Texas, where a large portion of the U.S. fractionation capacity and gas processing capacity are located, captured 15 percent of total domestic value added from Propane in 2015. In 2018 however, the state declined to account for only 12 percent of the domestic value added due to a shift of value-added contributions to the retail sector and domestic consumption, which is more heavily located in Midwest and Northeast states. However, even in 2018 Texas remained the state with the highest contribution to GDP of any state, with $6.7 billion of added value, followed by Michigan with $3 billion and Minnesota with $2.5 billion.

Relative to 2015, domestic propane production has increased sharply. However, due to a reduction in wholesale propane prices, total producer value has nevertheless declined. As a result, retail sales now account for a larger percentage of the value-added activities than do those associated with production.

With the return of normal winter conditions in 2018 compared to 2015, the Midwestern states experienced large increases in total retail propane consumption and economic added value. In particular, the East North Central saw the added economic value from propane increase 50 percent between 2015 and 2018, a region that experienced one of the largest changes in propane consumption. The South Atlantic and New England census regions both experienced moderate gains of 6.9 percent and 8.2 percent from 2015 to 2018, respectively.

Figure 3. Odorized Propane (Retail) Value Added by U.S. Census Region and Year



Source: ICF Propane Value Study (2015 and 2018)

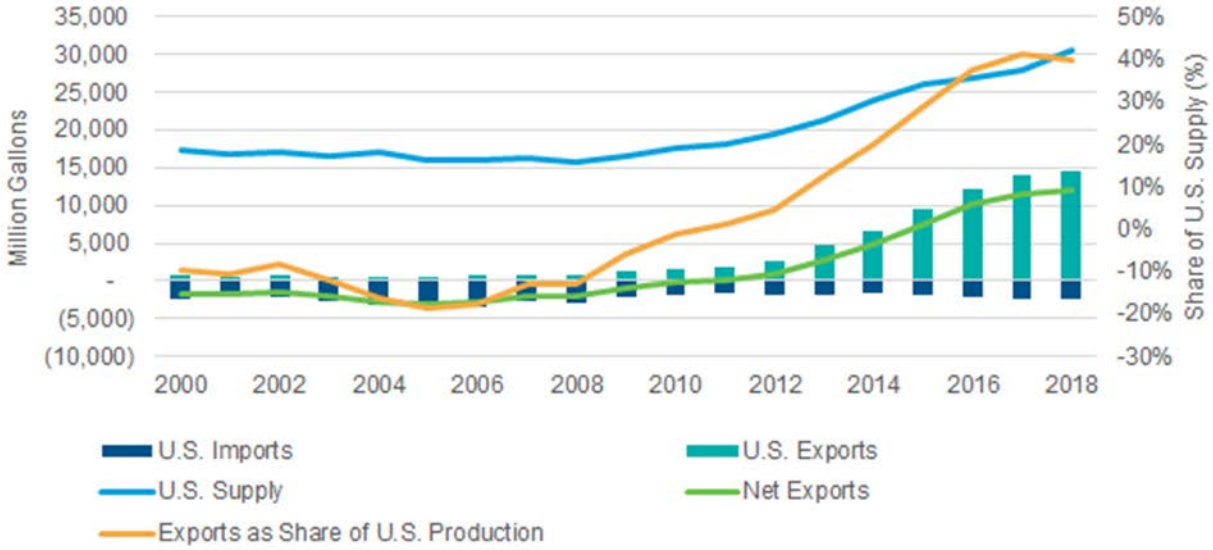
The domestic contribution to the odorized propane industry continues to grow.

- Value added generated in the U.S. from U.S. resources increased from 93 percent in 2015 to 95 percent in 2018. Including Canada, value added in the odorized propane industry attributable to North American labor and resources remained largely flat at 98 percent in 2018.
- Share of volumes of odorized propane consumed in the U.S. produced from U.S. resources increased from 82 percent in 2015 to 85 percent in 2018. When imports of Canadian purity propane and refining and gas plant feedstock are included, North American contribution to volumes increased from 94 percent in 2015 to 95 percent in 2018, with the remaining propane volume derived from imported crude oil.

Propane production in the U.S. has increased markedly with the increases in shale gas and associated gas production from U.S. tight oil plays. As the production of domestically produced natural gas and oil increases, so too will the domestic value-added contribution by the odorized propane industry to the U.S. economy. U.S. propane production from gas processing plants grew by 22 percent from 2015 to 2018 and totaled 21.5 billion gallons in 2018.

Following the rise in domestically produced propane, exports have increased to become the largest source of demand. In 2018, over 14.5 billion gallons of propane were exported. Propane exports are expected to continue to increase both in volume and in the share of domestic production that they support. In 2016, propane exports exceeded the amount of domestic consumption of propane in the retail sector and now is nearly 150% of domestic retail sales volumes.

Figure 4. U.S. Propane/Propylene Imports and Export as Share of Total Supply



Source: EIA, ICF

2. Methodology and Scope of Analysis

2.1. Impact from Production, Transportation and Consumption

To perform a detailed value-chain analysis for odorized propane at the state level ICF took a two-step approach: one, to identify all points along the pathway from the wellhead to the burner tip where value is added; and two, to allocate these values to individual states.

The primary source of propane production and inventory data is the Energy Information Administration (EIA). Because data reported by the EIA is primarily available only at the PADD[9] level, or in some cases at the refining district level[10], the data reported by the EIA was allocated to the state level by ICF. For this task, ICF employed a number of sources, both proprietary and public.

Furthermore, the comingling of various natural gas liquids (NGLs) at several levels of production and transport, as well as the lack of data on the individual components of the NGL-mix, resulted in the need to perform a full sector analysis that evaluated the volume and value chains of all NGL purity products. Through this process ICF was able to arrive at detailed estimates of both the share of total gallons and the share of value attributable to odorized propane. As a result, this study includes value tables for the total NGL complex, as well as the subsets of all propane, odorized propane, butanes, and ethane. By evaluating the full value chain for all liquids and the propane component in particular, the analysis resulted in estimates of the economic impact of odorized propane at the three stages of the supply chain: production, wholesale transport and storage, and retail. That impact, measured in terms of employment, wages, and gross domestic product (GDP) is then allocated at the state level.

2.1.1 Production

This study is focused solely on natural gas liquids purity products.[11] This approach, a result of ICF's in-house analysis and the employment of newly-available data sources, allows for a more accurate representation of the impact of the natural gas liquids industry on the U.S. economy. The result is a study that is both more useful to the propane industry and better able to report the value and volume chains of the butanes component of the NGL mix. Leveraging more accurate and complete data sources also allows for a more accurate tracking of product imports into the country, in terms of both quantities of products and ports of entry.

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[9] The Petroleum Administration for Defense Districts (PADDs) are geographic aggregations of the 50 States and the District of Columbia into five districts: PADD 1 is the East Coast, PADD 2 the Midwest, PADD 3 the Gulf Coast, PADD 4 the Rocky Mountain Region, and PADD 5 the West Coast. Due to its large population, PADD 1 is further divided into sub-PADDs, with PADD 1A as New England, PADD 1B the Central Atlantic States, and PADD 1C comprising the Lower Atlantic States. (Energy Information Administration, available at: http://www.eia.gov/todayinenergy/detail.cfm?id=4890)

[10] Refining Districts are PADD sub-regions, also defined by the Department of Energy. For a detailed description of refining districts, see: http://www.eia.gov/petroleum/supply/monthly/pdf/append.pdf

[11] Natural Gas Liquids purity products include Ethane, Ethylene, Propane, Propylene, Normal Butane, Iso-Butane, Butylene, and Pentanes Plus.

The analysis of propane production includes volumes produced from natural gas feedstocks – via gas processing plants and fractionators— as well as those produced as byproducts of the crude oil refining process. ICF calculations represent the volumes and values of natural gas liquids in the gas processing sector at a more detailed level than in previous studies, primarily by better applying data from both the EIA and internal sources on the raw gas quality produced in the various regions of the country. This approach more accurately credits natural gas liquids (NGLs) entrained in raw gas to those states where production takes place. A similar approach has also been employed to Liquefied Refinery Gases (LRGs) produced in refineries out of domestic and imported crudes. Crudes of varying qualities are credited with different shares of liquids yields, both by U.S. state, and for imported crudes. This data was not available in prior years, and its inclusion again provides for a more accurate assessment of where propane volumes and values are generated at the state level.

2.1.2 Midstream

ICF estimates for Midstream contribution to the value added generated by natural gas liquids include all activity in the transportation, storage, and wholesale stage of the value chain. These estimates are based on reported transportation costs of purity and mixed NGLs, reported volumes of product moved on all modes of transportation, and estimates of transport required within states in both upstream production activities and downstream retail activities. These costs are then allocated to the various purities, to propane specifically, and in the end to the odorized propane component of the market. Values allocated to the states include:

- All inter- and intra-state pipeline, surface, and water-borne transport of natural gas liquids. Both gathering lines that carry liquids entrained in raw natural gas and pipelines that move unfractionated raw NGLs are included. Special accounting is also made of liquids moved in dense phase along with natural gas along the Alliance pipeline.
- All activities associated with the shipment of purity propane from production regions to wholesale markets, such as Mont Belvieu and Conway, and on to the consumption centers.
- Accounting is also made of value added by wholesale activities. Value is also allocated to the market balancing services provided by storage operators.

2.1.3 Downstream

The retail sector is the largest source of employment directly attributable to the odorized propane industry. It also generates 64 percent of all value added for the retail propane sector and 42 percent for the entire propane sector.

LPG dealers are responsible for 98 percent of all value at the retail level, with gasoline stations contributing the remainder, due to their propane sale volumes. Total GDP impact of the retail sector is calculated as the difference between the value of propane at wholesale that is attributed to the odorized propane industry and the value of that same propane at the point of delivery to the customer.

The total contribution of the retail industry is then allocated to the states depending on a) that state's share of total gallons sold, and b) the total gallons of propane sold at the consumer level through gasoline stations (this includes gallons attributed to the motor vehicle market as well as propane cylinder sales done through gasoline stations).

2.1.4 Propane Retailer Capital Spending

The roughly 4,000 domestic propane retailers are made up of primarily small, private companies that operate from between one and three locations. There are also a number of cooperatives and larger private regional operators as well as several large national retailers. It is beyond the scope of this study to fully evaluate the capital and operating and maintenance spending of the retail propane sector by component and state. Instead, the study assessed the economic and employment impacts of the direct spending through the impacts of the Downstream Sector of the retail propane value chain analysis.

This approach has been taken to ensure that the economic impact of the retail propane sector is properly captured, given lack of transparency of the propane retailers, and to ensure that the impacts are not counted twice. ICF has prepared an estimate of the capital and O&M spending by propane retailer for 2018. However, these spending estimates are not included in the analysis of the economic and employment impacts of the sector.

2.2. Direct Economic Impact from the Purchase and Manufacture of Propane Equipment, Engines, and Appliances

This study uses a very detailed bottom-up estimate of the capital spending in 2018 by retail propane consumers for equipment, engines, and appliances that use odorized propane. This spending is separate from the spending on the purchase of fuel sector's capital spending across the various components of the industry. This approach has been taken in such a detailed manner to ensure that the true economic impact of the retail propane sector is properly captured given the non-traditional sources of capital spending and lack of transparency of the propane retailers.

The purchase of propane appliances and engines is primarily undertaken in a non-transparent manner, either through direct appliance purchases by consumers or spending by propane retailers, which are unregulated and largely private enterprises. Due to the relatively small share of company operations that propane engines and appliances account for, most companies do not provide a readily transparent accounting of the numbers built and sold each year. Furthermore, the reporting of commercial manufacturing activity for the U.S. Census' Annual Survey of Manufactures does not distinguish between the primary fuel types for most appliances and engines.

3. Employment and Wages Results

3.1. Employment and Wages in the Odorized Propane Industry

3.1.1 Direct Employment from Production, Transportation, and Consumption

This study assesses the level of employment in the propane industry by state for 2018. While no single, comprehensive classification under the North American Industrial Classification System (NAICS) captures all employment and wage data associated with the natural gas liquids industry — or especially with the retail propane industry in particular — ICF has identified those industrial segments where the employees working in the propane industry would be classified, including in the production, transportation, and distribution of propane, and has allocated employment in these industries accordingly, based on the contribution of the propane industry within each segment. Current analysis of total employment and wages attributable to the retail propane industry includes data obtained from the Bureau of Labor Statistics (BLS), the main source for labor-related data in this report. As of the writing of this report, the most recent year for which a full set of employment and wages data was available is 2018.

The BLS's Quarterly Census of Employment and Wages (QCEW) served as the primary source of labor and wage statistics for all Propane Industry Economic Impacts studies performed by ICF, including the 2009, 2012, and 2015 reports, as well as the current report based on 2018 data. The Bureau of Labor Statistics defines the census as "a comprehensive tabulation of employment and wage information for workers covered by state unemployment insurance (UI) laws and federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program." This definition in effect covers 98 percent of the U.S. legal labor force outside of the agricultural sector. The QCEW therefore serves as the primary data source for employment statistics across the U.S. economy, with statistics reported down to the county and metropolitan area level on a quarterly and annual basis, with monthly estimates.

Due to a number of data gathering and release restrictions, including the withholding of values to protect the anonymity of large employers, employment and wages data may not be available for all geographies in all periods. ICF addressed these data disclosure restrictions by estimating state level data based on the national totals, which are given for all categories in the data series, and other data that is available at the state level.

In the second quarter of 2011 the NAICS codes for Heating Oil Dealers and LPG Dealers were merged, and all economic statistics for these two classifications are now summed and reported under the Fuel Dealers classification. ICF accounted for this data reporting issue by attributing employment and wages to each category based on a combination of state-level historical trends, including total gallon sales, customer numbers, and sales per account for both propane and Fuel Oil usage. ICF also considered other reported propane employment reports, including the LP Gas Top 50, and macro-level economic drivers in its determination of state-level wage and employment data.

For the 2018 report, ICF also included a total of 11 different employment and wage industry classifications. A full listing and description of these 11 NAICS categories can be found in Appendix A. For the purposes of this study, the three stages of the value chain and their associated NAICS categories are identified as follows:

- **Production**: Oil and Gas Extraction (NAICS Code 211111), NGL Extraction (211112), Drilling Oil and Gas Wells (213111), Support Activities for O&G Operations (213112), and Petroleum Refining (32411)

- **Transportation**: Crude Pipelines (4861), Refined Petroleum Product Pipelines (48691), Natural Gas Pipelines (4862), and Wholesale Petroleum Trade (4247)
- **Retail** (Distribution): Gasoline Stations (447), Fuel Dealers (45431), and LPG Dealers (454312)

In order to disaggregate employment in the odorized propane industry from the broader categories reported in the QCEW data, ICF quantified the share of value component attributed to each output along the production chain, estimating the share of employees and wages coming from: 1) the total NGLs industry; 2) propane industry as a whole; and lastly 3) the odorized propane industry.

Total wages for the 11 classifications in 2018 were nearly $105 billion, $1.07 billion higher than the wages in 2015. Growth in wages was again concentrated primarily in the upstream and midstream segments of the overall industry (See Table 2). Of the total wages for these industries, production accounts for two thirds, followed by 23 percent from the retail sector and 15 percent in the transportation sectors. Wages attributed to the odorized (retail) propane sector, the retail component accounts for the majority of wages with a total of 66 percent, followed by the production sector with 30 percent and 4 percent in the transportation sector. From 2015 to 2018, wages attributable to the odorized (retail) propane sector increased by 29 percent to $4.2 billion.

Table 2 below summarizes the employment and wages directly associated with the odorized propane industry at every step in the value chain. For state-by-state details, see Table 3 through Table 5.

Table 2: 2018 National Summary of Direct Employment and Wages Associated with Odorized Propane

Employee Count	Production	Transportation, Storage, Wholesale	Retail	Total Direct
	Employees	Employees	Employees	Employees
All 11 NAICS Categories	591,443	152,668	974,514	1,718,625
Total NGL's	72,472	22,113	43,864	138,449
Propane/Propylene	33,871	7,174	43,864	84,909
Propane Only	30,173	6,207	43,864	80,245
Odorized Propane	**11,174**	**2,072**	**43,864**	**57,110**

Wages	Production	Transportation, Storage, Wholesale	Retail	Total Direct
	(Thousand $)	(Thousand $)	(Thousand $)	(Thousand $)
All 11 NAICS Categories	65,715,552	15,316,844	23,713,491	104,745,887
Total NGL/LRG	8,424,052	1,840,693	2,776,019	13,040,765
Propane/Propylene	3,890,360	611,526	2,776,019	7,277,906
Propane Only	3,425,946	529,509	2,776,019	6,731,474
Odorized Propane	**1,255,950**	**176,114**	**2,776,019**	**4,208,083**

Accounting for odorized propane industry's contribution to total value, an estimated total of 57,110 full time employment positions are directly attributable to the production, transportation, and distribution of odorized propane, accounting for 3.3 percent of all employees in the eleven industrial categories. The majority of these jobs (77 percent) are on the retail, or distribution, side of the industry.

3.1.2 Direct Wages

For this study, data on wages by NAICS category was also sourced from the Bureau of Labor Statistics' Quarterly Census of Employment and Wages. ICF estimated the total 2018 wages per sector attributable to NGLs, purity propane, and odorized propane using the same total-value-to-odorized-propane-value ratios used to allocate employment. The share of employment attributable to the product categories was estimated individually for each of the eleven NAICS codes included in the study. These estimates are found in Table 3 below. Summary totals for each product by industry segment are shown in Table 2 above. More detailed estimates of national-level wages by NAICS code are shown in the rightmost columns of Table 3, while state-level data for total Production, Transportation, and Retail can be found in Table 4 through Table 6.

As shown in Table 3 on the following page, direct wages generated by the odorized propane industry totaled $2.7 billion in 2018, representing 2.2 percent of all wages generated by the eleven employment categories included in the odorized propane value chain, and employees 2.1 percent of the total employment for the eleven categories. This close relationship between odorized propane industry's share of total labor and total wages reflects the impact the industry has along the full value chain. Within the sector, however, there are wide disparities in wages per employee, with annual income in the supply segment on average double the wages in the retail segment.

Relative to 2015, per-employee average wages in the propane industry increased 0.8 percent in nominal terms, from $59,600 in 2015 to $60,055 in 2018. The average per-employee wage in the retail segment of the odorized propane sector increased to $46,573 per year, which was well above the growth in wages reported for all labor categories covered by the Bureau of Labor Statistics' QCEW, which reported average U.S. worker wages have continued to increase in nominal terms from $49,300/yr in 2012, to $52,900/yr in 2015, and $62,800 – an increase of 7.3 percent and 18.7 percent over two separate three year periods, more than doubling the cumulative inflation during the same period.[12] The fastest wage growth was observed in the upstream segment of the propane value chain, as the tightening labor market in oil and gas drilling caused wage escalation well above the national trend.

3.1.3 Indirect and Induced Employment and Wages

The odorized propane industry has an impact on the economy beyond the direct employment and wages it generates. As companies in the production, transportation, and distribution segments of the value chain employ services that supply their operations (indirect economic impacts), or as the workers directly employed in the odorized propane industry spend their income and create demand for goods and services (induced economic impacts), the benefits of their spending lead to further employment throughout the U.S. economy.

ICF estimates that for 2018, in addition to the 57,110 jobs directly created by the odorized propane industry, another 39,977 indirect and induced full time jobs can be attributed to the industry, with indirect and induced wages adding another $5.2 billion to the total wages that can be attributed to the odorized propane industry in addition to the $4.2 billion from direct wages.

[12] *Consumer Price Index – Chained Consumer Price Index,* Series Id: SUUR0000SA0, Bureau of Labor Statistics, Washington, DC. Available at: http://www.bls.gov/cpi/data.htm

Table 3: Employment and Wages in Odorized Propane and Related Industries, 2018

		2018 Total Employees			Total Wages ($1,000)			Average Weekly Wages			2018 Employee Counts Allocated to:				2018 Wages ($1,000) Allocated to:		
Description	NAICS Code	Private	Government	Total	Private	Government	Total	Private	Government	Total	All NGLs	Propane/Propylene	Consumer-Grade Propane (C_3H_8)	Odorized Propane	All NGLs	Consumer-Grade Propane (C_3H_8)	Odorized Propane
Oil and Gas Extraction	211111	142,364	-	**184,796**	$ 30,152,579	$ -	**$ 30,152,579**	$3,138	-	**$3,138**	21,794	9,445	8,034	2,846	3,556,138	1,310,930	464,391
NGL Extraction	211112	7,250	-	**7,741**	$ 1,025,668	$ -	**$ 1,025,668**	$2,548	-	**$2,548**	3,051	1,322	1,322	468	404,265	175,203	62,065
Drilling Oil & Gas Wells	213111	64,322	-	**64,322**	$ 5,705,968	$ -	**$ 5,705,968**	$1,706	-	**$1,706**	7,586	3,269	2,825	940	672,951	250,638	83,362
Support Activities for O&G Operations	213112	264,786	-	**264,786**	$ 19,261,036	$ -	**$ 19,261,036**	$1,399	-	**$1,399**	44,468	21,384	19,553	6,798	3,234,662	1,422,308	544,173
Petroleum Refineries	32411	69,798	-	**69,798**	$ 9,570,301	$ -	**$ 9,570,301**	$2,637	-	**$2,637**	770	702	367	122	105,633	50,356	16,748
Asphalt, Paving & Roofing Manf.	32412	26,567	-	**26,567**	$ -	$ -	**$ -**	$0	-	**$0**	-	-	-	-	-	-	-
Crude Pipelines	4861	11,930	-	**11,930**	$ 1,519,266	$ -	**$ 1,519,266**	$2,449	-	**$2,449**	132	120	63	21	16,769	7,994	2,659
Refined Petroleum Product Pipelines	48691	7,563	-	**7,563**	$ 953,010	$ -	**$ 953,010**	$2,423	-	**$2,423**	801	254	220	73	100,874	27,710	9,216
Natural Gas Pipelines	4862	29,463	833	**30,296**	$ 3,857,272	$ 53,684	**$ 3,910,956**	$2,518	$1,239	**$2,483**	816	352	352	117	105,374	45,405	15,102
Wholesale Petroleum Trade	4247	102,836	43	**102,879**	$ 8,933,612	$ -	**$ 8,933,612**	$1,671	$0	**$1,670**	20,365	6,448	5,573	1,861	1,896,407	520,933	173,262
Gasoline Stations	447	932,389	2,057	**934,446**	$ 20,970,682	$ 52,196	**$ 21,022,878**	$433	$488	**$433**	3,796	3,796	3,796	3,796	85,406	85,406	85,406
Heating Oil Dealers	454311	73,091	-	**73,091**	$ 4,067,486	$ -	**$ 4,067,486**	$1,070	-	**$1,070**	-	-	-	-	-	-	-
LPG Dealers	454312	40,068	-	**40,068**	$ 2,690,613	$ -	**$ 2,690,613**	$1,291	-	**$1,291**	40,068	40,068	40,068	40,068	2,690,613	2,690,613	2,690,613
Natural Gas Distributors	2212	109,607	-	**109,607**	$ 12,292,565	$ -	**$ 12,292,565**	$2,157	-	**$2,157**	-	-	-	-	-	-	-
Total		**1,882,034**	**2,933**	**1,927,890**	**121,000,058**	**105,880**	**121,105,938**	**1,236**	**694**	**1,208**	**143,647**	**87,161**	**82,173**	**57,110**	**12,869,091**	**6,587,496**	**4,146,996**

Table 4: Odorized Propane (C_3H_8) Employment and Wages Summary, 2018

	Production		Trans., Stor., Wholesaling		Retail		Total	
State	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)
Alabama	40	4,466	12	1,030	733	37,555	785	43,051
Alaska	273	30,537	5	485	121	4,518	400	35,540
Arizona	0	2	11	2,258	498	28,692	508	30,952
Arkansas	8	884	10	783	415	21,668	433	23,335
California	267	30,035	54	4,359	2,425	160,511	2,746	194,905
Colorado	793	89,037	103	8,913	642	38,571	1,538	136,521
Connecticut	0	0	11	875	1,099	95,979	1,110	96,854
Delaware	1	201	6	475	518	37,975	526	38,651
District of Columbia	0	0	0	26	49	1,053	50	1,079
Florida	3	360	18	1,421	1,603	97,908	1,624	99,689
Georgia	0	0	37	2,983	1,431	74,525	1,468	77,507
Hawaii	1	83	4	311	58	7,680	63	8,074
Idaho	1	59	6	440	180	8,849	186	9,348
Illinois	52	5,984	58	4,784	976	53,814	1,085	64,582
Indiana	5	675	58	4,744	1,137	64,887	1,200	70,306
Iowa	0	0	-2	-188	471	23,699	468	23,511
Kansas	129	14,506	137	11,284	311	16,092	577	41,882
Kentucky	19	2,148	12	972	512	27,703	543	30,822
Louisiana	311	35,793	54	4,663	394	17,367	759	57,823
Maine	0	0	14	1,081	1,074	61,719	1,088	62,800
Maryland	0	0	10	808	1,008	80,063	1,018	80,871
Massachusetts	0	0	11	909	946	77,498	958	78,407
Michigan	12	1,403	51	4,094	1,541	98,331	1,604	103,829
Minnesota	2	295	47	3,723	1,140	65,171	1,189	69,188
Mississippi	69	7,852	17	1,403	673	34,344	760	43,599
Missouri	0	14	43	3,456	1,034	75,543	1,077	79,013
Montana	35	3,963	10	790	281	16,402	327	21,156
Nebraska	3	328	108	8,852	142	6,726	253	15,905
Nevada	0	43	4	314	244	15,699	248	16,056
New Hampshire	0	0	15	1,213	1,100	88,581	1,115	89,794
New Jersey	3	468	10	826	745	57,413	759	58,707
New Mexico	730	81,730	37	3,393	526	25,003	1,293	110,126
New York	0	35	34	2,729	2,776	224,948	2,811	227,712
North Carolina	0	0	50	4,033	2,680	150,185	2,731	154,218
North Dakota	1,035	115,799	49	4,417	85	4,870	1,168	125,086
Ohio	193	21,813	138	11,417	1,258	71,018	1,589	104,249
Oklahoma	1,154	129,497	196	16,846	511	27,205	1,861	173,549
Oregon	0	0	8	603	320	18,815	328	19,418
Pennsylvania	176	19,913	79	6,570	2,362	154,871	2,617	181,354
Rhode Island	0	0	3	214	272	18,562	275	18,775
South Carolina	0	0	27	2,163	954	54,868	981	57,031
South Dakota	2	203	7	545	220	10,609	229	11,356
Tennessee	2	273	11	891	1,060	46,549	1,074	47,713
Texas	5,106	573,255	285	26,254	2,443	170,168	7,833	769,677
Utah	99	11,140	15	1,304	218	12,197	333	24,640
Vermont	0	0	10	777	631	44,017	640	44,794
Virginia	0	1	21	1,634	1,589	98,740	1,609	100,374
Washington	3	410	19	1,495	821	54,191	842	56,095
West Virginia	520	58,593	105	9,087	126	7,047	751	74,727
Wisconsin	0	3	33	2,645	1,308	71,937	1,342	74,585
Wyoming	127	14,148	12	1,012	202	13,682	341	28,842
US Total	**11,174**	**1,255,950**	**2,072**	**176,114**	**43,864**	**2,776,019**	**57,110**	**4,208,083**

Table 5: Propane (C_3H_8) Employment and Wages Summary, 2018

	Production		Trans., Stor., Wholesaling		Retail		Total	
State	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)
Alabama	107	12,197	38	3,097	733	37,555	878	52,849
Alaska	737	83,099	15	1,458	121	4,518	873	89,075
Arizona	0	5	11	6,790	498	28,692	508	35,487
Arkansas	21	2,408	29	2,353	415	21,668	466	26,430
California	721	82,058	162	13,106	2,425	160,511	3,308	255,675
Colorado	2,141	242,647	309	26,798	642	38,571	3,092	308,016
Connecticut	0	0	33	2,631	1,099	95,979	1,132	98,610
Delaware	4	605	18	1,428	518	37,975	540	40,007
District of Columbia	0	0	1	78	49	1,053	50	1,131
Florida	9	979	54	4,273	1,603	97,908	1,666	103,160
Georgia	0	0	111	8,968	1,431	74,525	1,542	83,492
Hawaii	2	251	12	934	58	7,680	72	8,865
Idaho	1	161	17	1,324	180	8,849	198	10,334
Illinois	141	16,555	174	14,383	976	53,814	1,291	84,752
Indiana	15	1,951	176	14,264	1,137	64,887	1,327	81,102
Iowa	0	0	-7	-565	471	23,699	463	23,134
Kansas	348	39,619	412	33,925	311	16,092	1,071	89,636
Kentucky	51	5,924	36	2,921	512	27,703	599	36,548
Louisiana	848	98,699	164	14,020	394	17,367	1,405	130,086
Maine	0	0	41	3,250	1,074	61,719	1,115	64,968
Maryland	0	0	31	2,429	1,008	80,063	1,038	82,492
Massachusetts	0	0	34	2,734	946	77,498	981	80,232
Michigan	33	3,852	154	12,311	1,541	98,331	1,728	114,494
Minnesota	6	886	140	11,193	1,140	65,171	1,287	77,250
Mississippi	188	21,503	51	4,219	673	34,344	912	60,066
Missouri	0	39	129	10,390	1,034	75,543	1,163	85,972
Montana	95	10,804	29	2,377	281	16,402	406	29,582
Nebraska	8	891	325	26,614	142	6,726	475	34,230
Nevada	1	119	12	946	244	15,699	257	16,763
New Hampshire	0	0	46	3,646	1,100	88,581	1,146	92,228
New Jersey	10	1,408	31	2,482	745	57,413	786	61,303
New Mexico	1,969	222,514	110	10,203	526	25,003	2,605	257,719
New York	1	96	103	8,204	2,776	224,948	2,881	233,248
North Carolina	0	0	151	12,126	2,680	150,185	2,831	162,311
North Dakota	2,790	315,257	146	13,280	85	4,870	3,021	333,408
Ohio	522	59,657	416	34,328	1,258	71,018	2,195	165,003
Oklahoma	3,114	352,939	588	50,650	511	27,205	4,213	430,794
Oregon	0	0	23	1,814	320	18,815	343	20,629
Pennsylvania	476	54,501	239	19,753	2,362	154,871	3,076	229,125
Rhode Island	0	0	8	642	272	18,562	280	19,204
South Carolina	0	0	80	6,503	954	54,868	1,034	61,371
South Dakota	5	552	21	1,638	220	10,609	245	12,798
Tennessee	6	788	34	2,680	1,060	46,549	1,100	50,017
Texas	13,781	1,563,034	856	78,935	2,443	170,168	17,079	1,812,137
Utah	268	30,356	46	3,919	218	12,197	532	46,472
Vermont	0	0	29	2,337	631	44,017	660	46,354
Virginia	0	2	62	4,912	1,589	98,740	1,651	103,654
Washington	9	1,231	56	4,494	821	54,191	886	59,916
West Virginia	1,405	159,859	317	27,322	126	7,047	1,848	194,228
Wisconsin	0	10	100	7,952	1,308	71,937	1,409	79,899
Wyoming	341	38,491	37	3,042	202	13,682	580	55,215
US Total	**30,173**	**3,425,946**	**6,207**	**529,509**	**43,864**	**2,776,019**	**80,245**	**6,731,474**

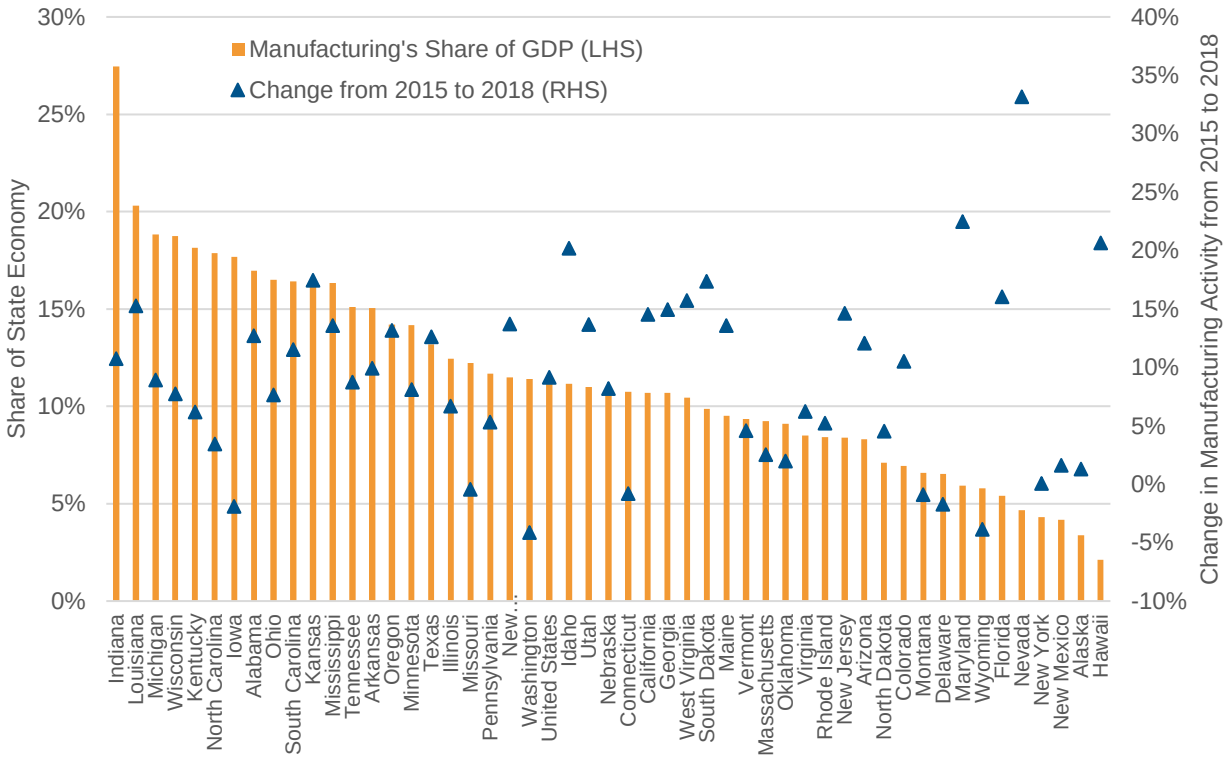
Table 6: Total NGLs / LRGs Employment and Wages Summary, 2018

	Production		Trans., Stor., Wholesaling		Retail		Total	
State	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)	Employee Count	Wages (Thousand $)
Alabama	257	29,930	64	5,354	733	37,555	1,054	72,840
Alaska	1,774	205,168	39	3,653	121	4,518	1,934	213,340
Arizona	0	12	39	3,918	498	28,692	536	32,622
Arkansas	51	5,936	124	9,907	415	21,668	590	37,511
California	1,729	201,339	383	31,097	2,425	160,511	4,537	392,947
Colorado	5,147	597,460	1,526	127,157	642	38,571	7,315	763,188
Connecticut	0	0	19	1,518	1,099	95,979	1,118	97,497
Delaware	9	1,269	11	942	518	37,975	538	40,186
District of Columbia	0	0	1	45	49	1,053	50	1,098
Florida	21	2,416	31	2,491	1,603	97,908	1,655	102,816
Georgia	0	0	74	6,427	1,431	74,525	1,505	80,952
Hawaii	4	526	7	588	58	7,680	69	8,794
Idaho	3	396	10	778	180	8,849	193	10,023
Illinois	334	39,804	764	62,669	976	53,814	2,074	156,287
Indiana	34	4,366	289	24,061	1,137	64,887	1,459	93,314
Iowa	0	0	213	16,967	471	23,699	683	40,665
Kansas	834	97,214	1,913	156,034	311	16,092	3,058	269,340
Kentucky	121	14,308	123	9,919	512	27,703	755	51,930
Louisiana	2,011	238,476	1,110	91,006	394	17,367	3,515	346,849
Maine	0	0	24	1,875	1,074	61,719	1,098	63,594
Maryland	0	0	18	1,401	1,008	80,063	1,025	81,465
Massachusetts	0	0	20	1,577	946	77,498	966	79,075
Michigan	80	9,371	115	9,269	1,541	98,331	1,735	116,971
Minnesota	13	1,858	95	7,677	1,140	65,171	1,248	74,707
Mississippi	449	52,540	147	12,160	673	34,344	1,269	99,044
Missouri	1	96	171	14,102	1,034	75,543	1,206	89,741
Montana	229	26,597	19	1,635	281	16,402	530	44,634
Nebraska	19	2,203	638	53,559	142	6,726	799	62,488
Nevada	2	290	7	548	244	15,699	253	16,537
New Hampshire	0	0	26	2,104	1,100	88,581	1,126	90,685
New Jersey	21	2,954	194	15,477	745	57,413	960	75,845
New Mexico	4,739	548,867	318	28,812	526	25,003	5,583	602,681
New York	2	237	60	4,734	2,776	224,948	2,838	229,919
North Carolina	0	0	96	8,175	2,680	150,185	2,777	158,361
North Dakota	6,715	777,684	236	22,862	85	4,870	7,036	805,416
Ohio	1,250	146,036	837	70,645	1,258	71,018	3,344	287,699
Oklahoma	7,485	868,953	1,397	121,776	511	27,205	9,393	1,017,934
Oregon	0	0	13	1,047	320	18,815	333	19,861
Pennsylvania	1,139	133,252	1,369	111,039	2,362	154,871	4,869	399,161
Rhode Island	0	0	5	371	272	18,562	277	18,932
South Carolina	0	0	56	4,931	954	54,868	1,010	59,800
South Dakota	12	1,364	12	950	220	10,609	244	12,922
Tennessee	14	1,767	21	1,675	1,060	46,549	1,094	49,991
Texas	33,115	3,846,091	8,120	672,248	2,443	170,168	43,677	4,688,507
Utah	644	74,769	621	49,926	218	12,197	1,483	136,891
Vermont	0	0	17	1,348	631	44,017	648	45,365
Virginia	0	5	36	2,834	1,589	98,740	1,624	101,579
Washington	18	2,583	99	7,913	821	54,191	937	64,686
West Virginia	3,375	392,815	389	36,861	126	7,047	3,890	436,722
Wisconsin	0	21	58	4,588	1,308	71,937	1,366	76,546
Wyoming	822	95,078	147	12,046	202	13,682	1,172	120,806
US Total	**72,472**	**8,424,052**	**22,113**	**1,840,693**	**43,864**	**2,776,019**	**138,449**	**13,040,765**

3.2. Manufacturing of Propane Equipment, Engines, and Appliances

Manufacturing is a major economic driver of the U.S. economy, and according to the Bureau of Economic Analysis accounted for over 2.32 million jobs in 2018.[13] The total number of manufacturing jobs by state and the share that these jobs represent are shown in Figure 5 below. Across the U.S., manufacturing average 11.4 percent of total jobs. Several Midwestern and Southern U.S. states represent the states where manufacturing accounts for the largest share of employment, including Indiana, Louisiana, Michigan, and Wisconsin. California, Texas, Ohio, and Illinois have the largest number of manufacturing jobs, totaling 778,000 in 2018, roughly one third of all manufacturing jobs.

Figure 5. Manufacturing Employment Percentages by State



Source: U.S. Census Annual Survey of Manufacturing, U.S. Bureau of Economic Analysis

Jobs Supported by the Manufacturing and Installation of Propane Equipment

The number of jobs supported by the manufacturing and installation of propane appliances and engines are estimated by the sector and type of equipment manufactured. The manufacturing and installation of equipment used by consumers of retail (odorized) propane support a total of almost 48,000 jobs, including 17,000 direct manufacturing jobs. These manufacturing jobs in turn support an additional 31,000 indirect/induced jobs across the country.

The residential sector supports a total of about 42,000 jobs, including 15,000 manufacturing jobs and 27,000 supporting jobs. This estimate accounts for the share of propane appliances that built overseas and imported into the U.S.[14] Table 7 shows the numbers of direct and indirect jobs

[13] https://www.bea.gov/data/employment/employment-by-industry

[14] The job impact of imported appliances and engines does not include the direct manufacturing activities but does include the distribution and installation of the propane equipment.

supported by the spending on new appliances, engines, and other applications that utilize odorized propane in 2018.

Table 7. Employment from Manufacturing Activities

Manufacturing Category	Direct	Indirect	Induced	Total
Residential Sector	15,154	10,452	16,339	41,945
New Construction	2,659	1,834	2,867	7,361
Conversions / Upgrades	789	544	851	2,184
Appliance Replacements	7,632	5,264	8,228	21,123
Propane BBQs	4,074	2,810	4,393	11,277
Commercial Sector	375	259	404	1,037
Internal Combustion Engines	1,557	1,074	1,679	4,310
Forklifts	1,233	850	1,329	3,412
School Buses	99	68	107	274
LDV/MDVs	92	63	99	254
Irrigation	134	93	145	371
Agricultural Products	119	82	128	329
Industrial / Other	99	68	106	273
Total Impact	17,304	11,935	18,656	47,894

Source: ICF

4. Direct Economic Impact Results

4.1. Economic Impact from Production, Transportation, and Consumption

The study of the impact of the U.S. consumer propane industry on the national and state economies is based upon a bottom-up approach to economic value assessment. Because the odorized propane industry sources its product from total U.S. purity propane supply, and because that purity propane is the product of both the refining and gas processing industries output of natural gas liquids (NGLs) and liquid refinery gasses (LRGs), ICF's approach to value calculation for the odorized propane industry attempts to trace the flow of all NGLs through the economy from the wellhead to the burner tip across all sources of production.

To estimate the state level direct economic impact of the odorized propane industry, the study used the 2018 Retail Propane Sales Report published by PERC for the odorized propane sales by sector,[15] to allocate the national direct economic impacts volumes among the states. A national summary of the sector specific retail propane consumption for 2018 is shown in Table 8 below.

Table 8. 2018 National-Level Odorized Propane Consumption and Expenditures by Sector

Retail Sector	Consumption (Million Gallon)	Percent of Total Consumption	Expenditures ($Millions)	Percent of Total Expenditures
Residential	5,184	55.63%	14,535	61.06%
Commercial	1,924	20.65%	4,984	23.40%
Sales to Resellers	354	3.80%	568	2.30%
Internal Combustion	479	5.14%	844	5.60%
Industrial	412	4.42%	931	6.30%
Agricultural	966	10.36%	1,941	9.00%
Total U.S. Odorized Propane Demand	9,320		23,803	

Source: ICF, 2018 Retail Propane Sales Report

Various data sources are also used to estimate the value of these gallons across the federal and state economies. These include data reported by Bloomberg, industry publications on wholesale and regional rack prices for propane, EIA reported retail propane prices for the heating season, and ICF's modeled estimates for retail propane prices at the state level for all months and sectors not reported by the EIA.

This comprehensive approach to volume and price aggregation allows for the estimation of not only the total value of odorized propane on the U.S. market, but also of all purity propane, ethane, butanes, and pentanes plus. National-level estimates for total value along the full production chain for odorized propane and purity NGLs are found in Table 9 through Table 13. Detailed estimates of the impact of the odorized, total purity propane industry, and all NGLs are found in Table 15, Table 16, and Table 17.

4.1.1 Upstream

Tracing the value added by the propane industry in the upstream sector begins by accounting for crude oil and natural gas inputs into refining and gas processing facilities. ICF used EIA data in combination with in-house proprietary information, such as gas and crude oil quality and transport infrastructure (pipelines, barges, rail, etc.) capacity, to estimate production of crude oil, lease condensate, and natural gas at the state level (see Table 14). This data was then combined with

[15] *2018 Retail Propane Sales Report, ICF and the Propane Education & Research Council, January 2020*

information on the composition of gas produced and refinery yields from various crudes to estimate total quantities and values of natural gas liquids – and subsequently odorized propane - produced at the state level.

- ICF estimates the total value of natural gas liquids (also referred to as Liquefied Refinery Gasses) coming from domestic crude at nearly $4.1 billion, with odorized propane's share of LRGs in domestic crude at $725 million.
- We estimate the value of NGLs produced from U.S. natural gas production at nearly $10.7 billion, with odorized propane's share of NGLs in raw domestic gas at $1.3 billion.

The total value of imported raw commodities and products is estimated at $4.0 billion. This figure includes all LRGs in imported crude and natural gas, $1.4 billion of which is contributed by Canadian crude. The value of imported raw commodities in the odorized propane segment is $0.7 billion, including $249 million of Canadian crude.

- U.S. gas processors extracted NGLs valued at $456 million from imported Canadian natural gas, including $48 million in odorized propane.
- $2.1 billion of imported natural gas liquids entered the U.S. in 2015, including $1.5 billion of NGLs imported from Canada.
- Odorized propane's share of imported NGLs value stood at $371 million in 2015, of which $336 million was attributed to imports from Canada.

4.1.2 Midstream

Accounting for value added generated by the midstream sector includes estimates for the economic contribution from the refining and gas processing sectors, fractionation sector, and pipeline and other transportation, storage, and wholesale market activities. As with upstream values, ICF's calculations begin with an accounting of the total value produced by the natural gas liquids complex, a value subsequently apportioned first to individual purity products, and finally from purity propane to odorized propane.

The share of refining revenues generated by natural gas liquids, and by propane, and odorized propane, specifically, continues to fall, resulting in declining value added from the refining sector. From 2015 to 2018, U.S. oil prices increased by 34 percent, from $48.66 per barrel in 2015 to $65.23 per barrel in 2018. Over this same time period propane prices increased by 92 percent due to a tightening of the relative price between propane and global oil prices, with Mont Belvieu propane prices averaging 87.8 ¢/gallon in 2018. Propane's share of total refinery output (measured in retail value) declined slightly, from 1.14 percent in 2015 to 1.01 percent in 2018, while the share of production from refineries declined from 2.4 percent in 2015 to 2.3 percent in 2018.

For gas processors and fractionators, the continued low natural gas prices mean liquids produced out of the raw natural gas provided a significant uplift to dry gas prices, with the notable exception of ethane. Due to an over-supplied market, ethane traded near parity with natural gas in 2018. Despite this anomaly, overall declines in the value of crude oil and related petroleum products relative to natural gas resulted in the value added from gas processing generating 56.8 percent of the value in NGLs produced from natural gas in 2018, down from 69 percent in 2015. The majority of this value was generated from heavier NGLs, specifically butanes and pentanes, accounting for $8.6 billion in added value. Propane accounted for $3.7 billion of all value added generated by the gas processors in 2018, while $1.3 billion, or 11 percent of the total, can be attributed to odorized propane.

The trend of an increasingly higher share of value from natural gas production generated from the liquids extracted continues to favor natural gas development to more NGL rich areas of production. There has also been a dramatic increase in associated gas production from expanding

development of U.S. tight oil resources, such as the Bakken and Eagle Ford shales and Permian region. Associated gas production contains high levels of NGLs within the natural gas production stream, which has supported the dramatic increase in domestic NGL production from gas processing. This expansion in NGL production has facilitated an increase in value despite a reduction in the price for NGL prices.

The industry's focus on the development of NGL rich gas resources has also occurred in Canada, resulting in higher NGLs production, bolstered by the development of the Montney tight gas resources and Duvernay shale. Total NGL imports from Canada decreased from 2,239 million gallons in 2015 to 1,799 million gallons in 2018, including those of propane, which decreased from 1,643 million gallons in 2015 to 1,306 million gallons in 2018. The value of odorized propane imported from Canada, from both refineries and gas processing plants, was $192 million in 2018, down sharply from the $336 million in 2015.

ICF used in-house data on pipeline capacity and throughput, pipeline tolls, and estimates of total transportation costs for "wet" natural gas and natural gas liquids to calculate the value added by the transportation sector. These estimates consider value added throughout the entire transportation sector, which includes gathering lines, intra- and inter-PAD pipelines moving various grades of NGLs from producers and fractionators to wholesalers and distributors, and terminaling services offered at export and import facilities throughout the country.

ICF estimates midstream value added for all NGL products to be:

- $3,393 million for long-distance transportation of NGLs, including $205 million for long-distance transport attributed to odorized propane.
- $1,346 million for intra-PAD transportation of NGLs, including $152 million for intra-PAD transport attributed to odorized propane.
- $7,633 million for storage and wholesaling services of NGLs, including $808 million for wholesaling services attributed to odorized propane.
- $798 million for terminaling at NGL export and import terminals, a sharp increase from $100 million in 2012. The terminaling of propane accounts for 2/3 of the total value.

4.1.3 Downstream

The total retail value for odorized propane is calculated based on total volumes of propane delivered to final consumers, by category of consumer, as well as the prices paid by those consumers, based on consumer type and geography. For this study ICF based volumes of odorized propane sold in the consumer market on the 2018 Retail Propane Sales Report published by PERC and ICF. For those states and customer types where PERC and ICF withholds data to avoid disclosure of individual company data, ICF estimated values based on in-house modeling using the Propane Database and Forecast Model (PDFM).[16] Pricing information for odorized propane is drawn from the Energy Information Administration's database of retail prices by region[17] and industry, wholesale and rack prices reported on Bloomberg, state heating fuel pricing reports, as

[16] The Propane Database and Forecast Model (PDFM) is a proprietary model that ICF utilizes to forecast all sectors of the U.S. retail propane sector, including Residential, Commercial, and Industrial, Agricultural, Resell, and Internal combustion demand. The PDFM utilizes multiple data sources and regressions to forecast annual and monthly propane consumption based on a variety of forecast metrics, including economic growth, weather, energy efficiency, economic growth, housing trends, and the adoption of propane engines across multiple uses.

[17] The EIA suspended publishing retail propane prices (Residential, Commercial, etc) by state in 2011. ICF has utilized historic relationships between sectors, Mont Belvieu wholesale propane prices, winter residential propane prices from EIA's State Heating Oil and Propane Price (SHOPP) state and regional Rack propane prices to estimate retail propane prices by sector and state.

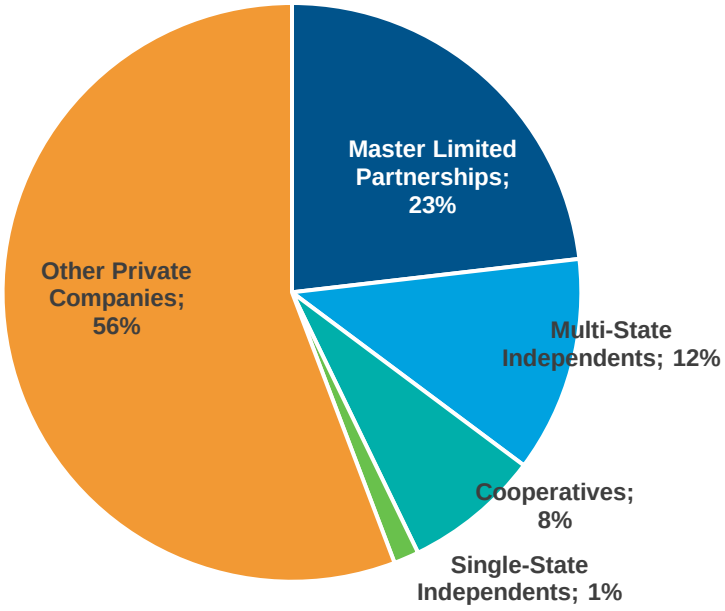
well as ICF's own estimates of retail prices based on in-house modeling and market data. The total value added attributable to the retail segment of the value chain is then calculated as the difference between the value of product at the wholesale level and the value of that product at the point of delivery to the ultimate consumer.

For 2018, value added by the retail sector totals just under $10.6 billion dollars – a 74 percent increase over 2012 value of $6.1 billion. On a per-gallon basis, average retail markup across all consumer groups increased from an estimated 72.7 ¢/gallon in 2012 to $113 ¢/gallon in 2015. As a percentage of total added value the contribution of the odorized propane segment, the added value from the retail portion increased from 39.8 percent in 2012 to nearly 60 percent in 2015, due in large part to the weakening wholesale propane prices while retail prices remained more constant.

4.1.4 Retailer Spending

There are over 4,000 propane retailers across the U.S. The majority of these propane retailers are small private enterprises. In addition, there are a number of independent retailers that can operate in either a single state or have regional operations, cooperatives, and larger national retailers that are structured as Master Limited Partnerships. The figure below shows data from LP Gas Magazine's February 2019 Issue, which provides details on the 50 largest public and private propane retailers across the county that choose to report their data to the Magazine.[18] Based on the total 2018 retail propane sales, the companies represented in the LP Gas Top 50 retailers accounted for 44 percent of sales that year. Master Limited Partnership category accounted for 23 percent of 2018 retail propane sales.[19] Companies that did not submit data to LP Gas Magazine, or were smaller than the 50 companies included in the survey accounted for about 56 percent of 2018 sales, and are not categorized in the LP Gas Top 50 rankings.

Figure 6. Share of 2018 Retail Propane Sales by Company Type



Source: LP Gas Magazine – February 2019 Issue of Top 50 Retailers

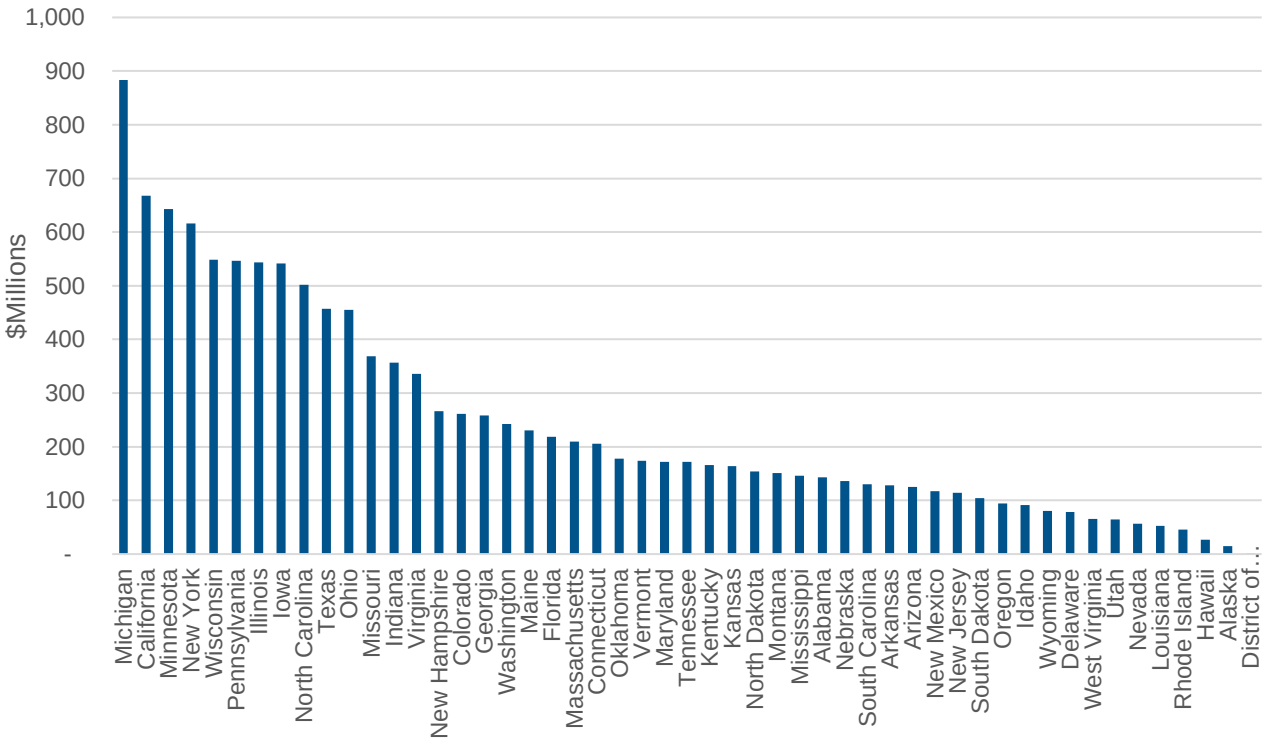
[18] Not all companies choose to participate in the LP Gas Magazine survey.
[19] The Master Limited Partnership category includes Amerigas Propane, Ferrellgas Partners LP, and Suburban Propane.

Retailer Capital and Operating and Maintenance Spending

The retail propane sector is not a capital intensive industry compared to the storage and distribution of other primary fuels to consumers. On an absolute and relative basis, the retail propane sector has a much smaller share of capital spending on infrastructure when compared to either the natural gas or power sectors. As such, the capital spending is less of a driver of economic activity for the retail propane sector when compared to the spending and economic contribution of other components, such as the manufacturing and installation of propane engines and appliances and operating and maintenance spending by propane retailers.

ICF estimates that propane retailers spent a total of $12.5 billion in 2018, made up of $600 million on capital investment and roughly $11.9 billion on operations & maintenance activities. This estimate is based on analysis of the spending from the largest public propane retailers operating in the U.S.[20] and an estimate on the capital and O&M spending levels for non-public retailers.

Figure 7. U.S. Propane Retailer Capital and O&M Spending by State



Source: ICF

[20] This analysis of 2018 spending includes AmeriGas Propane, Suburban Propane, Ferrellgas Partners, the retail propane business of NGL Energy Partners, and the U.S. subsidiary of Superior Plus Corp.

Explanation of Indirect and Induced Economic Impacts

In addition to the direct impact an industry has on the economy, indirect impacts are generated that affect employment and wages, as well as value added that can be attributed back to that industry. The natural gas liquids industry indirectly impacts the U.S. economy through several channels. These include the inputs it procures, the taxes paid by the industry and its employees, and the activity generated by the products it sells, as well as any positive impact the industry generates further down the value chain in terms of demand spurred by the wages it pays and services it buys (generally referred to as induced impact). ICF's estimates for the indirect and induced value-added generated by the odorized propane industry can be found in Table 13 below.

The 2018 ICF study used national level estimates of indirect and induced value added, and allocated this value throughout the U.S. economy at the state level. In 2018, the indirect and induced contribution to the U.S. GDP from the odorized propane sector is estimated at over $36.6 billion, up from $30.8 billion in 2015. Including direct value added, odorized propane's contribution to the U.S. GDP is estimated at $53.6 billion in 2018, an 18 percent increase from the $45.4 billion GDP contribution the U.S. economy in 2015. The increase from in Total Value added to the U.S. GDP is largely due to a 10.4 percent increase in retail propane consumption, increased propane production, and an increase in the price of retail propane sales. Excluding value in imported product and raw materials, the domestic component of the odorized propane industry was nearly $51 billion in 2018, an increase of 16 percent from the $43.8 billion in 2015.

Table 9: State Value Added, Employment, and Wages for Odorized Propane, 2018

State	Value Added ($1,000)			Employment	Wages ($1,000)
	Direct	Indirect & Induced	Total	Direct	Direct
Alabama	136,152	20,193	156,345	785	43,051
Alaska	62,456	233,655	296,111	400	35,540
Arizona	51,553	245,157	296,710	508	30,952
Arkansas	100,300	119,229	219,528	433	23,335
California	300,604	1,073,817	1,374,420	2,746	194,905
Colorado	563,497	1,011,227	1,574,724	1,538	136,521
Connecticut	93,908	403,504	497,412	1,110	96,854
Delaware	72,615	149,630	222,245	526	38,651
District of Columbia	5,369	90,867	96,236	50	1,079
Florida	201,299	570,070	771,369	1,624	99,689
Georgia	226,132	537,924	764,056	1,468	77,507
Hawaii	14,868	303,842	318,711	63	8,074
Idaho	66,090	339,921	406,011	186	9,348
Illinois	677,076	1,156,225	1,833,301	1,085	64,582
Indiana	429,420	752,536	1,181,956	1,200	70,306
Iowa	829,128	1,109,325	1,938,453	468	23,511
Kansas	323,677	690,700	1,014,377	577	41,882
Kentucky	198,799	504,162	702,961	543	30,822
Louisiana	322,096	590,939	913,035	759	57,823
Maine	88,238	507,974	596,212	1,088	62,800
Maryland	159,625	634,705	794,330	1,018	80,871
Massachusetts	90,876	524,303	615,179	958	78,407
Michigan	1,043,473	1,970,636	3,014,109	1,604	103,829
Minnesota	895,284	1,617,032	2,512,317	1,189	69,188
Mississippi	158,251	515,975	674,226	760	43,599
Missouri	521,869	1,316,835	1,838,703	1,077	79,013
Montana	112,549	294,894	407,443	327	21,156
Nebraska	221,663	513,786	735,449	253	15,905
Nevada	22,243	173,313	195,556	248	16,056
New Hampshire	117,773	270,246	388,018	1,115	89,794
New Jersey	113,599	313,304	426,903	759	58,707
New Mexico	305,346	559,021	864,367	1,293	110,126
New York	573,372	1,130,688	1,704,060	2,811	227,712
North Carolina	421,227	792,153	1,213,381	2,731	154,218
North Dakota	537,227	836,487	1,373,714	1,168	125,086
Ohio	712,470	1,561,668	2,274,138	1,589	104,249
Oklahoma	764,111	1,172,808	1,936,920	1,861	173,549
Oregon	40,178	501,676	541,854	328	19,418
Pennsylvania	624,543	1,131,076	1,755,619	2,617	181,354
Rhode Island	19,385	440,890	460,274	275	18,775
South Carolina	113,434	465,184	578,618	981	57,031
South Dakota	149,979	359,006	508,985	229	11,356
Tennessee	212,157	620,324	832,481	1,074	47,713
Texas	2,589,189	4,046,925	6,636,114	7,833	769,677
Utah	89,622	415,914	505,536	333	24,640
Vermont	77,983	399,936	477,919	640	44,794
Virginia	267,839	775,782	1,043,621	1,609	100,374
Washington	97,717	560,490	658,208	842	56,095
West Virginia	398,690	722,352	1,121,041	751	74,727
Wisconsin	730,113	1,269,037	1,999,149	1,342	74,585
Wyoming	76,715	279,488	356,203	341	28,842
U.S. State Totals	**17,021,781**	**36,596,829**	**53,618,610**	**57,110**	**4,208,083**
Imports	**862,367**		**862,367**		
Total Including Imports	**17,884,148**	**36,596,829**	**54,480,977**		

Table 10: State Production of Odorized Propane (C_3H_8), 2018

	Volume (1,000 Gal)			Percentage of National Total		
State	Refinery	Gas Plant	Total	of Ref. Prod.	of Gas Plt. Production	of Total Production
Alabama	8,704	35,389	44,093	0.59%	0.50%	0.51%
Alaska	6,424	34,996	41,420	0.43%	0.49%	0.48%
Arizona	-	-	-	0.00%	0.00%	0.00%
Arkansas	1,147	848	1,994	0.08%	0.01%	0.02%
California	84,616	16,592	101,208	5.70%	0.23%	1.17%
Colorado	3,265	694,748	698,013	0.22%	9.73%	8.09%
Connecticut	-	-	-	0.00%	0.00%	0.00%
Delaware	14,673	-	14,673	0.99%	0.00%	0.17%
District of Columbia	-	-	-	0.00%	0.00%	0.00%
Florida	-	673	673	0.00%	0.01%	0.01%
Georgia	-	-	-	0.00%	0.00%	0.00%
Hawaii	5,470	-	5,470	0.37%	0.00%	0.06%
Idaho	-	553	553	0.00%	0.01%	0.01%
Illinois	76,955	38,528	115,483	5.19%	0.54%	1.34%
Indiana	35,309	-	35,309	2.38%	0.00%	0.41%
Iowa	-	-	-	0.00%	0.00%	0.00%
Kansas	24,085	91,203	115,288	1.62%	1.28%	1.34%
Kentucky	21,551	15,636	37,187	1.45%	0.22%	0.43%
Louisiana	341,331	252,276	593,607	23.01%	3.53%	6.88%
Maine	-	-	-	0.00%	0.00%	0.00%
Maryland	-	-	-	0.00%	0.00%	0.00%
Massachusetts	-	-	-	0.00%	0.00%	0.00%
Michigan	10,494	5,026	15,518	0.71%	0.07%	0.18%
Minnesota	25,608	-	25,608	1.73%	0.00%	0.30%
Mississippi	35,966	52,118	88,084	2.42%	0.73%	1.02%
Missouri	-	-	-	0.00%	0.00%	0.00%
Montana	6,373	5,441	11,814	0.43%	0.08%	0.14%
Nebraska	-	-	-	0.00%	0.00%	0.00%
Nevada	180	-	180	0.01%	0.00%	0.00%
New Hampshire	-	-	-	0.00%	0.00%	0.00%
New Jersey	34,150	-	34,150	2.30%	0.00%	0.40%
New Mexico	4,775	367,423	372,199	0.32%	5.14%	4.31%
New York	-	-	-	0.00%	0.00%	0.00%
North Carolina	-	-	-	0.00%	0.00%	0.00%
North Dakota	5,386	488,676	494,062	0.36%	6.84%	5.73%
Ohio	46,182	183,358	229,540	3.11%	2.57%	2.66%
Oklahoma	33,304	949,741	983,046	2.25%	13.30%	11.40%
Oregon	-	-	-	0.00%	0.00%	0.00%
Pennsylvania	43,602	201,350	244,951	2.94%	2.82%	2.84%
Rhode Island	-	-	-	0.00%	0.00%	0.00%
South Carolina	-	-	-	0.00%	0.00%	0.00%
South Dakota	-	-	-	0.00%	0.00%	0.00%
Tennessee	13,783	851	14,633	0.93%	0.01%	0.17%
Texas	560,199	3,022,628	3,582,826	37.77%	42.32%	41.54%
Utah	6,370	55,559	61,929	0.43%	0.78%	0.72%
Vermont	-	-	-	0.00%	0.00%	0.00%
Virginia	-	-	-	0.00%	0.00%	0.00%
Washington	26,859	-	26,859	1.81%	0.00%	0.31%
West Virginia	523	628,512	629,034	0.04%	8.80%	7.29%
Wisconsin	284	-	284	0.02%	0.00%	0.00%
Wyoming	5,634	645	6,280	0.38%	0.01%	0.07%
U.S. Total	**1,483,201**	**7,142,768**	**8,625,967**	**100.00%**	**100.00%**	**100.00%**

Table 11: State Level Value Summary for Odorized Propane (C_3H_8), 2018

		Value Added ($1,000)									
						Direct	Indirect & Induced				Total
State	SUB PAD	Supply	Transportation, Storage, and Wholesaling Markup	Wholesale Value	Retail Markup	Value Added	In-State Contribution To GDP	Manufacturing Allocation Contribution	GDP Allocation Contribution	Contribution to GDP	Contribution To GDP
Alabama	3	18,458	9,968	28,426	107,726	136,152	176,997	58,906	-215,709	20,193	156,345
Alaska	5	55,899	1,934	57,833	4,623	62,456	81,193	2,664	149,798	233,655	296,111
Arizona	5	2	8,828	8,830	42,723	51,553	67,018	46,316	131,822	245,157	296,710
Arkansas	3	1,350	8,494	9,844	90,456	100,300	130,390	30,782	-41,944	119,229	219,528
California	5	42,898	47,950	90,848	209,756	300,604	390,785	491,291	191,742	1,073,817	1,374,420
Colorado	4	358,158	37,428	395,586	167,912	563,497	732,547	39,003	239,677	1,011,227	1,574,724
Connecticut	1-A	0	11,629	11,629	82,279	93,908	122,081	47,738	233,685	403,504	497,412
Delaware	1-B	2,422	5,094	7,516	65,099	72,615	94,400	7,295	47,935	149,630	222,245
District of Columbia	1-B	0	344	344	5,025	5,369	6,980	0	83,887	90,867	96,236
Florida	1-C	720	18,820	19,539	181,760	201,299	261,689	86,680	221,701	570,070	771,369
Georgia	1-C	0	24,087	24,087	202,045	226,132	293,972	100,146	143,806	537,924	764,056
Hawaii	5	0	3,677	3,677	11,192	14,868	19,329	2,893	281,621	303,842	318,711
Idaho	4	300	5,815	6,115	59,975	66,090	85,917	14,327	239,677	339,921	406,011
Illinois	2	-33,238	50,528	17,289	659,787	677,076	880,199	168,171	107,855	1,156,225	1,833,301
Indiana	2	329	30,920	31,249	398,171	429,420	558,246	158,338	35,952	752,536	1,181,956
Iowa	2	0	41,159	41,159	787,969	829,128	1,077,866	55,426	-23,968	1,109,325	1,938,453
Kansas	2	64,282	44,827	109,109	214,568	323,677	420,780	42,226	227,693	690,700	1,014,377
Kentucky	2	8,515	10,017	18,533	180,266	198,799	258,439	59,974	185,750	504,162	702,961
Louisiana	3	256,217	18,827	275,044	47,052	322,096	418,725	76,343	95,871	590,939	913,035
Maine	1-A	0	14,364	14,364	73,874	88,238	114,710	9,781	383,484	507,974	596,212
Maryland	1-B	0	10,735	10,735	148,889	159,625	207,512	37,717	389,475	634,705	794,330
Massachusetts	1-A	0	12,084	12,084	78,792	90,876	118,139	82,600	323,564	524,303	615,179
Michigan	2	3,299	50,597	53,897	989,576	1,043,473	1,356,515	158,735	455,387	1,970,636	3,014,109
Minnesota	2	0	44,789	44,789	850,496	895,284	1,163,870	81,663	371,500	1,617,032	2,512,317
Mississippi	3	34,311	11,489	45,800	112,451	158,251	205,726	28,628	281,621	515,975	674,226
Missouri	2	18	30,161	30,178	491,690	521,869	678,429	63,180	575,225	1,316,835	1,838,703
Montana	4	7,607	9,401	17,008	95,540	112,549	146,314	4,774	143,806	294,894	407,443
Nebraska	2	402	36,308	36,710	184,953	221,663	288,162	21,899	203,726	513,786	735,449
Nevada	5	50	4,162	4,212	18,031	22,243	28,916	12,575	131,822	173,313	195,556
New Hampshire	1-A	0	16,118	16,118	101,655	117,773	153,104	15,278	101,863	270,246	388,018
New Jersey	1-B	5,638	8,140	13,778	99,821	113,599	147,679	81,738	83,887	313,304	426,903
New Mexico	3	208,747	13,045	221,792	83,554	305,346	396,950	6,281	155,790	559,021	864,367
New York	1-B	43	36,262	36,306	537,067	573,372	745,384	115,667	269,637	1,130,688	1,704,060
North Carolina	1-C	0	38,961	38,961	382,266	421,227	547,595	160,671	83,887	792,153	1,213,381
North Dakota	2	312,218	18,645	330,863	206,364	537,227	698,396	6,268	131,822	836,487	1,373,714
Ohio	2	120,598	57,044	177,642	534,828	712,470	926,211	174,078	461,379	1,561,668	2,274,138
Oklahoma	2	469,882	57,990	527,872	236,240	764,111	993,345	29,665	149,798	1,172,808	1,936,920
Oregon	5	0	8,020	8,020	32,158	40,178	52,231	53,977	395,467	501,676	541,854
Pennsylvania	1-B	119,145	45,390	164,536	460,007	624,543	811,905	145,405	173,766	1,131,076	1,755,619
Rhode Island	1-A	0	2,839	2,839	16,546	19,385	25,200	8,238	407,451	440,890	460,274
South Carolina	1-C	0	14,108	14,108	99,326	113,434	147,464	60,067	257,653	465,184	578,618
South Dakota	2	249	7,227	7,475	142,504	149,979	194,973	8,242	155,790	359,006	508,985
Tennessee	2	421	10,643	11,064	201,093	212,157	275,805	86,866	257,653	620,324	832,481
Texas	3	2,114,003	98,349	2,212,351	376,838	2,589,189	3,365,946	357,415	323,564	4,046,925	6,636,114
Utah	4	33,277	7,540	40,816	48,806	89,622	116,508	29,769	269,637	415,914	505,536
Vermont	1-A	0	10,330	10,330	67,654	77,983	101,378	4,953	293,605	399,936	477,919
Virginia	1-C	1	21,712	21,713	246,126	267,839	348,191	74,067	353,524	775,782	1,043,621
Washington	5	0	17,638	17,638	80,079	97,717	127,032	97,910	335,548	560,490	658,208
West Virginia	1-C	327,570	29,066	356,637	42,053	398,690	518,296	12,314	191,742	722,352	1,121,041
Wisconsin	2	0	35,125	35,125	694,988	730,113	949,147	98,189	221,701	1,269,037	1,999,149
Wyoming	4	17,670	6,914	24,585	52,131	76,715	99,730	0	179,758	279,488	356,203
Total Allocated to states		**4,551,461**	**1,165,542**	**5,717,003**	**11,304,778**	**17,021,781**	**22,128,315**	**3,617,128**	**10,851,385**	**36,596,829**	**53,618,610**
Values Not Applied to States											
Value of Imported NGL Product		522,260									
Value in Imported Crude		573,319									
Value in Foreign Natural Gas		60,197									
Storage Inventory Change		-8,562		**Value in Non-U.S. Consumption ↘**							
Import Adjustments		-284,847				0					
U.S. Total		**5,413,828**	**1,165,542**	**6,579,370**	**11,304,778**	**17,884,148**	**17,884,148**	**3,800,381**	**11,401,144**	**33,085,674**	**50,969,822**

Table 12: State Level Value Summary for Propane (C_3H_8), 2018

		Value Added ($1,000)									
						Direct	Indirect & Induced				Total
State	SUB PAD	Supply	Transportation, Storage, and Wholesaling Markup	Wholesale Value	Retail Markup	Value Added	In-State Contribution To GDP	Manufacturing Allocation Contribution	GDP Allocation Contribution	Contribution to GDP	Contribution To GDP
Alabama	3	55,497	11,850	67,346	107,726	175,072	227,594	87,443	-320,212	-5,175	169,898
Alaska	5	168,067	3,346	171,413	4,623	176,036	228,847	3,954	222,369	455,170	631,206
Arizona	5	6	8,828	8,834	42,723	51,557	67,024	68,754	195,685	331,463	383,020
Arkansas	3	4,059	9,720	13,779	90,456	104,235	135,505	45,695	-62,263	118,937	223,172
California	5	128,978	53,446	182,423	209,756	392,179	509,833	729,301	284,633	1,523,766	1,915,946
Colorado	4	1,076,849	80,018	1,156,867	167,912	1,324,779	1,722,212	57,898	355,791	2,135,901	3,460,679
Connecticut	1-A	0	11,629	11,629	82,279	93,908	122,081	70,866	346,896	539,842	633,751
Delaware	1-B	7,283	5,962	13,245	65,099	78,344	101,847	10,828	71,158	183,834	262,178
District of Columbia	1-B	0	344	344	5,025	5,369	6,980	0	124,527	131,507	136,876
Florida	1-C	2,164	18,839	21,003	181,760	202,763	263,592	128,673	329,107	721,371	924,134
Georgia	1-C	0	34,433	34,433	202,045	236,478	307,421	148,663	213,475	669,559	906,037
Hawaii	5	0	4,000	4,000	11,192	15,192	19,749	4,295	418,054	442,098	457,290
Idaho	4	901	5,832	6,733	59,975	66,708	86,720	21,267	355,791	463,779	530,487
Illinois	2	-99,936	77,587	-22,349	659,787	637,438	828,670	249,643	160,106	1,238,418	1,875,856
Indiana	2	989	52,426	53,415	398,171	451,586	587,062	235,047	53,369	875,478	1,327,064
Iowa	2	0	34,177	34,177	787,969	822,147	1,068,791	82,278	-35,579	1,115,489	1,937,636
Kansas	2	193,271	113,196	306,466	214,568	521,035	677,345	62,683	338,001	1,078,030	1,599,064
Kentucky	2	25,603	11,753	37,356	180,266	217,623	282,909	89,028	275,738	647,676	865,298
Louisiana	3	770,349	47,001	817,350	47,052	864,402	1,123,723	113,328	142,316	1,379,368	2,243,770
Maine	1-A	0	14,364	14,364	73,874	88,238	114,710	14,519	569,266	698,494	786,732
Maryland	1-B	0	10,735	10,735	148,889	159,625	207,512	55,989	578,160	841,662	1,001,287
Massachusetts	1-A	0	12,084	12,084	78,792	90,876	118,139	122,617	480,318	721,073	811,949
Michigan	2	9,920	53,073	62,993	989,576	1,052,569	1,368,340	235,635	676,003	2,279,978	3,332,547
Minnesota	2	0	48,010	48,010	850,496	898,506	1,168,057	121,225	551,476	1,840,758	2,739,264
Mississippi	3	103,161	15,478	118,638	112,451	231,089	300,416	42,497	418,054	760,967	992,056
Missouri	2	53	40,649	40,702	491,690	532,392	692,109	93,788	853,898	1,639,796	2,172,188
Montana	4	22,872	9,939	32,811	95,540	128,351	166,857	7,087	213,475	387,418	515,769
Nebraska	2	1,208	90,401	91,609	184,953	276,562	359,531	32,508	302,422	694,461	971,024
Nevada	5	150	4,172	4,322	18,031	22,353	29,059	18,667	195,685	243,411	265,765
New Hampshire	1-A	0	16,118	16,118	101,655	117,773	153,104	22,680	151,211	326,996	444,768
New Jersey	1-B	16,951	10,161	27,112	99,821	126,933	165,013	121,337	124,527	410,877	537,810
New Mexico	3	627,624	25,232	652,856	83,554	736,410	957,333	9,324	231,264	1,197,921	1,934,331
New York	1-B	130	36,262	36,392	537,067	573,459	745,497	171,703	400,265	1,317,464	1,890,923
North Carolina	1-C	0	48,699	48,699	382,266	430,964	560,254	238,509	124,527	923,290	1,354,254
North Dakota	2	938,724	35,079	973,803	206,364	1,180,167	1,534,217	9,305	195,685	1,739,207	2,919,373
Ohio	2	362,594	117,177	479,771	534,828	1,014,599	1,318,979	258,411	684,898	2,262,288	3,276,887
Oklahoma	2	1,412,760	150,328	1,563,088	236,240	1,799,328	2,339,126	44,037	222,369	2,605,533	4,404,861
Oregon	5	0	8,020	8,020	32,158	40,178	52,231	80,127	587,055	719,413	759,592
Pennsylvania	1-B	358,226	70,400	428,625	460,007	888,632	1,155,222	215,848	257,948	1,629,018	2,517,650
Rhode Island	1-A	0	2,839	2,839	16,546	19,385	25,200	12,229	604,845	642,274	661,659
South Carolina	1-C	0	23,845	23,845	99,326	123,171	160,122	89,168	382,475	631,765	754,936
South Dakota	2	748	7,227	7,975	142,504	150,478	195,622	12,236	231,264	439,122	589,600
Tennessee	2	1,266	11,484	12,749	201,093	213,843	277,995	128,949	382,475	789,420	1,003,262
Texas	3	6,356,021	221,290	6,577,310	376,838	6,954,148	9,040,393	530,567	480,318	10,051,278	17,005,426
Utah	4	100,050	12,946	112,997	48,806	161,802	210,343	44,191	400,265	654,799	816,601
Vermont	1-A	0	10,330	10,330	67,654	77,983	101,378	7,352	435,844	544,574	622,558
Virginia	1-C	3	21,712	21,715	246,126	267,841	348,193	109,949	524,792	982,934	1,250,775
Washington	5	0	19,227	19,227	80,079	99,306	129,098	145,344	498,107	772,549	871,855
West Virginia	1-C	984,883	80,595	1,065,477	42,053	1,107,530	1,439,790	18,279	284,633	1,742,701	2,850,232
Wisconsin	2	0	35,141	35,141	694,988	730,130	949,168	145,757	329,107	1,424,032	2,154,161
Wyoming	4	53,129	10,658	63,787	52,131	115,918	150,693	0	266,843	417,536	533,454
Total Allocated to states		**13,684,552**	**1,858,062**	**15,542,614**	**11,304,778**	**26,847,392**	**34,901,610**	**5,369,478**	**16,108,435**	**56,379,523**	**83,226,915**
Values Not Applied to States											
Value of Imported NGL Product		1,570,242									
Value in Imported Crude		1,723,758									
Value in Foreign Natural Gas		180,989									
Storage Inventory Change		-25,743		**Value in Non-U.S. Consumption ↘**							
Import Adjustments		-856,428				-8,494,811					
U.S. Total		**16,277,370**	**1,858,062**	**18,135,432**	**11,304,778**	**20,945,399**	**20,945,399**	**4,189,080**	**12,567,239**	**37,701,718**	**58,647,117**

Table 13: State Level Value Summary for Total NGLs / LRGs, 2018

		Value Added ($1,000)									
						Direct	Indirect & Induced				Total
State	SUB PAD	Supply	Transportation, Storage, and Wholesaling Markup	Wholesale Value	Retail Markup	Value Added	In-State Contribution To GDP	Manufacturing Allocation Contribution	GDP Allocation Contribution	Contribution to GDP	Contribution To GDP
Alabama	3	161,674	34,824	196,499	107,726	304,225	395,492	209,123	-765,798	-161,182	143,042
Alaska	5	866,179	17,039	883,218	5,291	888,509	1,155,061	9,456	531,804	1,696,322	2,584,830
Arizona	5	13	8,828	8,841	42,723	51,564	67,033	164,429	467,987	699,449	751,013
Arkansas	3	9,444	74,275	83,719	90,456	174,175	226,428	109,282	-148,905	186,805	360,980
California	5	503,322	223,992	727,314	227,180	954,494	1,240,842	1,744,147	680,709	3,665,698	4,620,192
Colorado	4	3,168,196	852,197	4,020,393	219,416	4,239,809	5,511,752	138,465	850,886	6,501,103	10,740,912
Connecticut	1-A	0	11,629	11,629	82,279	93,908	122,081	169,477	829,614	1,121,172	1,215,080
Delaware	1-B	17,153	6,308	23,461	65,099	88,559	115,127	25,896	170,177	311,201	399,761
District of Columbia	1-B	0	344	344	5,025	5,369	6,980	0	297,810	304,790	310,160
Florida	1-C	5,112	18,915	24,027	181,760	205,787	267,522	307,725	787,070	1,362,318	1,568,104
Georgia	1-C	0	37,831	37,831	202,045	239,875	311,838	355,532	510,532	1,177,902	1,417,777
Hawaii	5	0	4,166	4,166	11,192	15,358	19,965	10,271	999,791	1,030,027	1,045,384
Idaho	4	2,675	5,889	8,564	59,975	68,539	89,101	50,862	850,886	990,849	1,059,388
Illinois	2	534,294	438,360	972,654	673,924	1,646,578	2,140,551	597,029	382,899	3,120,479	4,767,057
Indiana	2	2,034	160,676	162,710	398,920	561,630	730,120	562,123	127,633	1,419,875	1,981,506
Iowa	2	0	128,104	128,104	789,702	917,806	1,193,148	196,771	-85,089	1,304,830	2,222,637
Kansas	2	539,395	1,109,199	1,648,594	312,711	1,961,306	2,549,697	149,909	808,342	3,507,948	5,469,254
Kentucky	2	71,286	72,322	143,608	189,776	333,384	433,399	212,914	659,437	1,305,749	1,639,133
Louisiana	3	2,165,483	637,910	2,803,393	115,046	2,918,439	3,793,971	271,029	340,354	4,405,354	7,323,793
Maine	1-A	0	14,364	14,364	73,874	88,238	114,710	34,723	1,361,418	1,510,851	1,599,089
Maryland	1-B	0	10,735	10,735	148,889	159,625	207,512	133,899	1,382,690	1,724,102	1,883,727
Massachusetts	1-A	0	12,084	12,084	78,792	90,876	118,139	293,243	1,148,696	1,560,078	1,650,954
Michigan	2	25,264	67,637	92,901	990,603	1,083,504	1,408,555	563,530	1,616,684	3,588,769	4,672,273
Minnesota	2	0	55,352	55,352	850,496	905,848	1,177,603	289,914	1,318,873	2,786,390	3,692,238
Mississippi	3	287,114	82,839	369,954	119,552	489,505	636,357	101,633	999,791	1,737,781	2,227,286
Missouri	2	109	96,471	96,579	492,669	589,248	766,022	224,298	2,042,127	3,032,447	3,621,695
Montana	4	57,264	10,639	67,903	95,540	163,443	212,476	16,948	510,532	739,957	903,400
Nebraska	2	2,484	350,607	353,091	184,953	538,044	699,457	77,744	723,253	1,500,454	2,038,498
Nevada	5	308	4,178	4,486	18,031	22,517	29,272	44,643	467,987	541,902	564,419
New Hampshire	1-A	0	16,118	16,118	101,655	117,773	153,104	54,240	361,627	568,971	686,744
New Jersey	1-B	39,922	116,461	156,383	114,561	270,944	352,227	290,182	297,810	940,219	1,211,163
New Mexico	3	1,766,711	149,114	1,915,826	84,696	2,000,522	2,600,679	22,299	553,076	3,176,053	5,176,575
New York	1-B	267	36,262	36,529	537,067	573,596	745,675	410,633	957,247	2,113,555	2,687,151
North Carolina	1-C	0	51,896	51,896	382,266	434,162	564,411	570,403	297,810	1,432,624	1,866,786
North Dakota	2	2,416,026	91,918	2,507,944	206,364	2,714,308	3,528,601	22,254	467,987	4,018,842	6,733,150
Ohio	2	1,032,516	454,817	1,487,333	541,846	2,029,179	2,637,933	617,998	1,637,956	4,893,887	6,923,066
Oklahoma	2	3,846,444	712,333	4,558,777	263,668	4,822,445	6,269,179	105,316	531,804	6,906,298	11,728,743
Oregon	5	0	8,020	8,020	32,158	40,178	52,231	191,626	1,403,962	1,647,820	1,687,998
Pennsylvania	1-B	926,098	802,699	1,728,797	838,463	2,567,260	3,337,438	516,207	616,892	4,470,538	7,037,798
Rhode Island	1-A	0	2,839	2,839	16,546	19,385	25,200	29,246	1,446,506	1,500,953	1,520,338
South Carolina	1-C	0	27,043	27,043	99,326	126,369	164,279	213,247	914,703	1,292,229	1,418,598
South Dakota	2	1,538	7,227	8,764	142,504	151,268	196,649	29,262	553,076	778,987	930,255
Tennessee	2	3,427	11,853	15,280	201,093	216,373	281,285	308,386	914,703	1,504,374	1,720,747
Texas	3	17,840,549	4,593,922	22,434,472	877,182	23,311,653	30,305,149	1,268,870	1,148,696	32,722,715	56,034,368
Utah	4	282,558	369,301	651,859	68,697	720,556	936,723	105,684	957,247	1,999,654	2,720,211
Vermont	1-A	0	10,330	10,330	67,654	77,983	101,378	17,582	1,042,335	1,161,296	1,239,280
Virginia	1-C	6	21,712	21,718	246,126	267,844	348,197	262,947	1,255,057	1,866,202	2,134,046
Washington	5	0	58,957	58,957	83,531	142,489	185,235	347,594	1,191,241	1,724,070	1,866,558
West Virginia	1-C	2,614,439	161,729	2,776,168	42,053	2,818,221	3,663,687	43,715	680,709	4,388,111	7,206,331
Wisconsin	2	0	35,132	35,132	694,988	730,120	949,156	348,583	787,070	2,084,808	2,814,928
Wyoming	4	110,708	84,750	195,458	58,199	253,657	329,754	0	638,165	967,918	1,221,575
Total Allocated to states		**39,300,013**	**12,372,150**	**51,672,163**	**12,534,285**	**64,206,448**	**83,468,383**	**12,841,290**	**38,523,869**	**134,833,542**	**199,039,990**
Values Not Applied to States											
Value of Imported NGL Product		2,420,451									
Value in Imported Crude		3,544,266									
Value in Foreign Natural Gas		610,727									
Storage Inventory Change		-29,230			**Value in Non-U.S. Consumption ↘**						
Import Adjustments		-933,020				-16,217,549					
U.S. Total		**44,913,207**	**12,372,150**	**57,285,358**	**12,534,285**	**53,602,094**	**53,602,094**	**10,720,419**	**32,161,257**	**96,483,770**	**150,085,864**

4.2. Summary Results of the Propane Value Chain Analysis

The basic results of the ICF analysis are shown in a series of value-chain and volume-chain diagrams. The detailed results, including volumes, value and prices for each step in the value chain are shown in Figure 8 through Figure 17.

Explanation of Value/Volume Chain Diagrams

Each of the ten value/volume chain diagrams illustrates the flow of values or volumes for one of the product categories considered: (Odorized Propane, Propane, Propane/Propylene, Ethane, and Total NGLs/LRGs). These diagrams depict the total product supply process, from the wellhead to the burner tip. They are organized horizontally by supply source, with crude oil and refining at the left, natural gas and natural gas processing and fractionation in the center, and imports and inventory changes at the right. Vertically, the diagrams start upstream, indicating the value/volume of inputs. Thus, the top left box contains the value/volume in domestically-produced crude converted to product shown.

The diagrams split out the contribution to the value/volume chain from Canadian resources. Thus, the second box down shows the value in Canadian crude/"wet" natural gas imported into the U.S. and converted to the product shown in the diagram, and the box below sums up domestic and Canadian inputs into a North America total. The fourth box down then adds in non-North American crude to sum up to total value/volume of crude converted to product. LNG imports from outside North America are not processed for NGL extraction.

The column on the right shows the import/export balance. The top box shows the total value/ volume of product exported from the United States. The second box in the Product Imports/ Exports column shows the value/volume of product imports from Canada. Third box down shows the total imports from outside North America, with the box below netting out imports and exports to arrive at the total net imports of product into the U.S.

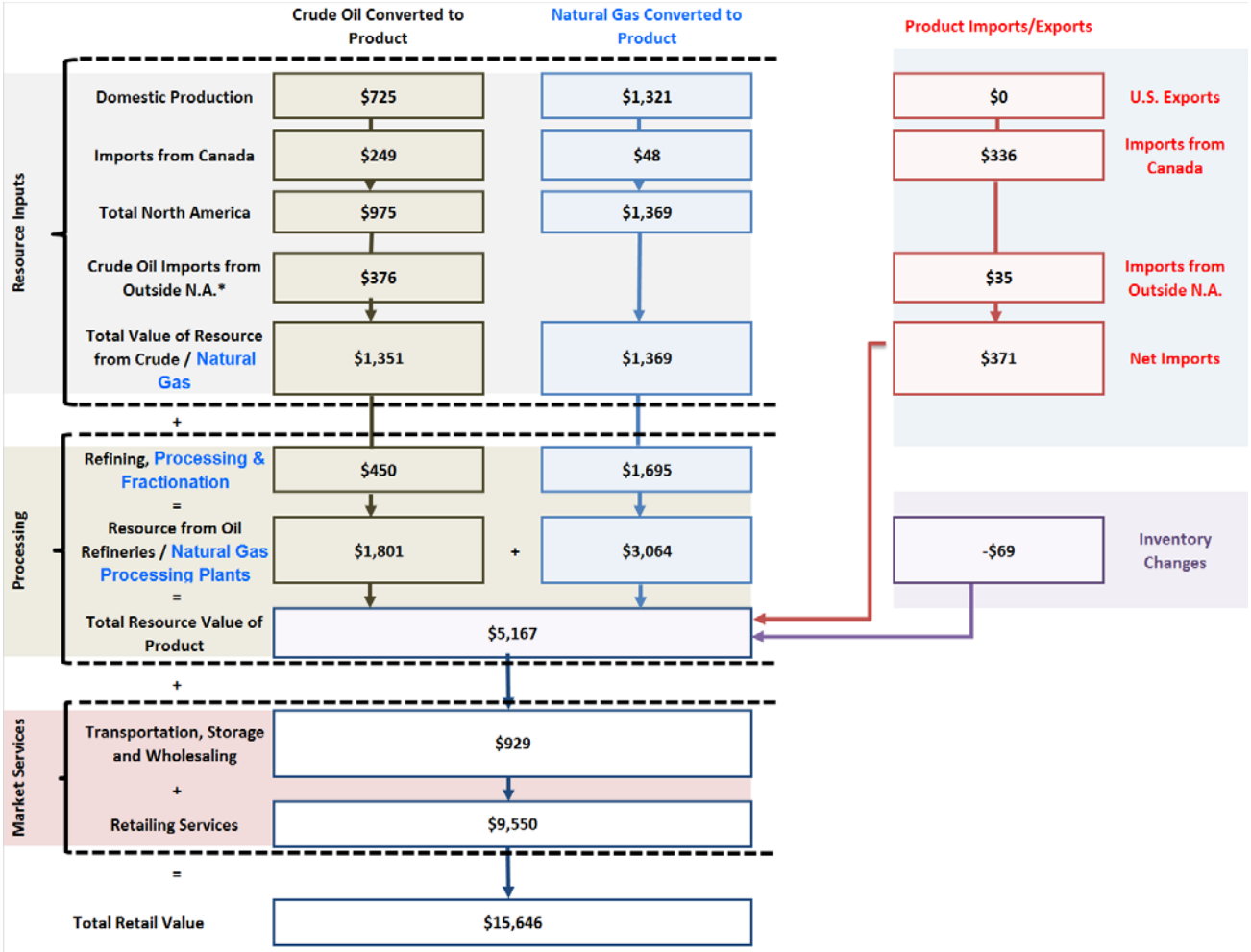
Net inventory changes for the year, calculated as the difference in inventory levels between January 1st and December 31st of 2018, are not shown. Positive numbers indicate net storage withdrawals, which add to total supply, and therefore to total value/volume contributed to the economy in that year.

The processing, or midstream, section of the diagram shows value added in the refining, natural gas processing, and fractionating stages of NGL/LRG production (the volume chain diagrams do not show Processing and Market Services sector contributions, as these do not add to volume). For refining, this value represents the difference between the Refiner Acquisition Cost of Crude (RACC) and the wholesale value of product on a $/MMBtu basis. A negative number indicates a discount, on a Btu basis, of product to crude price for the year. The processing and fractionation value is the total value added by the natural gas processing industry in the processing of both domestic and Canadian gas (at the Aux Sable plant in Illinois).

Below the processing sector is the market services section, which adds in the value of wholesaling services and retail markup. For wholesaling services, the total is the difference between the supply and wholesale pricing points. Retail services are the final component of the value chain, and represent the difference between the wholesale value of the product and the total retail value at the ultimate point of consumption.

Both the value chain analysis diagram and the volume chain diagram to its right show at bottom the share of domestic and North American value/volume contribution to the total product consumption in the United States.

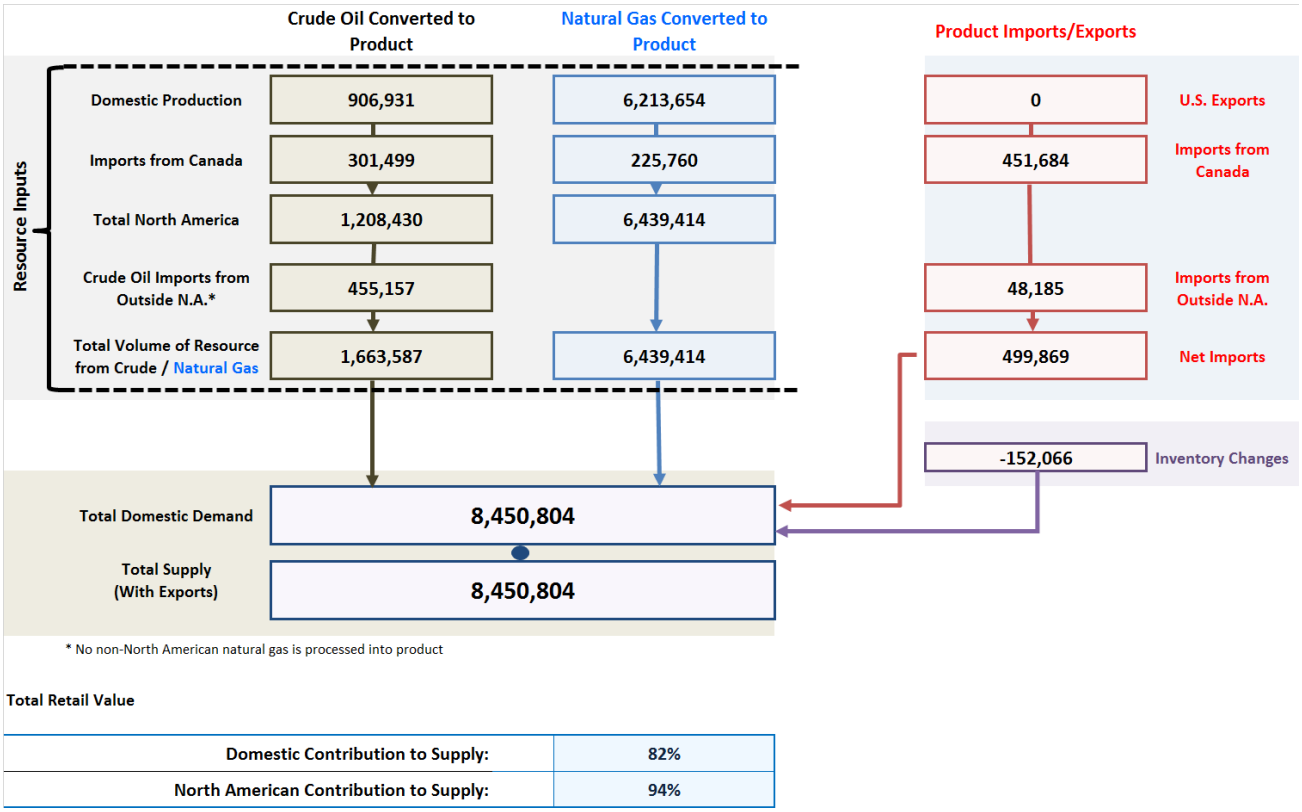
Figure 8: Value Chain for Odorized Propane (C_3H_8), 2018 (Million Dollars)



Total Retail Value

Domestic Contribution to Value:	93%
North American Contribution to Value:	97%

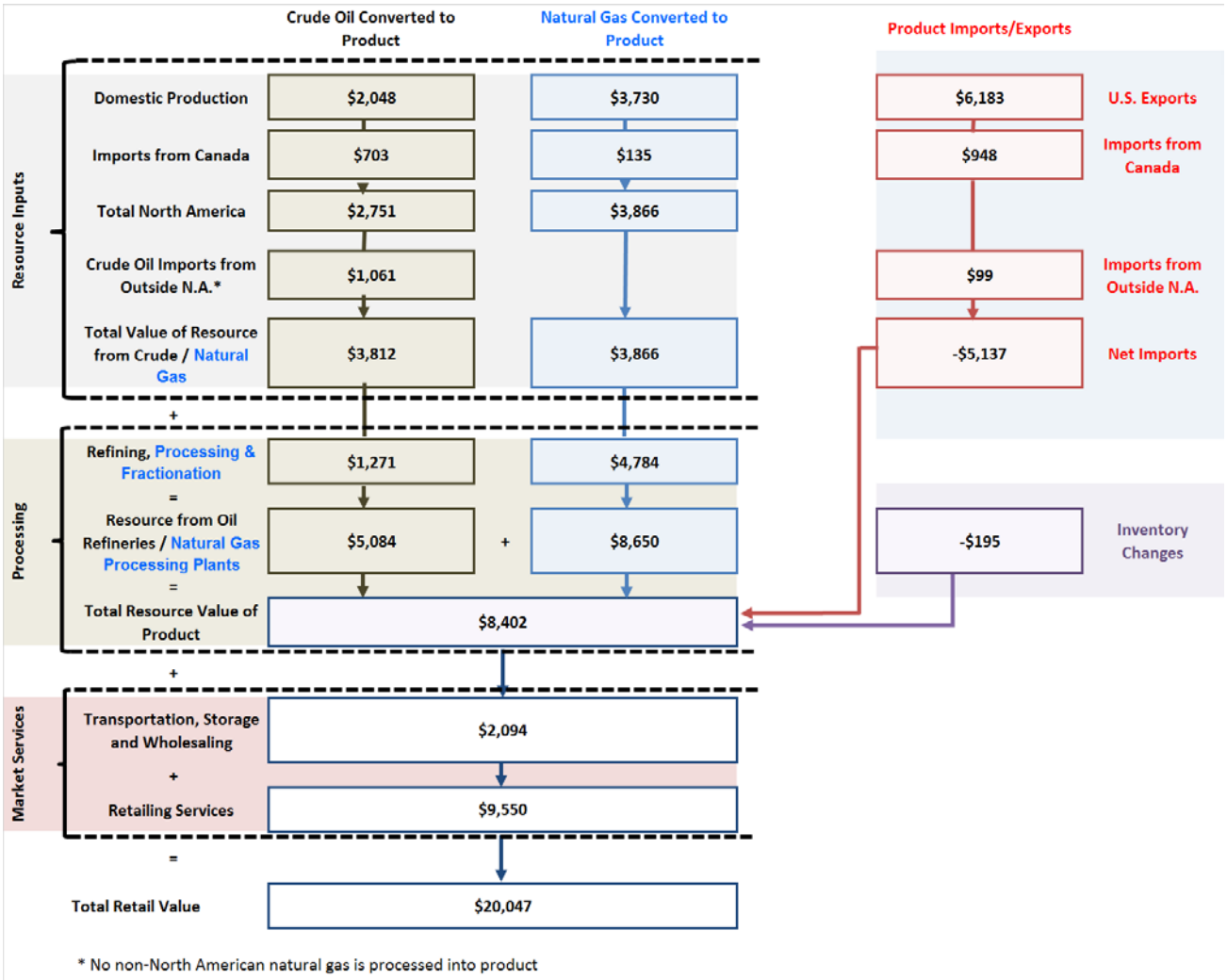
Figure 9: Volume Chain for Odorized Propane (C_3H_8), 2018 (Thousand Gallons)



Total Retail Value

Domestic Contribution to Supply:	**82%**
North American Contribution to Supply:	**94%**

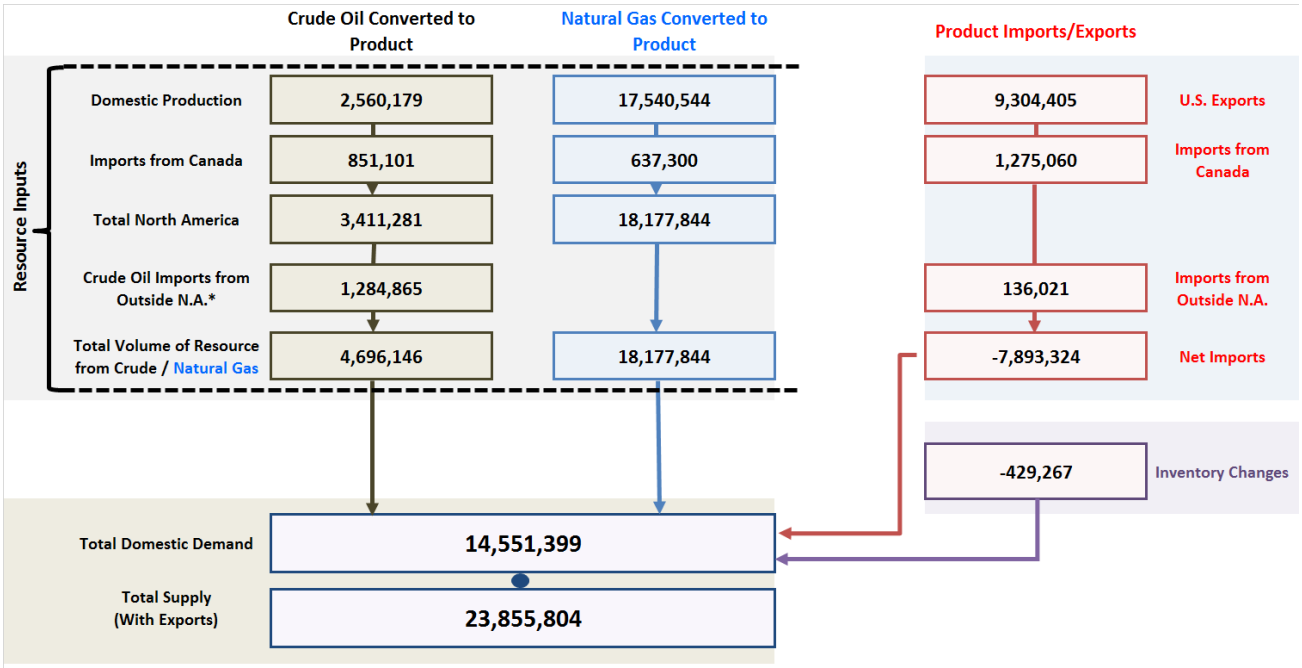
Figure 10: Value Chain for All Purity Propane (C_3H_8), 2018 (Million Dollars)



Total Retail Value

Domestic Contribution to Value:	116%
North American Contribution to Value:	94%

Figure 11: Volume Chain for All Purity Propane (C_3H_8), 2018 (Thousand Gallons)



Domestic Contribution to Supply:	82%
North American Contribution to Supply:	94%

Figure 12: Value Chain for Butanes (C_4H_{10}), 2018 (Million Dollars)

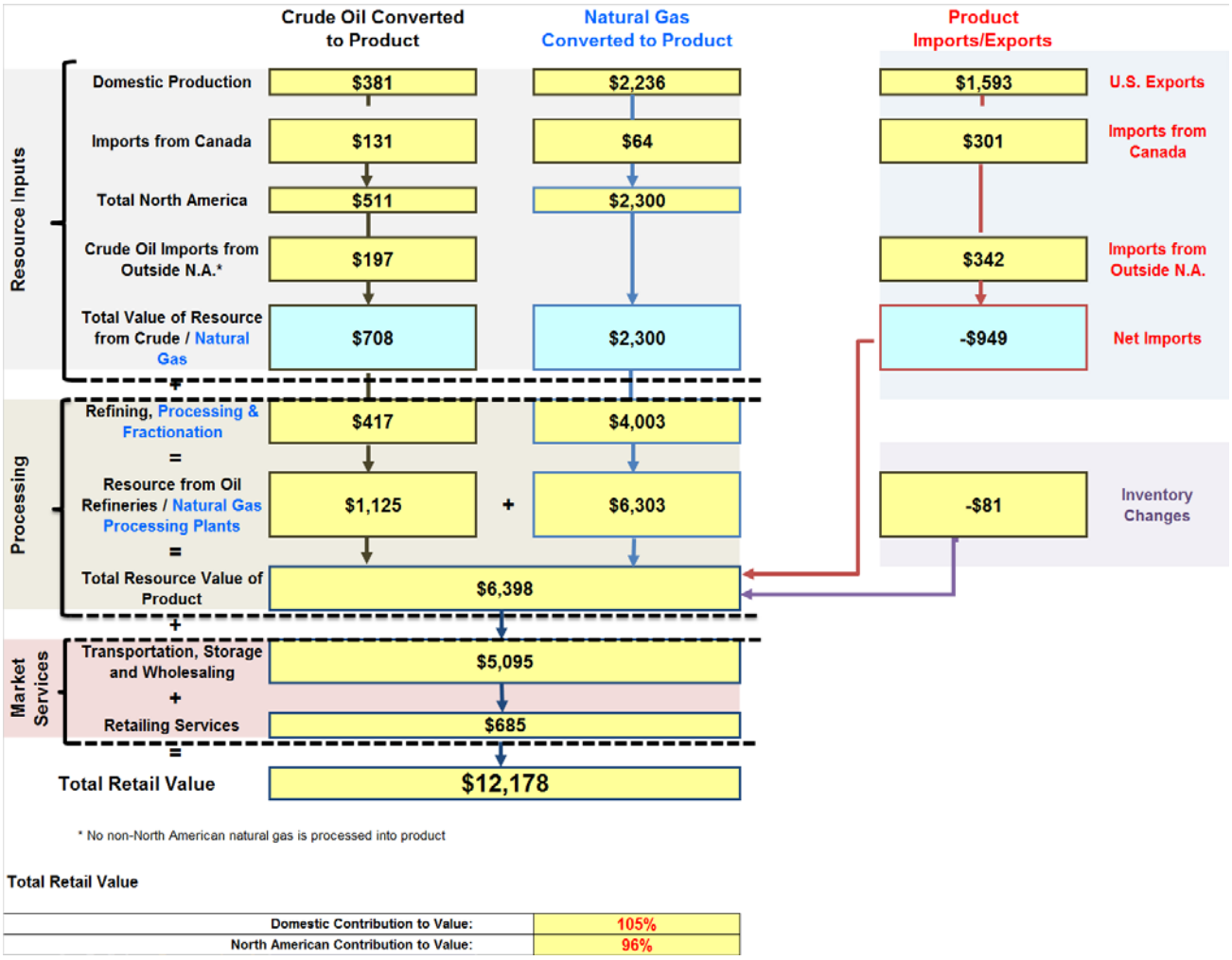


Figure 13: Volume Chain for Butanes (C_4H_{10}), 2018 (Thousand Gallons)

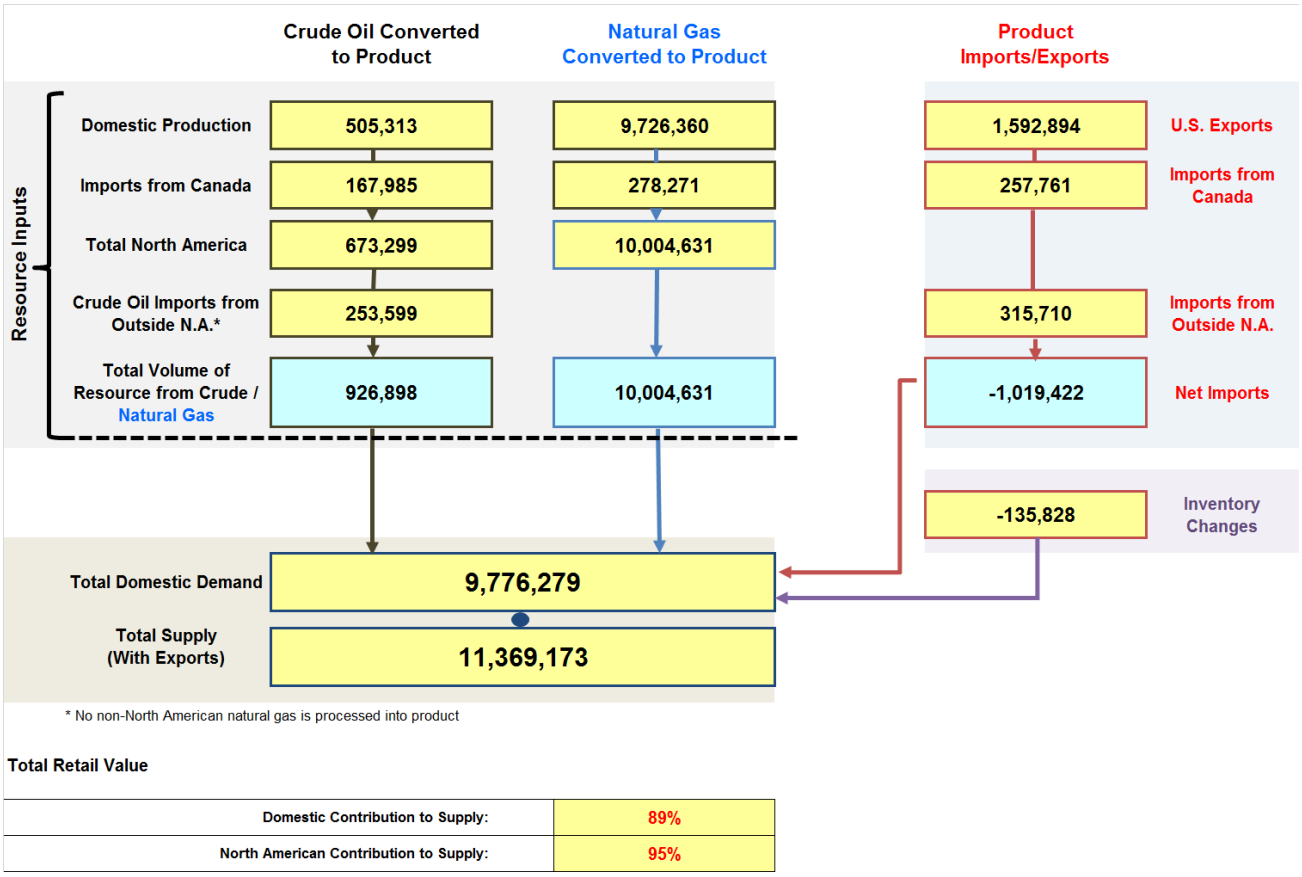
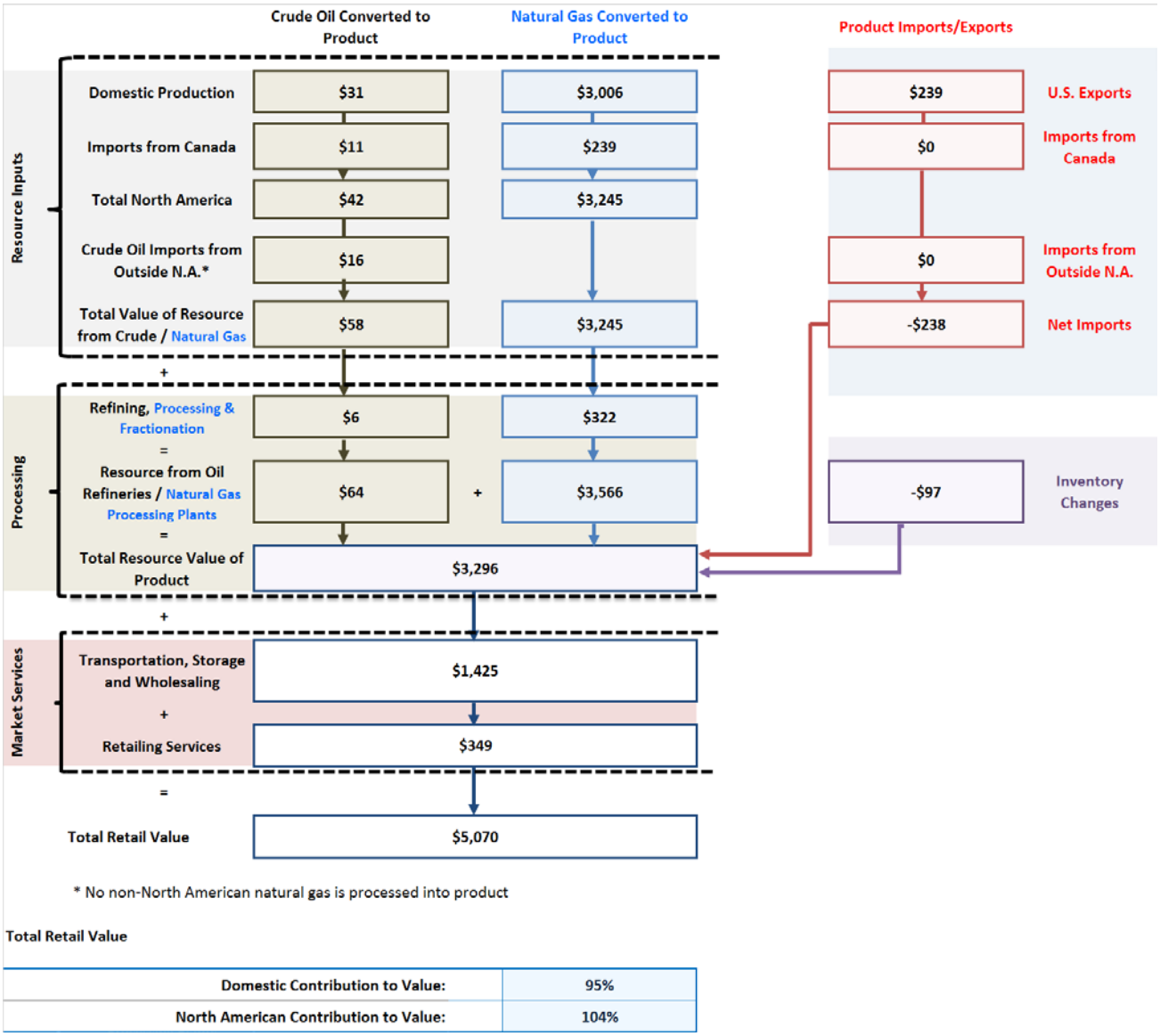


Figure 14: Value Chain for Ethane (C_2H_6), 2018 (Million Dollars)



Total Retail Value	
Domestic Contribution to Value:	95%
North American Contribution to Value:	104%

Figure 15: Volume Chain for Ethane (C_2H_6), 2018 (Thousand Gallons)

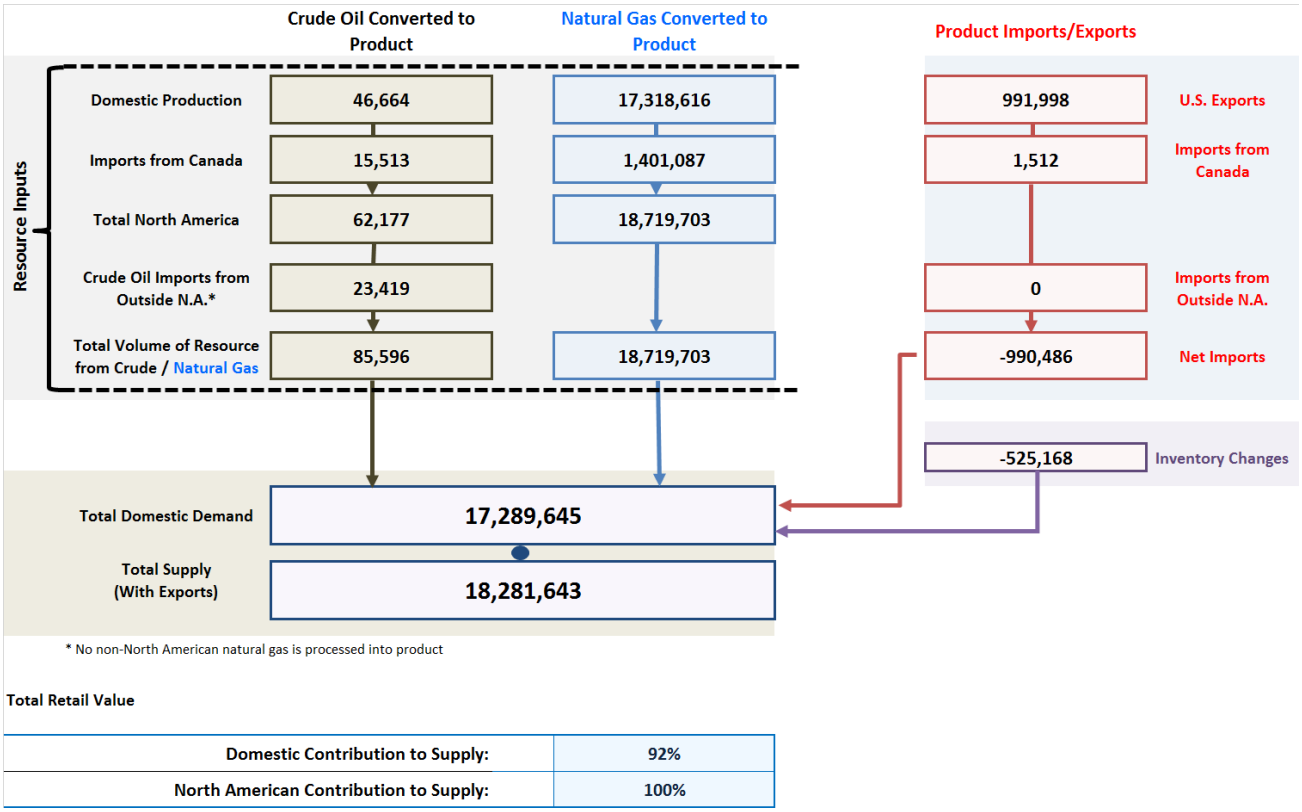
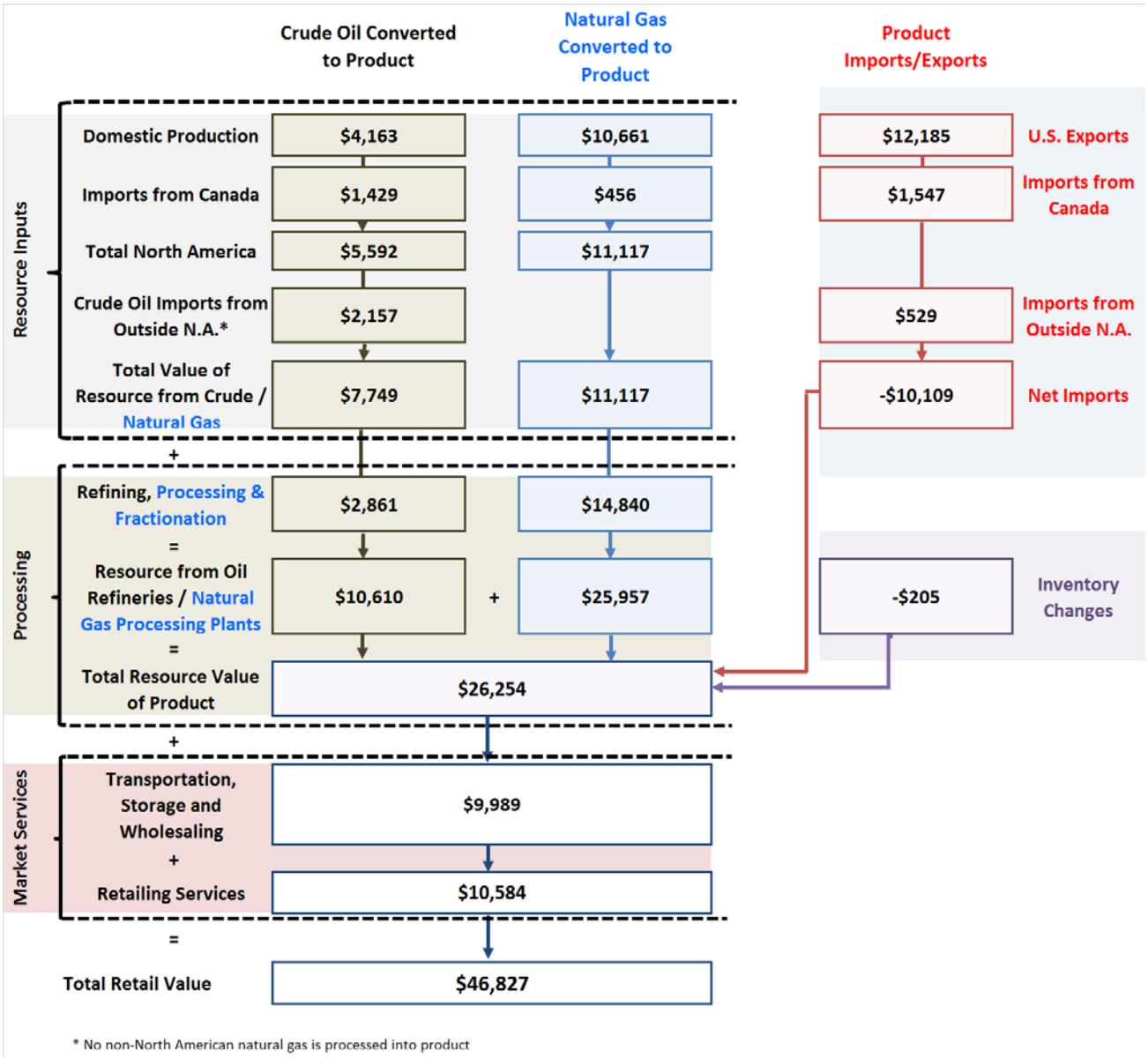


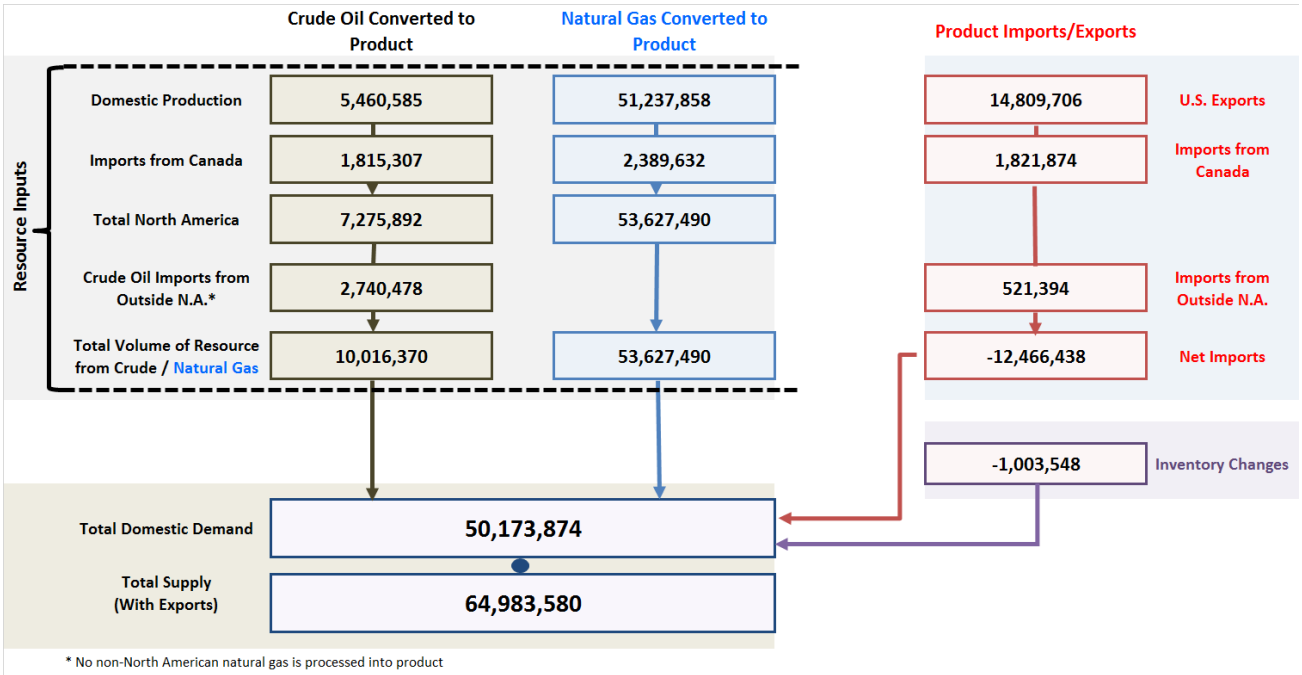
Figure 16: Value Chain for All NGLs and LRGs, 2018 (Million Dollars)



Total Retail Value

Domestic Contribution to Value:	113%
North American Contribution to Value:	120%

Figure 17: Volume Chain for All NGLs and LRGs, 2018 (Thousand Gallons)



Total Retail Value

Domestic Contribution to Supply:	86%
North American Contribution to Supply:	95%

Table 14: National Value Summary for Odorized Propane (C_3H_8), 2018

	Volume Gallons (1,000)	Value $ Million	Price $ per Gal.
Refining			
Value in Imported Crude (CIF)	756,656	625.0	0.826
in Canadian Crude	301,499	249.0	0.826
in Non-Canadian crude	455,157	376.0	0.826
Value in Domestic Crude	906,931	725.5	0.800
Value Added by Crude Refining	1,663,587	450.4	0.271
Refinery Sales	**1,663,587**	**1,800.9**	**1.083**
Gas Processing			
Value in Natural Gas	6,213,654	1,321.5	0.213
Value Added by Gas Processing	6,213,654	1,296.9	0.209
Fractionation	6,213,654	287.9	0.046
Gas Plants (With Fractionation)	**6,213,654**	**2,906.3**	**0.468**
EIA Product Imports			
Imported Product Value (CIF)	630,348	458.1	0.727
Canadian Imports	582,164	423.1	0.727
Non-Canadian Imports	48,185	35.0	0.727
Terminaling	630,348	11.7	0.019
Imports (With Terminaling)	**630,348**	**469.8**	**0.745**
Inventory Change	(152,066)	(68.9)	0.453
Supply	**8,355,523**	**5,108.1**	**0.611**
Import Adjust. (Imports Not Counted by EIA)	(130,480)	(87.3)	0.669
Aux Sable Value Added by Gas Processing and Frac.	225,760	110.0	0.487
Aux Sable Value of Canadian Gas	225,760	47.9	0.212
Total Supply	**8,450,804**	**5,178.7**	**0.613**
Exports			
Export Product Value	-	-	
Terminaling	-	-	
Export Value (FOB)	**-**	**-**	
Domestic Demand	8,450,804	6,096.1	0.721
Balancing Item	-	-	0.721
Total Domestic Demand (Wholesale Value)	**8,450,804**	**6,096.1**	**0.721**
Supply Value	8,450,804	5,178.7	0.613
Wholesale Value	8,450,804	6,096.1	0.721
Wholesale Market Services	**8,450,804**	**917.4**	**0.109**
Breakout of Wholesale Market Services			
Long Distance P/L Transportation		135.5	
Intra PAD P/L Transporation		139.2	
Storage and Wholesale Markup		642.7	
Wholesale Value Balancing Item		-	
Total Wholesale Market Services	**8,450,804**	**917.4**	**0.109**
Final Retail Values			
Wholesale Value	8,450,804	6,096.1	0.721
Retail Markup on Total Volume	8,450,804	9,550.3	1.130
Total Retail Value	**8,450,804**	**15,646.4**	**1.851**

Table 15: National Value Summary for All Purity Propane (C_3H_8), 2018

	Volume	Value	Price
	Gallons (1,000)	$ Million	$ per Gal.
Refining			
Value in Imported Crude (CIF)	2,135,967	1,764.3	0.826
in Canadian Crude	851,101	703.0	0.826
in Non-Canadian crude	1,284,865	1,061.3	0.826
Value in Domestic Crude	2,560,179	2,048.0	0.800
Value Added by Crude Refining	4,696,146	1,271.5	0.271
Refinery Sales	**4,696,146**	**5,083.8**	**1.083**
Gas Processing			
Value in Natural Gas	17,540,544	3,730.5	0.213
Value Added by Gas Processing	17,540,544	3,661.0	0.209
Fractionation	17,540,544	812.8	0.046
Gas Plants (With Fractionation)	**17,540,544**	**8,204.3**	**0.468**
EIA Product Imports			
Imported Product Value (CIF)	1,779,413	1,293.1	0.727
Canadian Imports	**1,643,392**	1,194.3	0.727
Non-Canadian Imports	136,021	98.8	0.727
Terminaling	1,779,413	33.0	0.019
Imports (With Terminaling)	**1,779,413**	**1,326.2**	**0.745**
Inventory Change	(429,267)	(194.5)	0.453
Supply	**23,586,836**	**14,419.7**	**0.611**
Import Adjust. (Imports Not Counted by EIA)	(368,332)	(246.6)	0.669
Aux Sable Value Added by Gas Processing and Frac.	637,300	310.5	0.487
Aux Sable Value of Canadian Gas	637,300	135.3	0.212
Total Supply	**23,855,804**	**14,618.9**	**0.613**
Exports			
Export Product Value	9,304,405	6,183.5	0.665
Terminaling	9,304,405	345.9	0.037
Export Value (FOB)	**9,304,405**	**6,529.4**	**0.702**
Domestic Demand	10,979,771	7,920.4	0.721
Balancing Item	3,571,628	2,576.4	0.721
Total Domestic Demand (Wholesale Value)	**14,551,399**	**10,496.9**	**0.721**
Supply Value	14,551,399	8,917.1	0.613
Wholesale Value	14,551,399	10,496.9	0.721
Wholesale Market Services	**14,551,399**	**1,579.7**	**0.109**
Breakout of Wholesale Market Services			
Long Distance P/L Transportation		382.4	
Intra PAD P/L Transporation		393.1	
Storage and Wholesale Markup		804.3	
Wholesale Value Balancing Item		135.8	
Total Wholesale Market Services	**14,551,399**	**1,715.6**	**0.118**
Final Retail Values			
Wholesale Value	14,551,399	10,496.9	0.721
Retail Markup on Total Volume	14,551,399	9,550.3	0.656
Total Retail Value	**14,551,399**	**20,047.2**	**1.378**

Table 16: National Value Summary for Butanes (C_4H_{10}), 2018

	Volume	Value	Price
	Gallons (1,000)	$ Million	$ per Gal.
Refining			
Value in Imported Crude (CIF)	421,585	328	0.778
in Canadian Crude	167,985	131	0.778
in Non-Canadian crude	253,599	197	0.778
Value in Domestic Crude	505,313	381	0.753
Value Added by Crude Refining	926,898	417	0.450
Refinery Sales	**926,898**	**1,125.1**	**1.214**
Gas Processing			
Value in Natural Gas	9,726,360	2,236	0.230
Value Added by Gas Processing	9,726,360	3,281	0.337
Fractionation	9,726,360	458	0.047
Gas Plants (With Fractionation)	**9,726,360**	**5,974.6**	**0.614**
EIA Product Imports			
Imported Product Value (CIF)	573,472	644	1.123
Canadian Imports	257,761	301	1.170
Non-Canadian Imports	315,710	342	1.084
Terminaling	573,472	13	0.023
Imports (With Terminaling)	**573,472**	**656.8**	**1.145**
Inventory Change	(135,828)	(81)	0.596
Supply	**11,090,902**	**7,675.6**	**0.692**
Import Adjust. (Imports Not Counted by EIA)	-	-	-
Aux Sable Value Added by Gas Processing and Frac.	278,271	265	0.951
Aux Sable Value of Canadian Gas	278,271	64	0.229
Total Supply	**11,369,173**	**8,003.8**	**0.704**
Exports			
Export Product Value	1,592,894	1,593	1.000
Terminaling	1,592,894	57	0.036
Export Value (FOB)	**1,592,894**	**1,649.7**	**1.036**
Domestic Demand	9,721,362	11,436	1.176
Balancing Item	54,917	64.6	1.176
Total Domestic Demand (Wholesale Value)	**9,776,279**	**11,500.4**	**1.176**
Supply Value	9,776,279	6,882.4	0.704
Wholesale Value	9,776,279	11,500.4	1.176
Wholesale Market Services	**9,776,279**	**4,618.0**	**0.472**
Breakout of Wholesale Market Services			
Long Distance P/L Transportation		496.6	
Intra PAD P/L Transporation		185.8	
Storage and Wholesale Markup		3,965.5	
Wholesale Value Balancing Item		376.4	
Total Wholesale Market Services	**9,776,279**	**5,024.4**	**0.514**
Final Retail Values			
Wholesale Value	9,776,279	11,500.4	1.176
Retail Markup on Total Volume	9,776,279	1,234.9	0.126
Total Retail Value	**9,776,279**	**12,735.3**	**1.303**
Retail Margin			
Non-Chemical Retail Value	583,282	1,368	2.345
Non-Chemical Wholesale Value	583,282	683	1.171
Difference = Retail Markup	**583,282**	**685.1**	**1.175**

Table 17: National Value Summary for Ethane (C_2H_6), 2018

	Volume	Value	Price
	Gallons (1,000)	$ Million	$ per Gal.
Refining			
Value in Imported Crude (CIF)	38,932	26.8	0.687
in Canadian Crude	15,513	10.7	0.687
in Non-Canadian Crude	23,419	16.1	0.687
Value in Domestic Crude	46,664	31.1	0.666
Value Added by Crude Refining	85,596	6.4	0.075
Refinery Sales	**85,596**	**64.2**	**0.751**
Gas Processing			
Value in Natural Gas	17,318,616	3,005.6	0.174
Value Added by Gas Processing	17,318,616	(618.9)	(0.036)
Fractionation	17,318,616	797.2	0.046
Gas Plants (With Fractionation)	**17,318,616**	**3,183.9**	**0.184**
EIA Product Imports			
Imported Product Value (CIF)	1,512	0.4	0.263
Canadian Imports	1,512	0.4	0.263
Non-Canadian Imports	-	-	-
Terminaling	1,512	0.0	0.010
Imports (With Terminaling)	**1,512**	**0.4**	**0.273**
Inventory Change	(525,168)	(96.5)	0.184
Supply	**16,880,556**	**3,152.0**	**0.187**
Import Adjust. (Imports Not Counted by EIA)	-	-	
Aux Sable Value Added by Gas Processing and Frac.	1,401,087	143.6	0.103
Aux Sable Value of Canadian Gas	1,401,087	238.9	0.171
Total Supply	**18,281,643**	**3,534.6**	**0.193**
Exports			
Export Product Value	991,998	238.8	0.241
Terminaling	991,998	32.1	0.032
Export Value (FOB)	**991,998**	**270.9**	**0.273**
Domestic Demand	17,318,616	4,728.9	0.273
Balancing Item	-28,971	(7.9)	0.273
Total Domestic Demand (Wholesale Value)	**17,289,645**	**4,721.0**	**0.273**
Supply Value	17,289,645	3,342.8	0.193
Wholesale Value	17,289,645	4,721.0	0.273
Wholesale Market Services	**17,289,645**	**1,378.2**	**0.080**
Breakout of Wholesale Market Services			
Long Distance P/L Transportation		274.2	
Intra PAD P/L Transporation		319.7	
Storage and Wholesale Markup		784.4	
Wholesale Value Balancing Item		14.9	
Total Wholesale Market Services	**17,289,645**	**1,393.1**	**0.080**
Retail Margin			
Non-Chemical Retail Value	296,873	429.8	1.448
Non-Chemical Wholesale Value	296,873	81.1	0.273
Difference = Retail Markup on Non-Chem.	**296,873**	**348.7**	**1.175**
Final Retail Values			
Wholesale Value	17,289,645	4,721.0	0.273
Retail Markup on Total Volume	17,289,645	348.7	0.020
Total Retail Value	**17,289,645**	**5,069.8**	**0.293**

Table 18: National Value Summary for Total NGL and LRG, 2018

	Volume	Value	Price
	Gallons (1,000)	$ Million	$ per Gal.
Refining			
Value in Imported Crude (CIF)	4,555,785	3,586.3	0.787
in Canadian Crude	1,815,307	1,429.0	0.787
in Non-Canadian crude	2,740,478	2,157.3	0.787
Value in Domestic Crude	5,460,585	4,162.9	0.762
Value Added by Crude Refining	10,016,370	2,861.0	0.286
Refinery Sales	**10,016,370**	**10,610.2**	**1.059**
Gas Processing			
Value in Natural Gas	51,237,858	10,661.0	0.208
Value Added by Gas Processing	51,237,858	11,643.4	0.227
Fractionation	51,237,858	2,387.5	0.047
Gas Plants (With Fractionation)	**51,237,858**	**24,692.0**	**0.482**
EIA Product Imports			
Imported Product Value (CIF)	2,760,691	2,355.5	0.853
Canadian Imports	2,239,297	1,826.3	0.816
Non-Canadian Imports	521,394	529.2	1.015
Terminaling	2,760,691	54.8	0.020
Imports (With Terminaling)	**2,760,691**	**2,410.3**	**0.873**
Inventory Change	(1,003,548)	(205.0)	0.204
Supply	**63,011,371**	**37,507.5**	**0.595**
Import Adjust. (Imports Not Counted by EIA)	(417,423)	(279.4)	0.669
Aux Sable Value Added by Gas Processing and Frac.	2,389,632	808.8	0.338
Aux Sable Value of Canadian Gas	2,389,632	456.4	0.191
Total Supply	**64,983,580**	**38,493.3**	**0.592**
Exports			
Export Product Value	14,809,706	12,184.8	0.823
Terminaling	14,809,706	529.2	0.036
Export Value (FOB)	**14,809,706**	**12,714.0**	**0.858**
Domestic Demand	47,671,841	36,246.5	0.760
Balancing Item	2,502,033	(3.4)	(0.001)
Total Domestic Demand (Wholesale Value)	**50,173,874**	**36,243.0**	**0.722**
Supply Value	50,173,874	27,665.6	0.551
Wholesale Value	50,173,874	36,243.0	0.722
Wholesale Market Services	**50,173,874**	**8,577.4**	**0.171**
Breakout of Wholesale Market Services			
Long Distance P/L Transportation		1,648.3	
Intra PAD P/L Transporation		1,081.9	
Storage and Wholesale Markup		5,847.2	
Wholesale Value Balancing Item		828.0	
Total Wholesale Market Services	**50,173,874**	**9,405.4**	**0.187**
Final Retail Values			
Wholesale Value	50,173,874	36,243.0	0.722
Retail Markup on Total Volume	50,173,874	10,584.2	0.211
Total Retail Value	**50,173,874**	**46,827.2**	**0.933**

4.3. Economic Impact from the Manufacture of Propane Appliances and Engines

The economic impact in the U.S. from the manufacturing, distribution, and installation of propane engines, appliances, and other propane end use equipment that was installed or purchased in 2018 is estimated to be $12.3 billion, consisting of $4.1 billion of direct propane consumers spending and $8.2 billion from indirect/induced economic benefits. The table below shows the capital outlays from consumers and total economic impacts from that spending by sector and type of propane equipment.

Table 19. Economic Impact from Manufacturing Activities ($Millions)

Manufacturing Category	Consumer Spending (Direct)	Indirect	Induced	Total
Residential Sector	3,587.2	3,122.7	4,056.1	10,766.0
New Construction	629.5	548.0	711.8	1,889.3
Conversions / Upgrades	186.8	162.6	211.2	560.6
Appliance Replacements	1,806.5	1,572.5	2,042.6	5,421.7
Propane BBQs	964.5	839.6	1,090.5	2,894.5
Commercial Sector	88.7	77.2	100.3	266.3
Internal Combustion Engines	368.6	320.9	416.8	1,106.3
Fork Lifts	291.8	254.0	329.9	875.7
School Buses	23.4	20.4	26.5	70.2
LDV/MDVs	21.7	18.9	24.5	65.1
Irrigation / Mowers	31.8	27.6	35.9	95.3
Agricultural Products	28.1	24.5	31.8	84.4
Industrial / Other	23.4	20.3	26.4	70.1
Total Impact	4,096	3,566	4,631	12,293

Source: ICF

4.3.1 Residential Sector Propane Equipment Usage

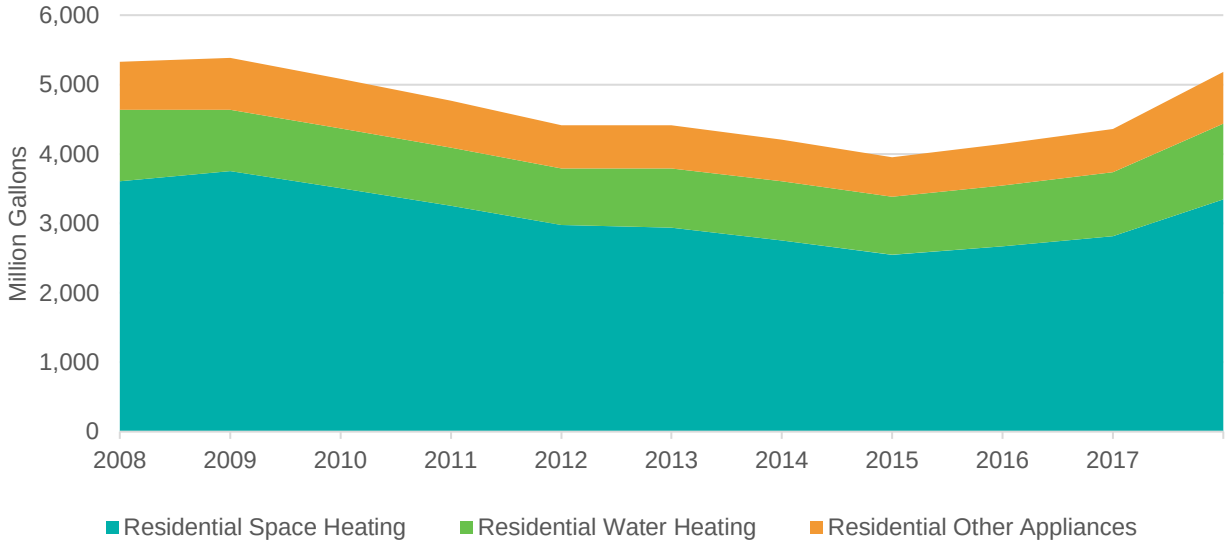
Residential Propane Consumption

The Residential sector accounts for the largest share of the domestic retail propane industry, with odorized propane sales totaling 5.2 billion gallons in 2018, or roughly 55.6 percent of the 2018 total retail propane sales.

The average residential customer of a propane retailer consumed 436 gallons per account, however, there are wide variations based on the region and local weather conditions and the share of local accounts that use propane for space heating. In North Dakota a residential consumer account averaged over 800 gallons, while in Florida the average usage per residential customer was 120 gallons.

On a national basis, space heating accounts for the majority of propane usage in the residential sector, accounting for two thirds of consumption. The figure below shows the total residential propane demand by end-use. Water heating accounted for 21 percent residential propane fuel usage in 2018.

Figure 18. Residential Odorized Propane Consumption by End-Use



Source: ICF, PERC, EIA Residential Energy Consumption Survey

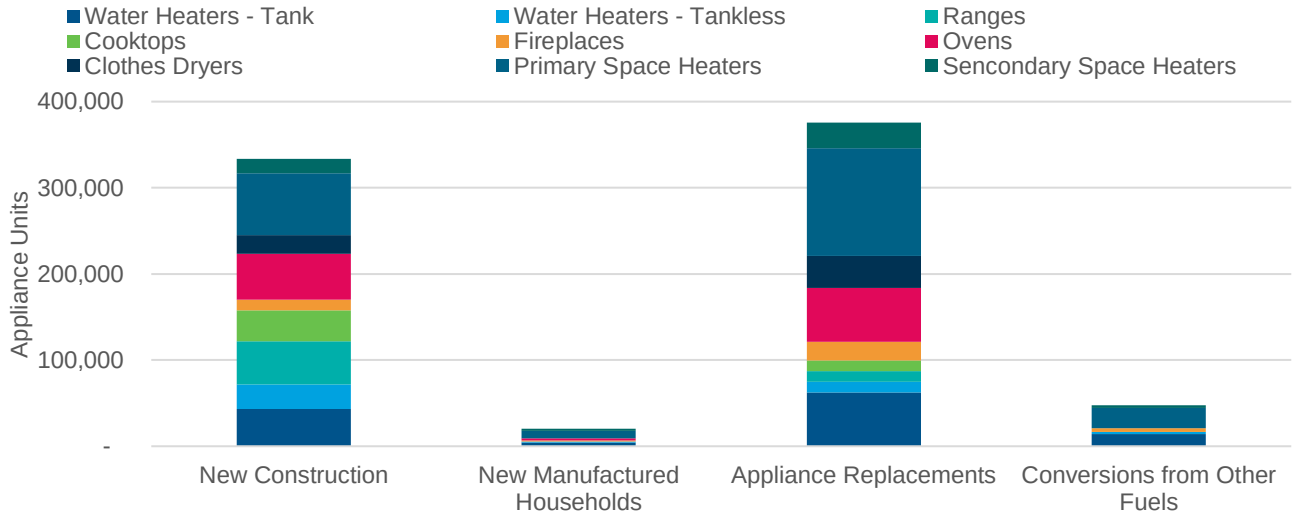
Propane Appliance Installations by Market Installation Category

This analysis will look at the major appliance purchases in the residential sector for space and water heating equipment, cooking ranges, and indoor fireplaces. To estimate the number of propane appliances purchased and installed each year, ICF looked at four separate residential housing market segments for new appliances.

The figure below shows the number of new appliance installations by the type of appliance and four different types of market installation.

In 2018, ICF estimates that there was a nearly 780,000 propane appliance installations consisting of 333,650 appliances installed in newly built households, 375,400 replacement appliances in existing households, and 20,240 appliances installed in new manufactured households, and 50,420 appliances in households that converted from another fuel to propane.

Figure 19. Residential Appliance Installations by Type and Construction Status



Source: ICF

These four market installations and the approach to estimate the appliance installations in provided below:

New Household Construction:

ICF used estimates of new construction by the primary space heating fuel from the U.S. Census' Survey of Construction (SOC).[21] This provides a detailed estimate of the physical characteristics of newly built households at the census division level for the country, including the types of major appliances installed and primary space heating fuel choice. ICF they used state-level new residential construction permit data to estimate the number of newly built households within each state.

According to the Survey of Construction data, there were a total of 1.5 million newly constructed households in 2018. Of these, 71,600 households used propane as the primary space heating fuel.

The majority of these propane households were built in the Midwest and Northeast, totaling 24,000 and 22,000 respectively. There were 18,000 new propane fueled households built in the Western U.S. and 7,500 built in the Southern U.S., where propane has the lowest share of primary space heating fuels used in new construction.

New Manufactured Household Construction:

In 2018, there were a total of 96,600 shipments of new manufactured households, a 4 percent increase from the prior year's totals.[22] Compared to site-built households, manufactured households have a significantly different suite of appliances included within the building as well as the sizing of these appliances.

ICF estimates that propane would be used as a primary space heating fuel in 9 percent of newly shipped manufactured households, or roughly twice the market share of propane used in site-built households. This estimate was based on the large share of shipments of manufactured households to rural areas with more limited access to natural gas distribution lines. Based on this assumption, ICF assumes that there were roughly 8,960 manufactured households that installed a propane space heating system, 5,370 propane water heater systems, and 5,910 other propane appliances to total 20,240 total propane appliances installed (Figure 19).

Conversions from other Fuels to Propane:

Propane serves as a primary space heating fuel in largely rural areas that have more limited access to natural gas and where low-cost electric space heating is not readily available. In these areas, there are traditionally large number households that have used Fuel Oil for primary space heating purposes, as well as more limited number of households that have used Wood or other non-traditional fuels.

The conversion away from Fuel Oil heated households to Propane is the most common form of household fuel conversion. In 2018 there were a total of 5.4 million households that had used Fuel Oil for primary space heating, a decline of over 1 million households over the last five years.

[21] https://www.census.gov/construction/nrc/index.html
[22] https://www.census.gov/data/tables/time-series/econ/mhs/shipments.html

ICF estimates that in 2018, there were nearly 24,000 new propane heated households that ICF estimates were added in 2018. These conversions occur in areas where there is a large residential Fuel Oil usage, such as the Northeast and Midwest.

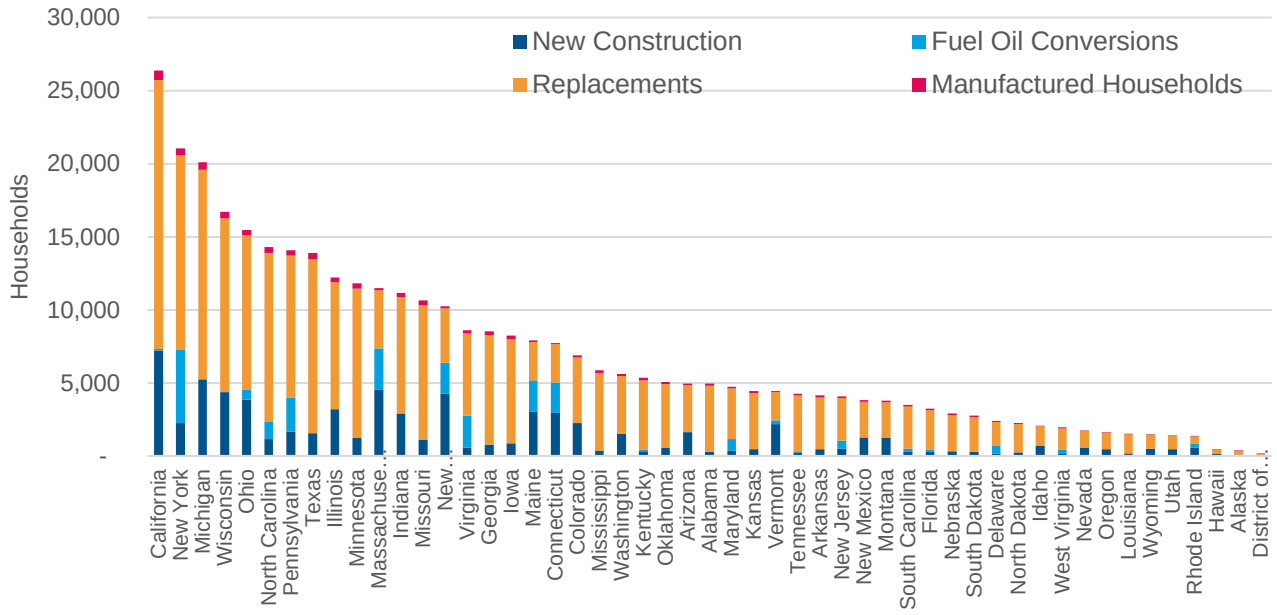
Replacements of Propane Appliances in Existing Households:

In 2018, there were roughly 5.8 million households that used propane as a primary space heating fuel and another 5.1 million households that use propane for water heating or as a back-up space heating fuel. ICF estimates that nearly 250,000 households that were already using propane appliances, replaced 375,000 propane appliances. This figure indicates that roughly 4.3 percent of existing residential propane customers replaced an appliance in 2018.

State-Level Households Appliance Installations

In 2018, ICF estimates that a total of 354,000 new and existing households replaced nearly 777,000 propane appliances. The below figure shows the number of households in each of the four market installation categories by state. This figure does not include propane fired BBQs.

Figure 20. Number of Households with New Propane Appliances by State



Source: ICF

Propane Fired Home Barbeques

According the EIA's Residential Energy Consumption Survey, there are over 42 million homes that use propane for outdoor grilling activities. BBQs that use a gaseous fuels[23] represented 64 percent of all outdoor grills used in the U.S. according to the Hearth, Patio & Barbeque Association, which provides information on total ownership of BBQs and annual manufacturer shipments.

Based on estimated BBQ shipment data, ICF estimates that in 2018 there were nearly 6.5 million new propane-fired BBQs purchased by consumers. The cost of BBQs can range significantly, from

[23] Gaseous fuels include propane, butane, and natural gas

small portable grills to custom-built outdoor installations. ICF has used an average cost of a propane BBQ from a standard two-burner BBQ available at home improvement stores to calculate the amount that consumers spent on propane BBQs, which totaled nearly $1 billion.

4.3.2 Commercial Sector Propane Equipment Installations

Commercial Propane Consumption

Odorized propane sales to the commercial sector accounted for 20.6 percent of the 2018 total retail propane sales, or roughly 1.9 billion gallons. In 2018, propane retailers sold these volumes to nearly 1.1 million commercial propane accounts across the country with an average sales of 1,765 gallons per account.

The commercial sector accounts for the second largest number of buildings, behind residential, with a 92 million square feet of commercial floor space, an increase from the 87.1 million square feet in 2012.[24]

Commercial Appliance Installations by Market Installation Category

ICF estimates that a total of 9,450 major propane appliances were installed in newly built commercial buildings in 2018, including 4,320 space heaters, 2,840 commercial water heaters, and over 2,000 propane fired food preparation or cooking systems. These installations represent over $88.7 million in direct consumer spending.

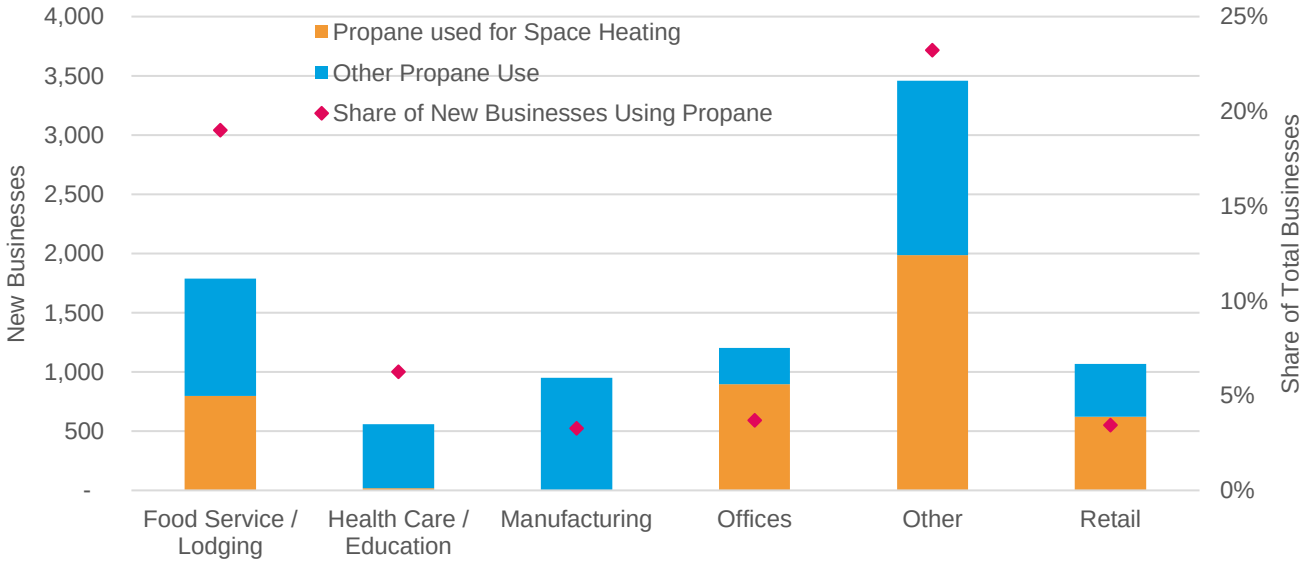
ICF's estimate on the number of commercial appliance installations is based on analysis of commercial building types, energy consumption, and appliance information from the EIA Commercial Building Energy Survey. This survey is conducted every periodically and includes detailed information and estimates for the entire commercial sectors, including new commercial construction, major appliance replacements, and key trends in energy and fuel usage.[25]

From 2003 to 2012, there was an average of 126,000 new commercial buildings per year, representing roughly 13.4 million square feet of floor space. Similar to the residential sector, propane usage in the commercial sector is significantly more limited than electricity and natural gas use. Over this ten-year period, propane is being used in 7.2 percent of the newly built commercial buildings. However, when only looking at new businesses that use propane for space heating, the share of new commercial businesses declines to just 3.4 percent of newly built commercial businesses, or roughly 4,320 new commercial businesses added per year.

Figure 21 shows the annual average from 2003 to 2012 of new businesses that reported using propane. There are two types of propane use. One category for businesses that use propane for space heating and other end uses. The other category includes businesses that use propane for any other end use except space heating. These breakouts are shown by the major industry type to provide estimates on the different types of major appliances required as part of the business.

[24] https://www.eia.gov/consumption/commercial/
[25] https://www.eia.gov/consumption/commercial/ - Information from the surveys conducted in 2012 and 2003 has been used in this analysis. Information from the Commercial survey conducted in 2018 will not be available until late 2020.

Figure 21. Average Number of New Commercial Businesses that Use Propane by Industry Type (2003 to 2012)



4.3.3 Propane Internal Combustion Engines

The economic impact of new propane engines is estimated to be $1.1 billion, including $368 million in direct engine purchases by consumers. Included in this economic impact are forklift engines, irrigation engines, commercial lawn mower engines, and vehicle engines for Light Duty Vehicles (LDV), Medium Duty Vehicles (MDV), and school buses.

In 2018, the World LPG Association estimated that there were nearly 27 million propane fueled vehicles and that propane was the third most widely used transportation fuel.[26] In the U.S., the Propane Education and Research Council estimated that there are over 150,000 vehicles that utilize propane as the primary fuel source currently on the road, accounting for roughly 0.1 percent of the total fuel usage across the transportation sector.[27]

To support this fleet of propane autogas vehicles, there is a large network of public and private propane fueling stations. The U.S. Department of Energy's Alternative Fuels Data Center (AFDC) provides a listing off the public alternative fueling locations.[28] However, a large number of propane autogas vehicles are part of private fleet operations that are not reported in this public directory. ICF estimates that private propane fueling facilities account for 50 percent of the total number of propane fueling stations.

Based on analysis of the number of new public propane fueling stations that began operation, 26 in 2018 total, ICF estimates that there were a total of 52 new propane fueling stations that year. Costs of new propane fueling stations will depend on a variety of factors, such as location, size of facility,

[26] https://www.wlpga.org/wp-content/uploads/2019/12/WLPGA-Annual-Report-2019.pdf & https://www.wlpga.org/wp-content/uploads/2019/04/A-Global-Roadmap-for-Autogas-December-2019.pdf

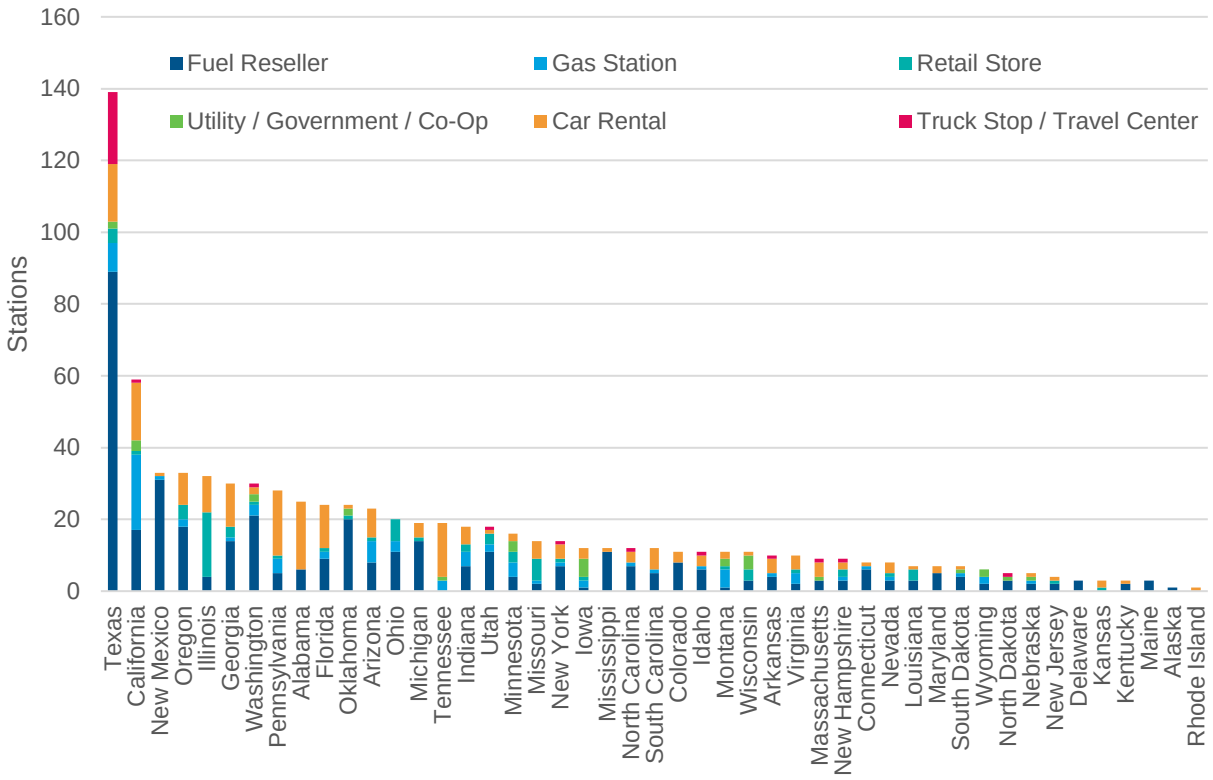
[27] This estimate includes light duty vehicles using propane, or LPG, fuels, school buses, and other medium duty vehicles used in various fleet operations. This estimate does not include forklifts or other off-road propane fueled vehicles.

[28] The AFDC provides statistics and information on alternative fuel use across the U.S., including biodiesel, electricity, natural gas, hydrogen, ethanol, and propane - https://afdc.energy.gov/

if the facility is stand-alone of sharing infrastructure, and type of fleet that is being serviced. Compared to a traditional gasoline fueling station, propane fueling stations require significantly less upfront capital. PERC provides a range for new propane fueling stations between $15,000 and $225,000.[29]

The addition of these facilities brought the total number of propane fueling stations online in the U.S. to 819. Texas and California have the most stations, with 139 and 59 propane fueling stations, representing 24% of the nation's propane fueling stations. The number of stations and type of facility are shown by state in the figure below.

Figure 22. Number of Public Propane Fueling Stations by State



Source: U.S. Department of Energy, Alternative Fuels Data Center

Propane Fueled School Buses

School buses are a key part of the fabric of daily life for millions of school children across the U.S. In 2018, there were an estimated 476,150 school buses across the country that transported over 23 million students to school each week.[30]

Traditionally, these vehicles have been powered by diesel or gasoline fueled engines. However, in recent year's alternative fueled vehicles options have become more common, lead in large part by in an increase in the number of new propane fueled school buses.

[29] https://propane.com/for-my-business/fleet-vehicles/propane-autogas-refueling-options/#/find/nearest?fuel=LPG&lpg_secondary=true&country=US
[30] https://files.schoolbusfleet.com/stats/SBF-StateTransportationStats2017-18.pdf

There are three major manufactures of propane fueled buses. Blue Bird, IC Bus, and Thomas Built Bus. This

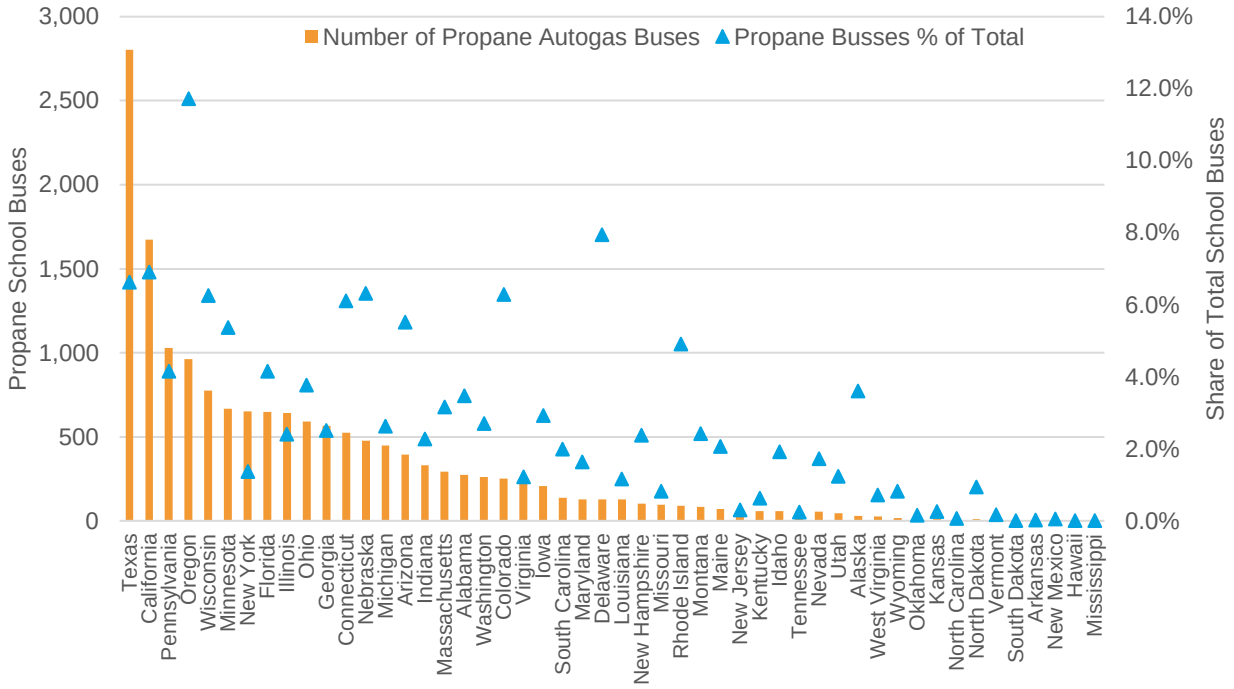
- ***Blue Bird*** is the largest manufacturer of propane fueled school buses, with over 12,000 buses built.[31] Blue Bird is headquartered in Georgia where the company manufactured nearly 12,000 school buses in 2018 and 2019. The company has over 50 dedicated dealers across the country, selling propane fueled school buses as well as other engine configurations offered.
- North Carolina based ***Thomas Built Bus***[32] manufactures multiple engine types for its fleet of buses, including alternative fuel vehicles that run on propane. Thomas Built Bus has partnered with several firms that produced the propane fueled engines for its vehicles, including Agility Fuel Solutions, formerly CleanFuel USA, and Power Solution International.
- ***IC Bus*** is a subsidiary of Navistar International and manufactures school and commercial buses in North American. The company's operations are centered in Oklahoma and Arkansas and it has over 700 distribution locations across North American through its parent company. The company began manufacturing propane fueled school buses in 2015 and is one of several types of alternative fueled vehicles on offer.

In 2018, there were a total of 39,692 school buses sold in the U.S., down slightly from the prior year. ICF estimates that there were roughly 2,600 were new propane-fueled vehicles built and sold during 2018, bringing the total number of active propane school buses to more than 17,000. Industry forecasts indicate an overall strong outlook for new school buses of over 35,000 new shipments per year. Propane fueled buses are expected to see yearly growth in market share as several states and school districts expand their purchases of these vehicles.

Figure 23 shows the estimated number of operating propane-fueled school buses and the share that those vehicles represent of the state's total school bus fleet. Texas has over 2,800 propane fueled school buses that account for roughly 6.6% of the state's total school bus fleet. California, Pennsylvania, Oregon, and Wisconsin are the states with next largest propane fueled fleets in the U.S. These top five states have a total of more than 7,700 propane vehicles and 45% of the total propane school buses in the U.S.

[31] https://www.blue-bird.com/alternative-fuels
[32] https://thomasbuiltbuses.com/

Figure 23. Number of Propane Fueled School Buses and Share of Total School Bus Fleet by State



Source: Propane Education & Research Council, School Bus Fleet, ICF

Propane Fueled Forklifts

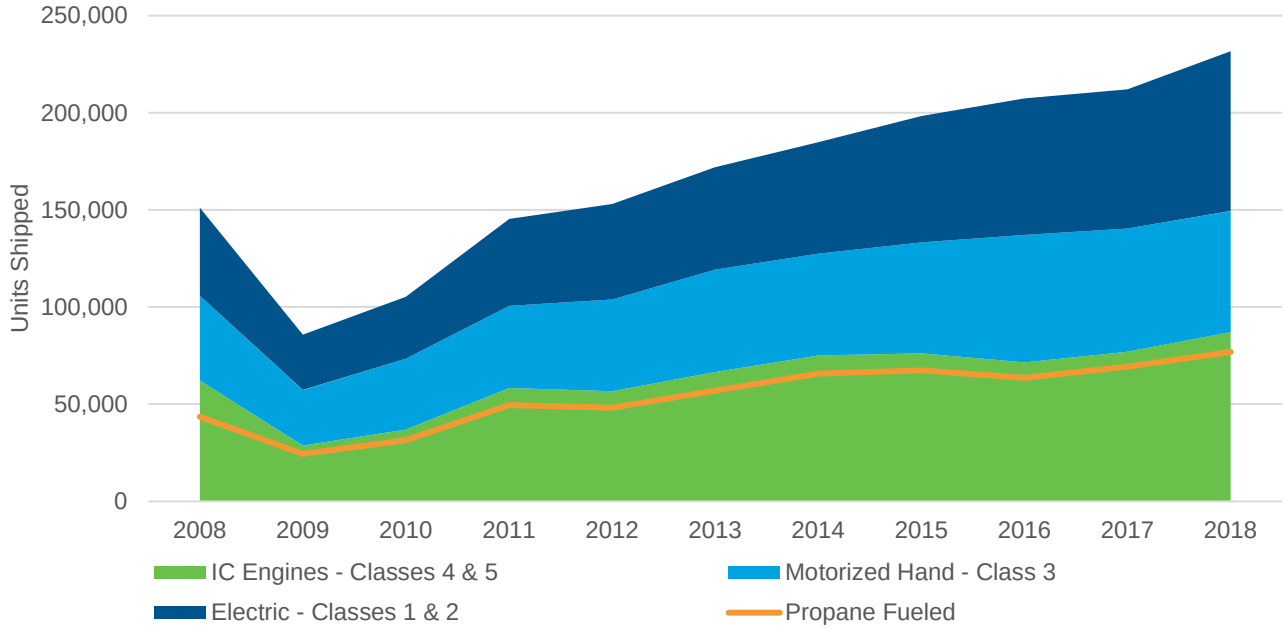
Forklifts are used in a variety of commercial and industrial settings, both indoors and outdoors, to transport heavy materials. It is estimated that are over 850,000 forklifts active across the county. PERC estimates that there are roughly 500,000 propane fueled forklifts operating in the U.S. These propane powered forklifts consumed nearly 400 million gallons of odorized propane in 2018.

Propane fueled forklifts are a key leading support warehousing activity and are separated into five separate classes. Class 1 & Class 2 forklifts are powered by electric engines and are a key competitor to propane powered engines. Class 4 & Class 5 forklifts are categorized as using an internal combustion engine. Within this class of forklifts propane has a market share above 90 percent, followed by diesel powered units, and a minimal number of forklifts using gasoline.

In 2018, there were 231,696 total forklifts shipped.[33] Electric Class 1 & 2 engines accounted for roughly 36 percent of these shipments, while shipments of propane powered forklifts totaled 33 percent of total shipments, or roughly 77,000 new propane fueled forklifts shipped. Figure 24 shows the number of new forklift shipments over the last decade by the type of forklift class and the estimated number of propane powered forklifts.

[33] https://machinemaxxusa.com/2018-annual-forklift-report/

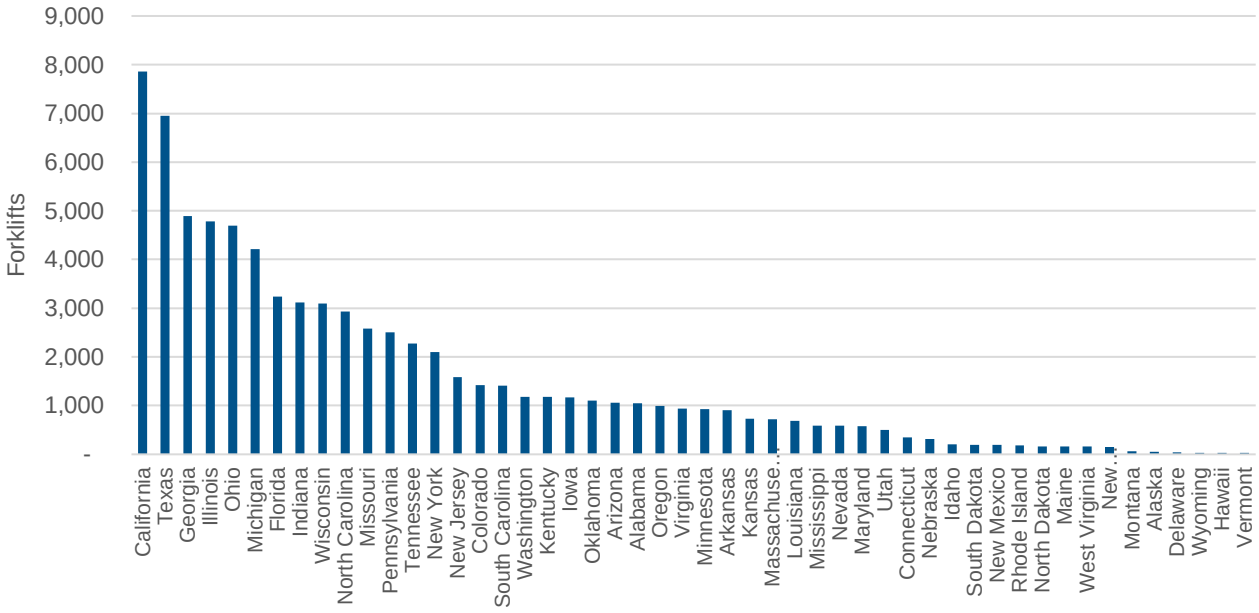
Figure 24. New U.S. Forklift Shipments by Class



Source: PERC, Machine Maxx USA Annual Forklift Reports

The figure below shows the state-level shipments of propane forklifts. These state level estimates show where the propane forklifts were delivered and do not represent the location where the propane engines, or full forklifts, are manufactured, assembled, and sold.

Figure 25. Number of 2018 Propane Forklift Shipments by State



Agricultural Irrigation Engines

According to the U.S. Department of Agriculture's 2018 Irrigation and Water Management Survey, there were 600,500 irrigation pumps on more than 160,000 farms.[34] The primary purpose of these pumps is to water from wells to the surrounding land. A majority of these irrigation pumps are run on electricity, particularly when there is ready access to electric lines. Natural Gas and diesel are also used as fuel sources for irrigation pumps.

The 2018 survey indicates that there were 443,694 pumps powered by electricity, 102,865 pumps powered by diesel, 29,041 pumps powered by natural gas, 11,176 propane powered irrigation pumps, and a smaller number of pumps powered by gasoline, solar, or other fuels.[35]

In recent years propane has made significant in-roads as a portable fuel that can be used to power agricultural engines that support farmers in providing irrigation water for their crops. These engines have been displacing traditional diesel-powered units due to competitive costs, improved local emissions, and the relative ease in fueling given little to no infrastructure is required to support these engines.

Commercial Mowers Engines

Propane has a distinct advantage as a portable fuel for commercial mowing owing to a cleaner particulate emissions profile than diesel and gasoline fuels, and reliability and range compared to electric engines. In recent year, PERC has developed multiple programs to support increased penetration of propane engine use in this sub-sector.[36]

Based on available market data and information provided by PERC, ICF estimates that in 2018 there were a total of 7,310 new commercial mower engines sold. While large commercial mowers can cost the equivalent of a small car, the cost of a propane engine typically range between $500 and $2,500.

4.3.4 Other Agricultural Products

Odorized propane sales to the agricultural sector accounted for 10.4 percent of the 2018 total retail propane sales, or roughly 966 million gallons.

A majority of propane used in the agricultural sector is used by farmers to dry grain harvests. However, there are a wide variety of other uses of propane across America's agricultural sector, including propane fueled torches used for weeing control, radiant heating systems for hog and chicken farms, and the heating of greenhouses. Propane use for irrigation engines is detailed in a prior section.

There are limited public sources of information for the purchase of propane equipment and appliances in the agricultural sector. ICF's estimate for the economic impact for manufacturing of new equipment is based on estimates from PERC on the penetration of newly developed propane appliances.

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[34] https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/fris.pdf

[35] The USDA's 2013 Farm and Ranch Irrigation Survey reported there were 13,444 irrigation pumps were powered by propane, up slightly from the 12,203 propane powered pumps in 2008.

[36] https://propane.com/propane-products/commercial-mowers/

The economic impact of new propane fueled agricultural equipment, excluding irrigation engines, is estimated to be $84.4 million, including $28.1 million in direct equipment purchases by consumers.

4.3.5 Industrial Sector

Odorized propane sales to the Industrial (non-Forklift) sector accounted for 4.4 percent of the 2018 total retail propane sales, or roughly 411 million gallons. The average size of an industrial customer account was 2,230 gallons in 2018, more than five times the size of a residential account for propane retailers.

There is a lack of available public information on the industrial sector's fuel consumption at a detailed enough level to estimate the number of new appliance or engine installations. The use of propane in the industrial sector can vary dramatically by the type of industry and availability of competing fuels or feed stocks.

Given this heterogeneous nature of propane use in industrial applications, ICF is not able to conduct an assessment of all new propane engines and appliances purchased or installed in 2018.

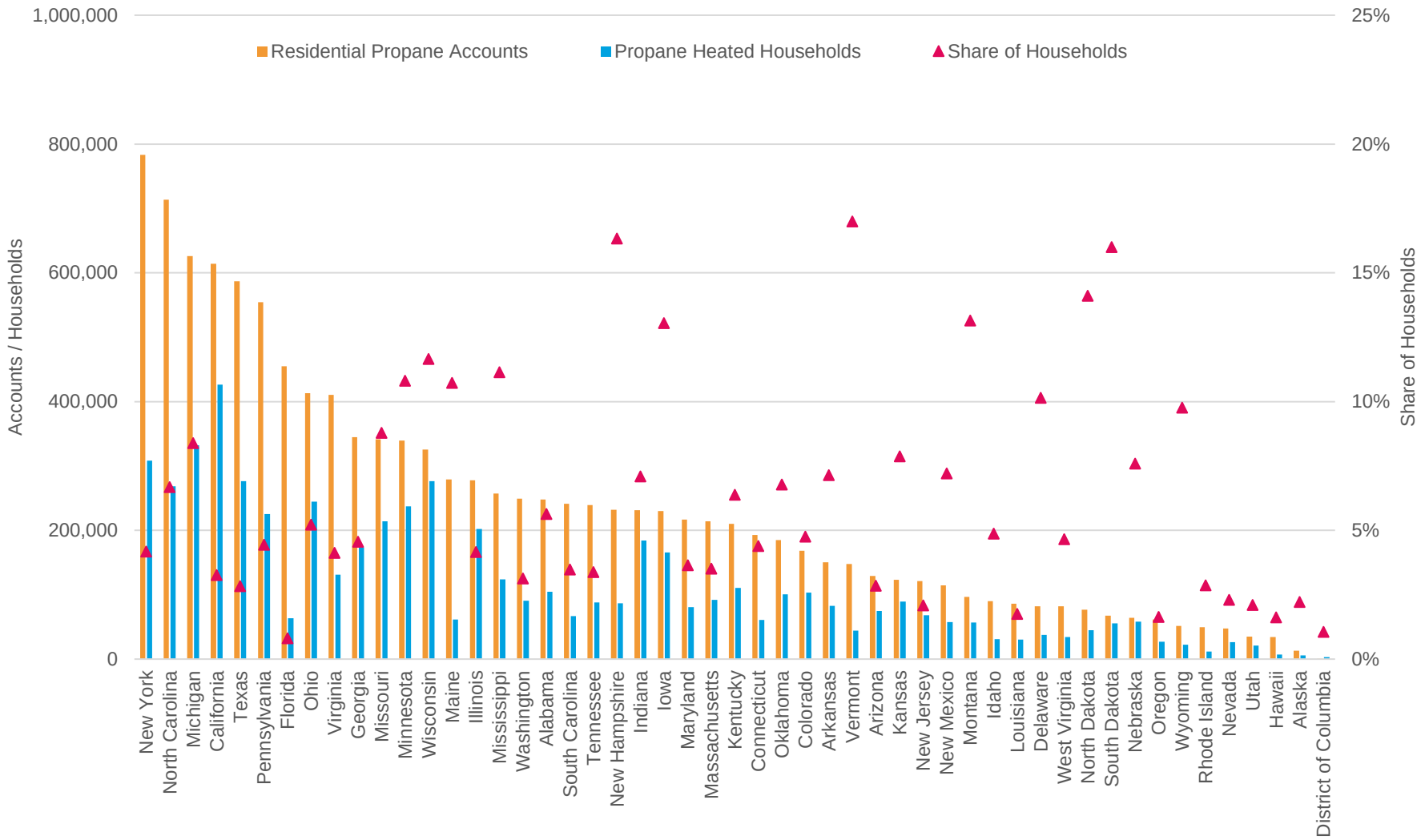
The economic impact of new propane fueled industrial equipment is limited to on-site generators that can be used to meet heating requirements or act as a portable power source. ICF estimates that there were a roughly 1,100 new industrial generators purchased domestically in 2018, representing a total economic contribution of $70.1 million for the year.

5. National Overview by State

The graphs on the following pages present a ranking of each state for each of the metrics outlined. These graphs represent key indicators of the economic and employment impacts from the propane, retail propane, and entire NGL value chain. The title of each map refers to the information being presented and includes the propane heated households, employment, wage, and the economic impacts.

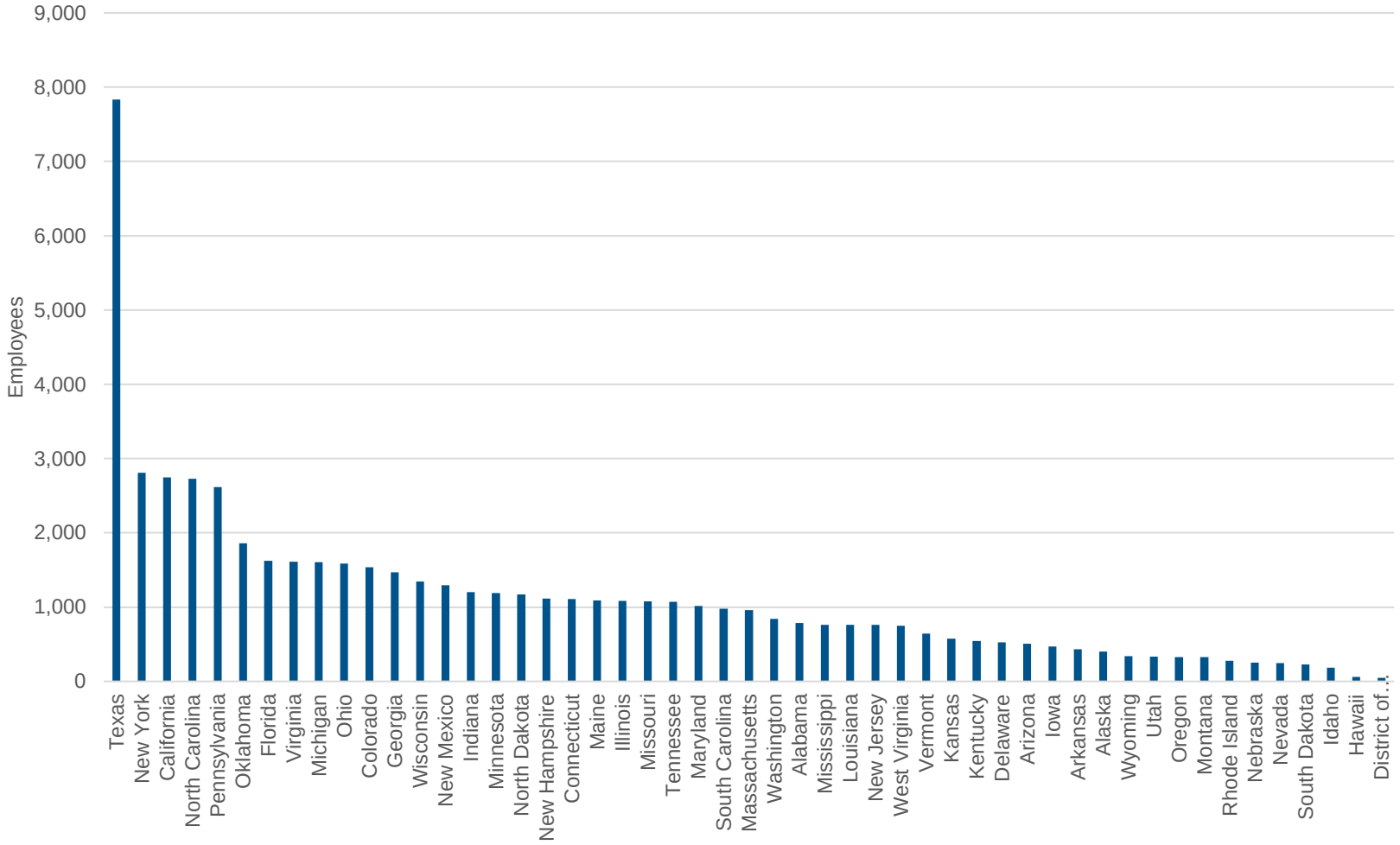
5.1. Residential Propane Accounts and Primary Heated Households by State

Figure 26. Residential Propane Accounts and Primary Heated Households by State



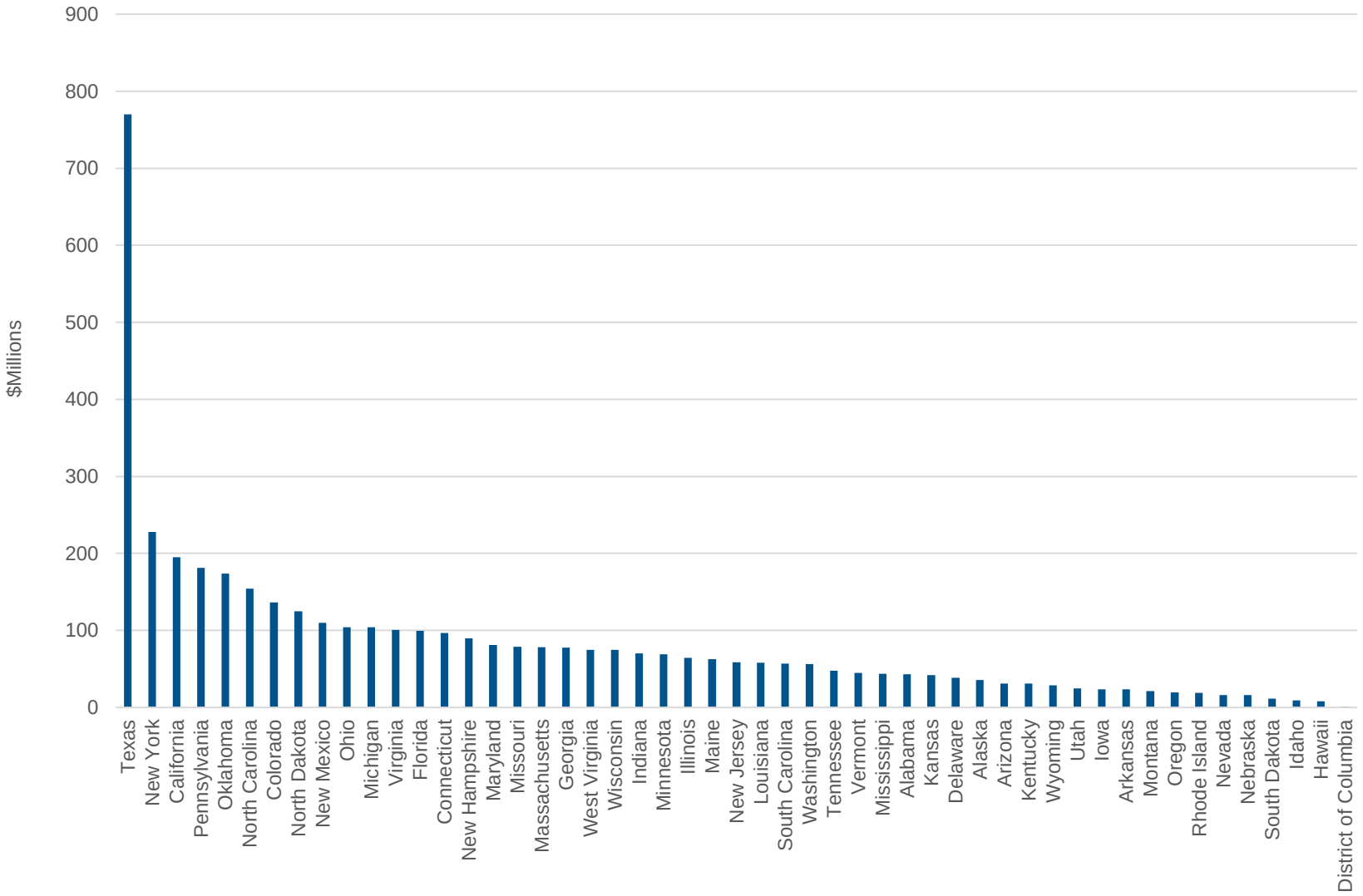
5.2. Retail Propane Employment by State

Figure 27. Retail Propane Employment by State (Section 3)



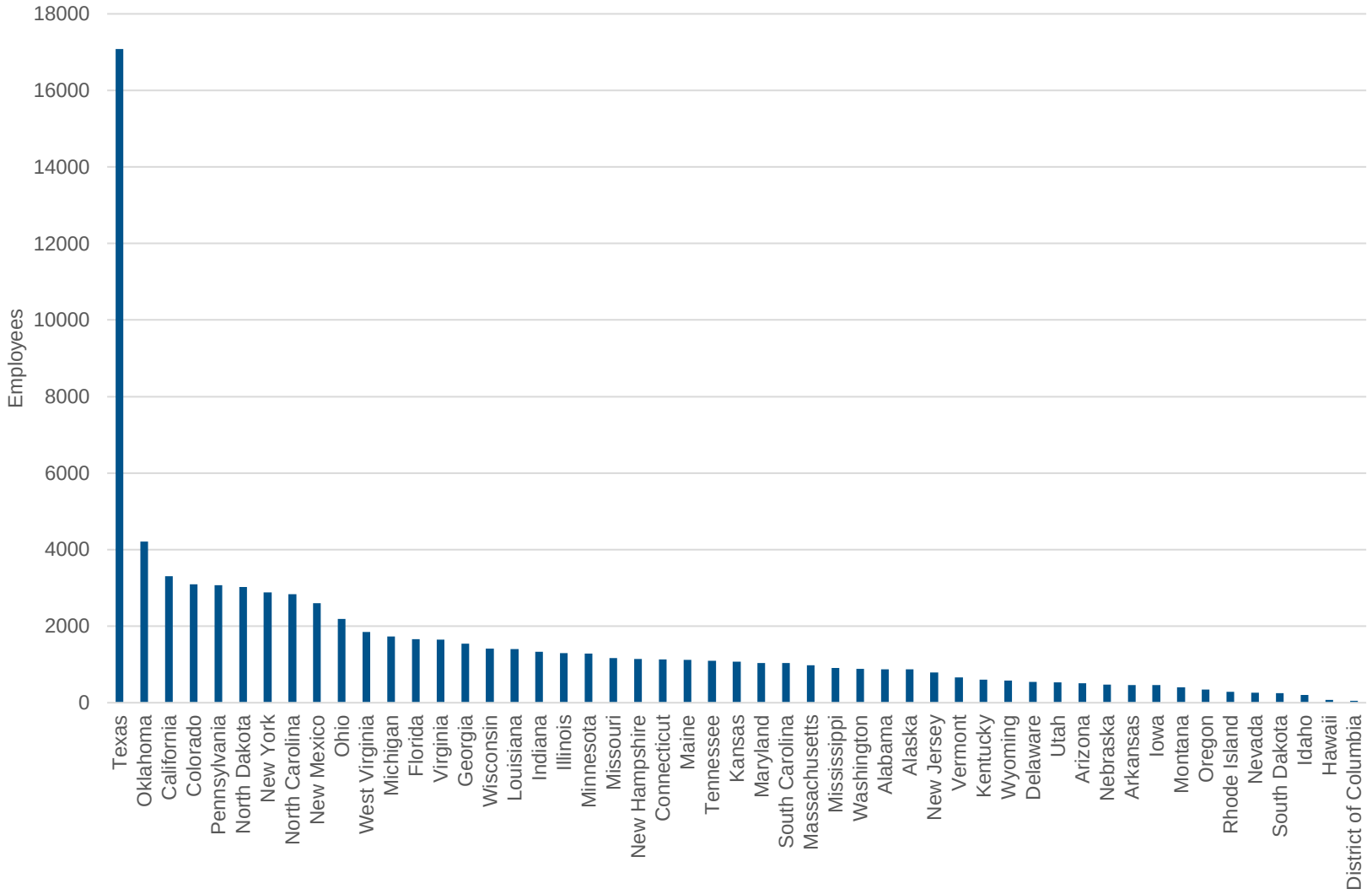
5.3. Retail Propane Wages ($ Millions) by State

Figure 28. Retail Propane Wages ($ Millions) by State (Section 3)



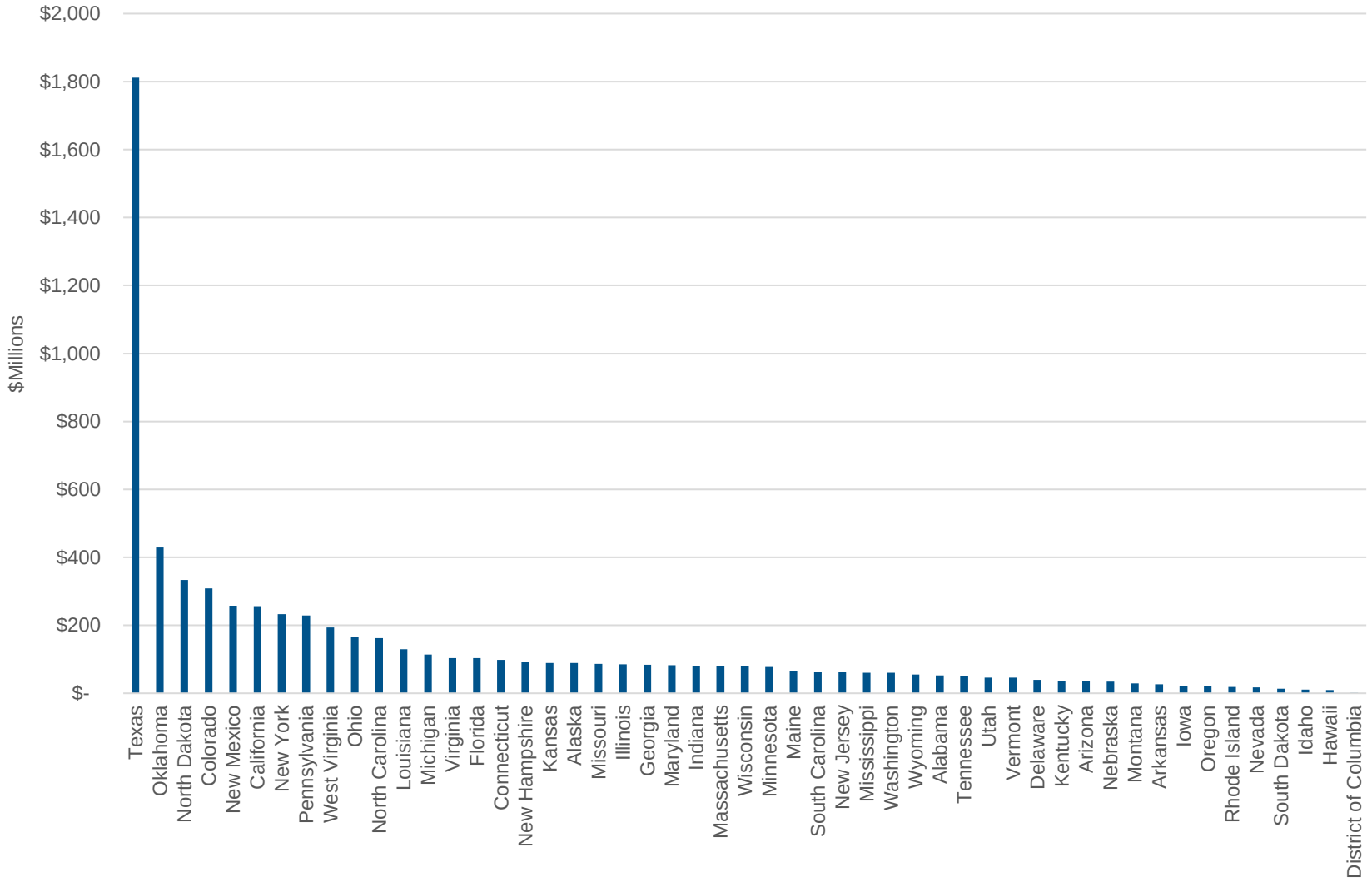
5.4. Total Propane Employment by State

Figure 29. Total Propane Employment by State (Section 3)



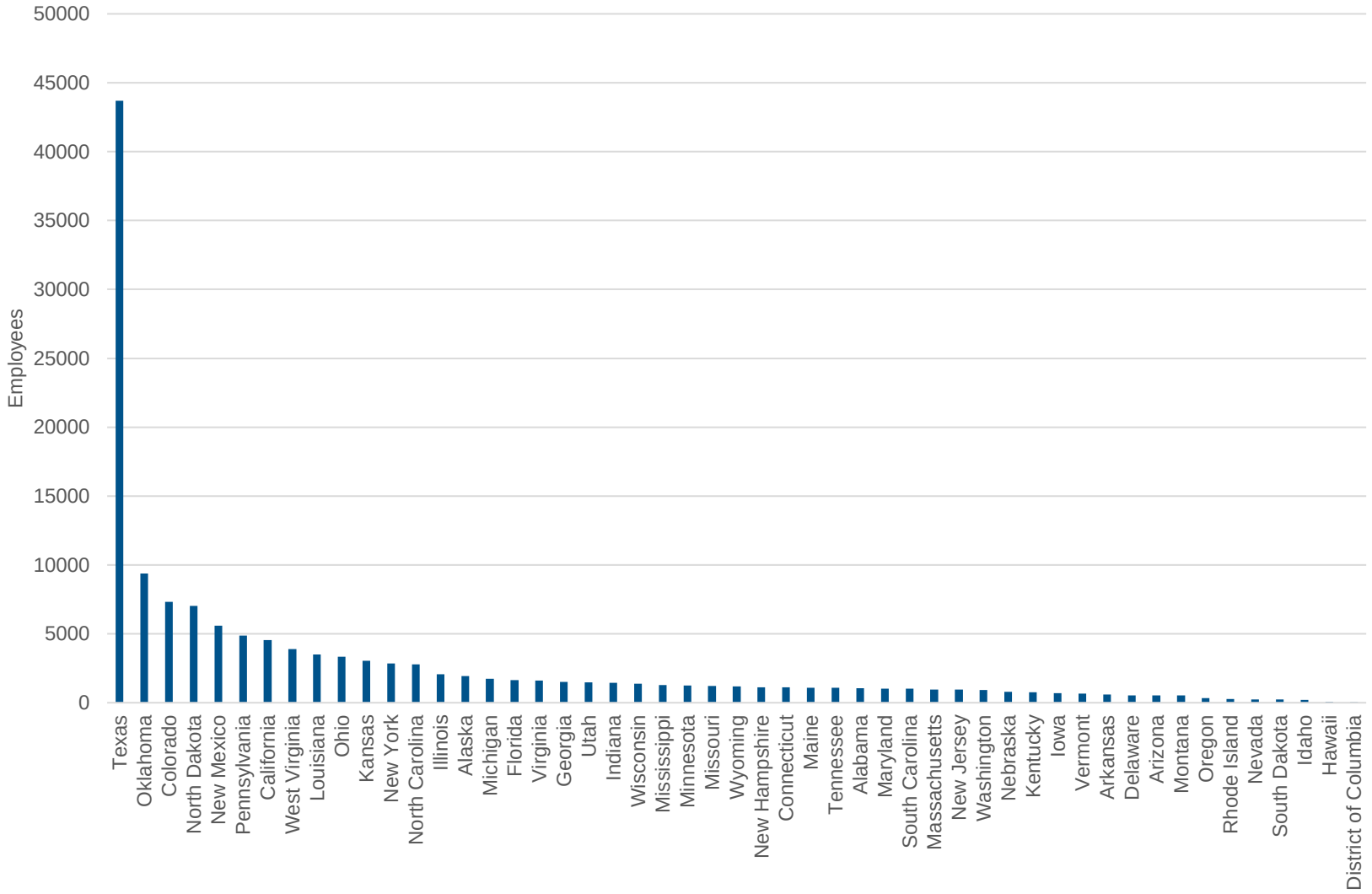
5.5. Total Propane Wages ($Millions) by State

Figure 30. Total Propane Wages ($Millions) by State (Section 3)



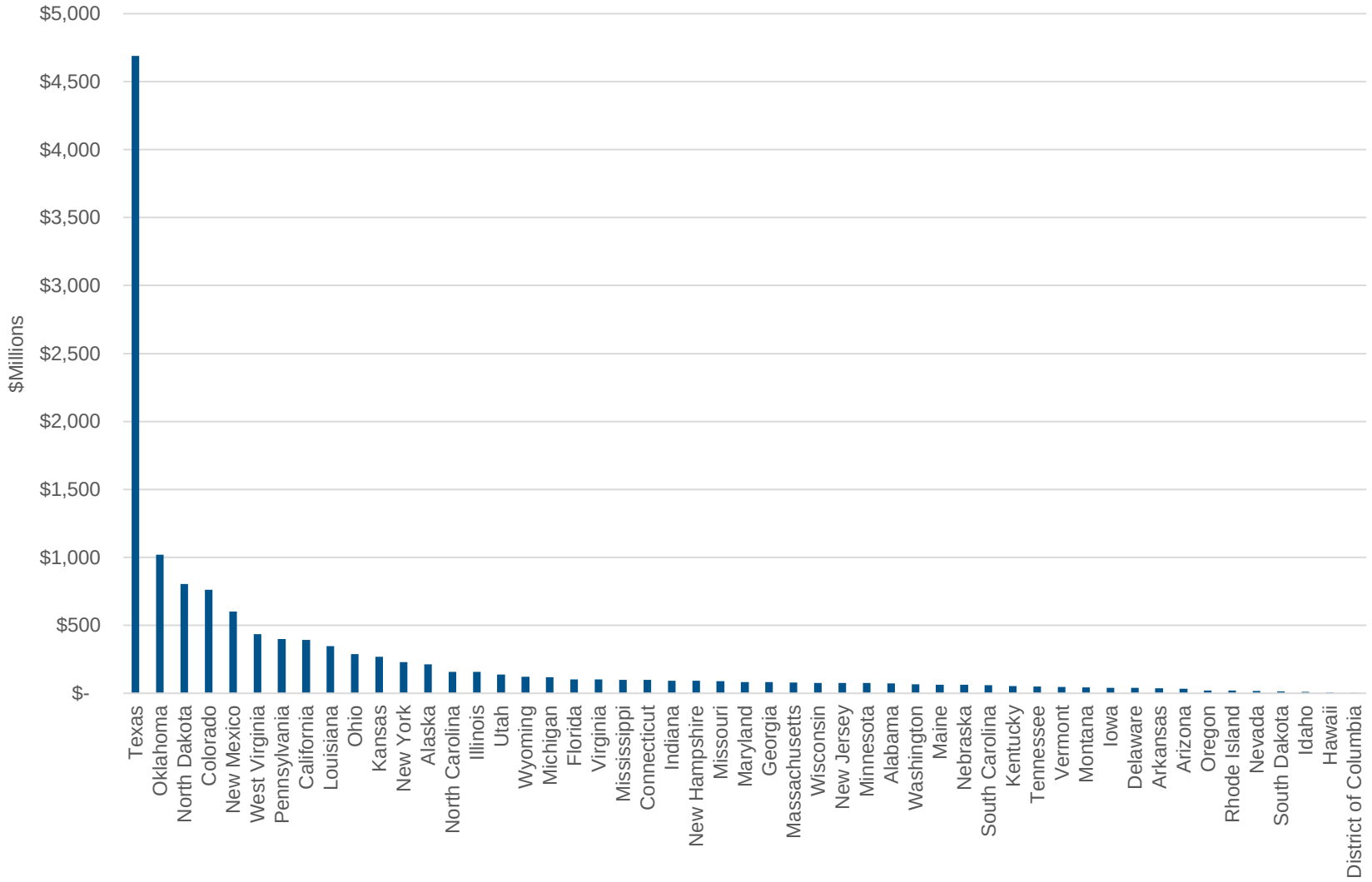
5.6. Total Employment from Natural Gas Liquids and Propane by State

Figure 31. Total Employment from Natural Gas Liquids and Propane by State (Section 3)



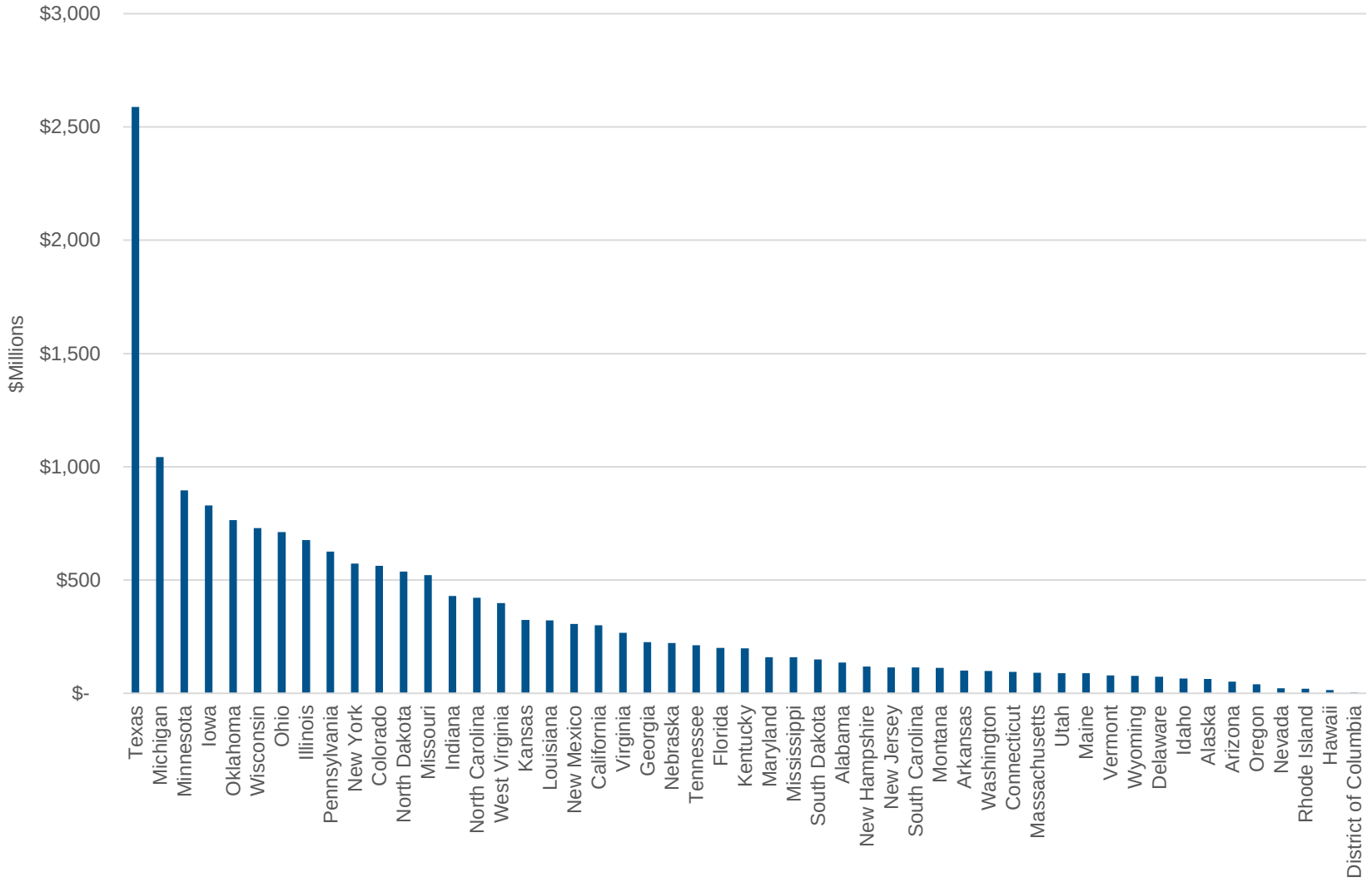
5.7. Total Wages ($Millions) from Natural Gas Liquids and Propane by State

Figure 32. Total Wages ($Millions) from Natural Gas Liquids and Propane by State (Section 3)



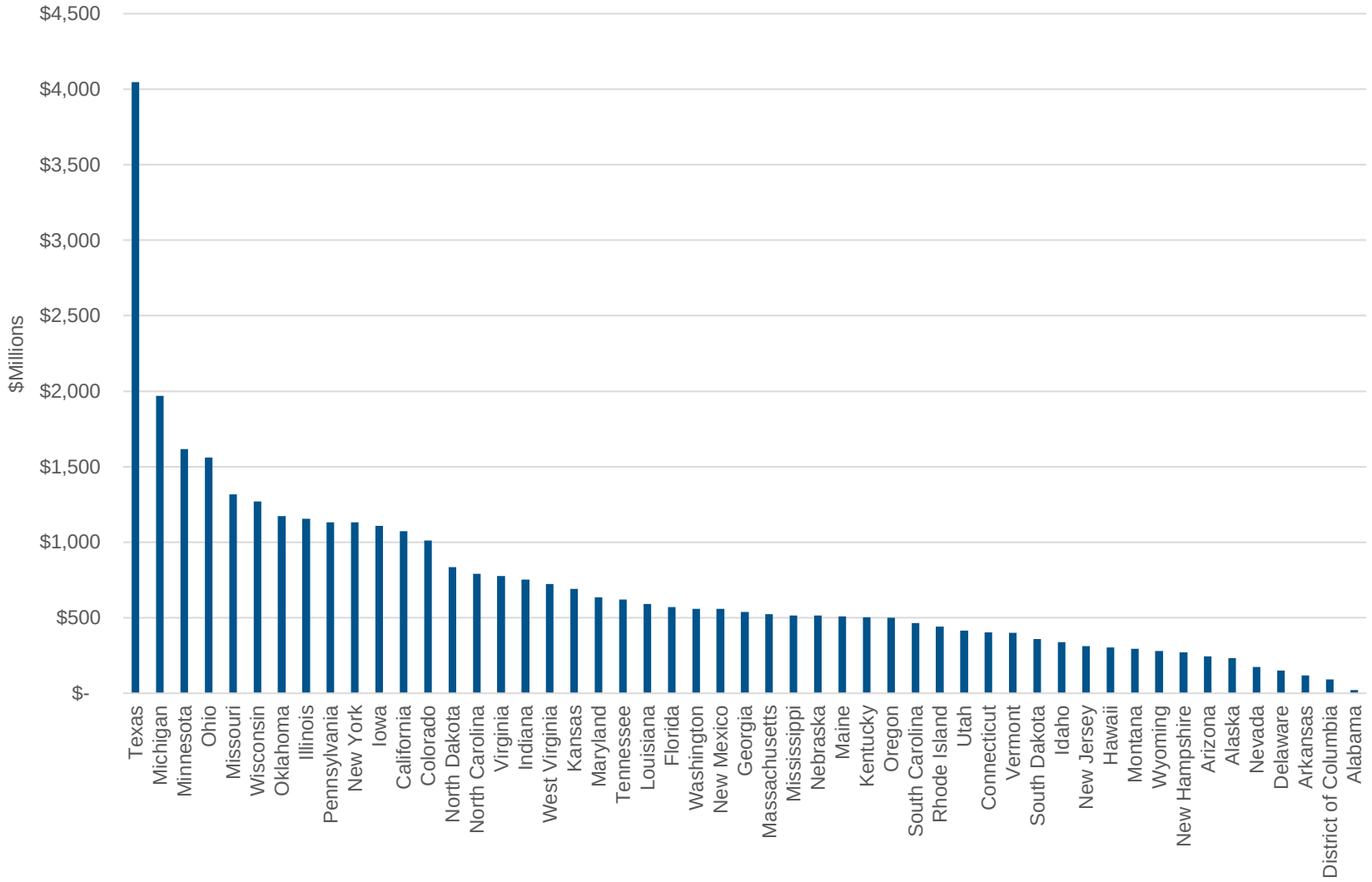
5.8. Direct Added Value from Odorized (Retail) Propane by State

Figure 33. Direct Added Value from Odorized (Retail) Propane by State (Section 4)



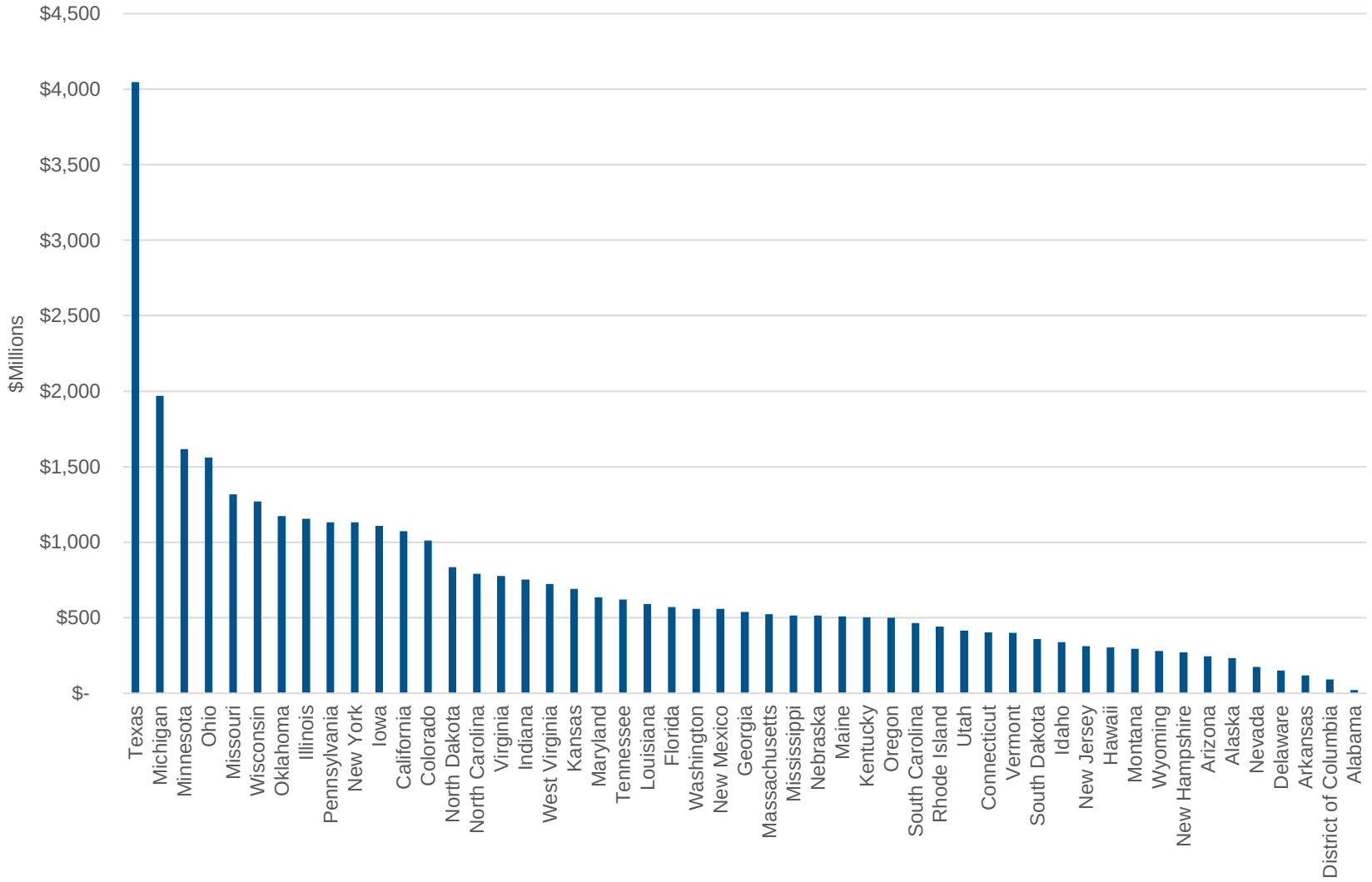
5.9. Indirect and Induced Added Value ($Millions) from Retail Propane by State

Figure 34. Indirect and Induced Added Value ($millions) from Retail Propane by State (Section 4)



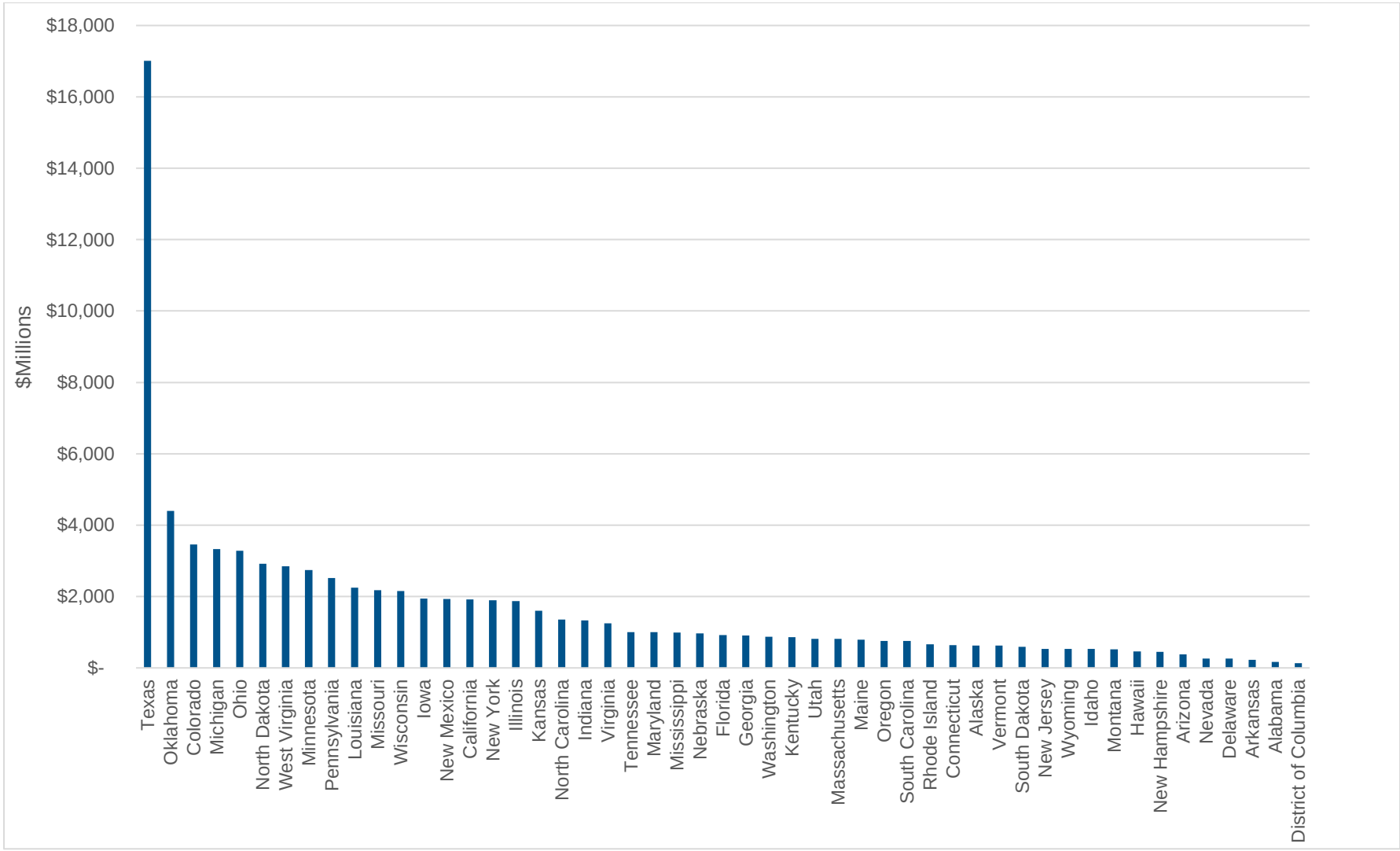
5.10. Total Added Value ($Millions) from Retail Propane by State

Figure 35. Total Added Value ($Millions) from Retail Propane by State (Section 4)



5.11. Total Added Value ($Millions) from Propane by State

Figure 36. Total Added Value ($Millions) from Propane by State (Section 4)



A. Appendix: Odorized Propane Industry's Impact on the U.S. Economy by State

The tables on the following pages present the detailed findings of the value chain analysis at the national and state level.

The top left table on each page shows total odorized propane sales for the region (numbers may not add to total due to independent rounding). These sales are split by end use, with the total number of households using propane for primary space heating shown below.

The top right table shows the odorized propane industry's total contribution to GDP. For the national total, this includes a calculation for domestic and imported direct value. At the state level, the difference between the top-line Total Market Value and the Total Direct Value Added is the difference between in-state propane production and odorized propane brought in from, or sent out to, other states. The final two lines in the table show the indirect and induced value added, as calculated by ICF and allocated to the state level, and the total contribution to national/state/district GDP.

The two boxes in the middle of the page show total employment and wages attributed to odorized propane, allocated by sector. In addition, the first page, showing the U.S. total, shows ICF's estimates for indirect and induced labor and wages at the national level.

The box at the bottom of the page shows production details. At the state level, only refinery and gas processing plant production are shown. For each state, that state's contribution to total U.S. odorized propane production is also shown. Nationally, production is further split into the share of odorized propane coming from domestic and imported feedstock, including Canadian and non-North American crude as well as Canadian "wet" natural gas. The two right-most boxes on the U.S. total table show for every source of odorized propane the share produced from domestic and North American feedstock, including the final share at the bottom.

As illustrated in the Total U.S. table below, odorized propane consumed in the United States is primarily a North American energy resource. Over 85 percent of the product used in the retail propane segment is sourced domestically, with roughly 10 percent imported from Canada, and the remaining 5 percent of propane supply sourced from imported crude oil. As a result of the sharp increase in domestic propane supplies from natural gas production the U.S. now has a much higher degree of domestically supplies propane relative to crude oil, the feedstock for gasoline and distillate, which still imports a large percent of its domestic consumption.

End-Use Categories, as defined by the Annual Retail Propane Sales Report

Residential Sector:

Residential propane sales include odorized propane delivered to and used by residential consumers at their place of residence for fixed applications. Uses include space heating, water heating, cooking, spa/pool use, and other household uses. Residential sector sales include delivery and replacement of 100-pound cylinders attached at fixed locations. Residential sales do not include household use of propane from 20-pound (or similar) cylinders used for portable appliances and applications.

Commercial Sector:

Commercial sector propane sales include odorized propane delivered to and used by commercial entities, such as schools, hospitals, retail outlets, office buildings, and other types of non-industrial outlets. Commercial sales do not include propane used forklifts or engine use. Commercial sales include propane used in on-site standby or backup electric generation at the facility.

Industrial (Non-Forklift) Sector:

Industrial (non-forklift) sector propane sales include odorized propane delivered to and used by industrial or manufacturing facilities for process heating, large scale combined heat and power systems, distributed generation, or as a fuel for furnaces. Propane used by industrial customers in forklifts or other internal combustion engines is reported as Internal Combustion and is not included in industrial (non-forklift) sector.

Agricultural Sector:

Agricultural sector propane sales include odorized propane delivered to and used by agricultural entities that are primarily engaged in growing crops, raising animals, or other agricultural products. Agricultural sector sales include propane used for grain drying, agricultural harvesting activities, weed control, radiant heating systems, crop irrigation engines, and other related agricultural applications. Propane used by agricultural customers in other internal combustion engine applications is reported in the Internal Combustion category.

Cylinder Markets:

Cylinder market sales include Consumer Bottle Refill & Exchange and Rental Yards / RV Refill Stations / Other categories. Propane that is delivered and used in a 20-pound (or similar) cylinder. The definition of propane cylinder markets does not include wholesale or bulk propane sales to other propane retailers, fixed 100-pound (or similar) cylinders attached at fixed residential locations, or cylinders used by forklifts, commercial mowers, or other internal combustion engines.

Internal Combustion:

The Internal Combustion sector includes odorized propane sales for use in internal combustion engines (other than agricultural irrigation engines) in the Propane Autogas, Material Handling (Forklift), and non-Road categories.

A.1 Odorized Propane's Impact on Total U.S. Economy

2018 Odorized Propane Sales Breakout

	(1,000 Gal.)	(% of Total)
Residential	5,184,478	55.6%
Commercial	1,924,122	20.6%
Cylinder	354,431	3.8%
Internal Combustion	479,288	5.1%
Industrial	411,700	4.4%
Agricultural	965,883	10.4%
Total United States Odorized Propane Demand	**9,319,900**	**100.0%**
Total Propane-Heated Households	**5,785,087**	
Propane Share of United States Home Heating		4.76%

2018 Contribution to the U.S. Economy

	($1,000)
Total Market Value of Odorized Propane Sold in the United States	**$17,731,896**
Value in Imported Product and Feedstock	-$862,367
Total Market Value of Odorized Propane of Domestic Origin Sold in the United States	**$16,869,529**
Supply	$4,551,461
Transportation, Storage, and Wholesale	$1,165,542
Retail	$11,304,778
Total Direct Value Added in United States	**$17,021,781**
Indirect and Induced Value Added	36,596,829
Total Odorized Propane Industry Contribution to United States GDP	**$53,618,610**

2018 Employment

Production	11,174
Transportation, Storage, and Wholesale	2,072
Retail	43,864
Direct United States Employment Related to Odorized Propane	**57,110**
Indirect and Induced Labor	39,977
Total United States Employment Related to Odorized Propane	**97,087**

2018 Labor Income

	($1,000)
Production	$1,255,950
Transportation, Storage, and Wholesale	$176,114
Retail	$2,776,019
Direct Labor Income in United States Odorized Propane Industry	**$4,208,083**
Indirect and Induced Labor	$5,260,103
Total Labor Income in the United States Related to Odorized Propane	**$9,468,186**

2018 Odorized Propane Supply

	(1,000 Gal.)				Share of Supply (%)	
	Domestic	Canadian	From Outside N. America	Total	From U.S.	From N. America
Odorized Propane from Crude	804,202	270,555	408,443	1,483,204	8.63%	11.53%
Odorized Propane from Natural Gas	7,142,768	231,993	-	7,374,765	76.64%	79.13%
Total Odorized Propane Produced in the United States	**7,946,970**	**502,548**	**408,443**	**8,857,969**	**85.27%**	**90.66%**
Odorized Propane Imports		434,412	45,351	479,763	0.00%	4.66%
Inventory Changes	(17,817)			(17,817)	-0.19%	-0.19%
Total Supply of Odorized Propane in the United States	**7,929,153**	**936,960**	**453,794**	**9,319,915**	**85.08%**	**95.13%**

Source: Total Home Heating Market Share for Propane includes Single and Multi-Family Housing, as well as Boats, RVs, and other Full-time Residences

A.2 Odorized Propane's Impact on Total U.S. Economy

	In-State Production		In State Consumption		Economic Impact		Propane Heated Households	
State	Total Volume (1,000 Gal)	Share of U.S. Total (%)	Total Volume (1,000 Gal)	Share of U.S. Total (%)	Direct Labor	Total Value Added ($1,000)	Householde	Market Share (%)
Alabama	1,034,385	11.41%	104,090	1.12%	1,612	1,192,665	115,419	6.22%
Alaska	146	0.00%	14,186	0.15%	402	174,798	3,831	1.52%
Arizona	-	0.00%	101,760	1.09%	508	320,889	68,183	2.75%
Arkansas	127,330	1.40%	90,866	0.97%	529	362,919	79,387	6.92%
California	65,318	0.72%	521,173	5.59%	2,821	1,475,007	415,492	3.22%
Colorado	81	0.00%	186,778	2.00%	982	776,086	98,438	4.73%
Connecticut	-	0.00%	134,056	1.44%	1,116	531,173	52,619	3.86%
Delaware	-	0.00%	53,731	0.58%	21	227,274	35,829	10.17%
District of Columbia	-	0.00%	4,137	0.04%	5	100,975	2,926	1.05%
Florida	164,358	1.81%	216,829	2.33%	1,773	1,025,783	72,285	0.96%
Georgia	-	0.00%	218,237	2.34%	1,474	812,708	177,239	4.84%
Hawaii	-	0.00%	40,523	0.43%	6	336,740	5,307	1.17%
Idaho	223	0.00%	66,944	0.72%	188	427,047	29,774	4.89%
Illinois	135,009	1.49%	385,597	4.14%	1,068	2,204,957	198,002	4.11%
Indiana	-	0.00%	232,892	2.50%	1,198	1,231,074	180,475	7.11%
Iowa	-	0.00%	464,656	4.99%	397	2,017,475	163,764	13.08%
Kansas	222,594	2.46%	123,992	1.33%	658	1,218,034	85,570	7.63%
Kentucky	904	0.01%	105,499	1.13%	531	715,361	106,305	6.16%
Louisiana	243,655	2.69%	49,906	0.54%	685	689,355	37,734	2.17%
Maine	-	0.00%	165,582	1.78%	1,095	639,770	52,708	9.51%
Maryland	-	0.00%	123,588	1.33%	1,023	831,638	72,677	3.33%
Massachusetts	-	0.00%	139,295	1.49%	964	654,886	83,401	3.23%
Michigan	6	0.00%	569,045	6.11%	1,622	3,126,068	320,680	8.25%
Minnesota	-	0.00%	497,796	5.34%	1,204	2,613,112	223,289	10.37%
Mississippi	108,563	1.20%	109,529	1.18%	801	736,220	128,596	11.65%
Missouri	-	0.00%	287,431	3.08%	1,086	1,914,908	213,192	8.93%
Montana	1,400	0.02%	105,285	1.13%	330	418,243	50,070	11.92%
Nebraska	-	0.00%	107,796	1.16%	239	774,201	56,003	7.48%
Nevada	-	0.00%	47,914	0.51%	250	209,280	28,298	2.69%
New Hampshire	-	0.00%	185,797	1.99%	1,123	423,710	81,344	15.44%
New Jersey	-	0.00%	82,229	0.88%	757	432,989	61,831	1.93%
New Mexico	122,291	1.35%	80,365	0.86%	1,053	518,115	59,100	7.67%
New York	-	0.00%	418,017	4.49%	2,830	1,789,215	274,348	3.76%
North Carolina	-	0.00%	393,191	4.22%	2,745	1,291,038	280,434	7.24%
North Dakota	55,768	0.62%	120,529	1.29%	881	741,295	40,253	12.92%
Ohio	69,282	0.76%	312,128	3.35%	1,473	2,241,938	241,227	5.21%
Oklahoma	878,225	9.69%	138,022	1.48%	1,708	1,826,424	98,458	6.70%
Oregon	-	0.00%	92,455	0.99%	331	575,524	27,283	1.74%
Pennsylvania	41,441	0.46%	379,570	4.07%	2,480	1,629,642	209,004	4.17%
Rhode Island	-	0.00%	32,728	0.35%	276	482,629	11,518	2.80%
South Carolina	-	0.00%	106,696	1.14%	983	611,561	74,302	3.97%
South Dakota	-	0.00%	83,306	0.89%	232	528,951	53,053	15.63%
Tennessee	888,132	9.80%	117,859	1.26%	1,796	1,803,958	101,513	3.99%
Texas	3,097,930	34.18%	386,445	4.15%	7,705	5,478,122	291,843	3.09%
Utah	58,399	0.64%	55,851	0.60%	335	514,101	20,253	2.16%
Vermont	-	0.00%	119,077	1.28%	646	509,884	40,879	15.81%
Virginia	-	0.00%	250,287	2.69%	1,620	1,102,672	138,822	4.47%
Washington	-	0.00%	194,195	2.08%	845	706,751	83,427	3.03%
West Virginia	848,131	9.36%	39,042	0.42%	856	1,427,555	34,417	4.67%
Wisconsin	-	0.00%	404,806	4.34%	1,358	2,079,534	260,306	11.18%
Wyoming	900,444	9.93%	58,196	0.62%	1,080	1,325,120	22,821	9.91%
U.S. Total	**9,064,015**	**100.00%**	**9,319,903**	**100.00%**	**57,701**	**55,799,376**	**5,663,929**	**4.77%**

A.3 Odorized Propane's Impact on Alabama Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	57,937,996	55.7%
Commercial	23,515,305	22.6%
Cylinder	4,842,059	4.7%
Internal Combustion	5,907,000	5.7%
Industrial	2,336,000	2.2%
Agricultural	9,552,000	9.2%
Total Alabama Odorized Propane Demand	**104,090,360**	**100.0%**
Total Propane-Heated Households	**104,577**	
Propane Share of Alabama Home Heating		5.64%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Alabama ($1,000)	**$205,028**
Supply	$18,458
Transportation, Storage, and Wholesale	$9,968
Retail	$107,726
Total Direct Value Added in Alabama	**$136,152**
Indirect and Induced	$20,193
Total Odorized Propane Industry Contribution to Alabama GDP	**$156,345**

2018 Employment

Production	40
Transportation, Storage, and Wholesale	12
Retail	733
Direct Alabama Employment Related to Odorized Propane	**785**

2018 Labor Income

	($1,000)
Production	$4,466
Transportation, Storage, and Wholesale	$1,030
Retail	$37,555
Direct Labor Income in Alabama Odorized Propane Industry	**$43,051**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	8,704,000	0.59%
Gas Processing Plants	35,389,000	0.50%
Total Alabama Odorized Propane Production	**44,093,000**	**0.51%**

A.4 Odorized Propane's Impact on Alaska Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	3,292,311	23.2%
Commercial	8,151,241	57.5%
Cylinder	1,727,797	12.2%
Internal Combustion	382,000	2.7%
Industrial	613,000	4.3%
Agricultural	20,000	0.1%
Total Alaska Odorized Propane Demand	**14,186,349**	**100.0%**
Total Propane-Heated Households	**5,640**	
Propane Share of Alaska Home Heating		2.22%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Alaska ($1,000)	**$25,748**
Supply	$55,899
Transportation, Storage, and Wholesale	$1,934
Retail	$4,623
Total Direct Value Added in Alaska	**$62,456**
Indirect and Induced	$233,655
Total Odorized Propane Industry Contribution to Alaska GDP	**$296,111**

2018 Employment

Production	273
Transportation, Storage, and Wholesale	5
Retail	121
Direct Alaska Employment Related to Odorized Propane	**400**

2018 Labor Income

	($1,000)
Production	$30,537
Transportation, Storage, and Wholesale	$485
Retail	$4,518
Direct Labor Income in Alaska Odorized Propane Industry	**$35,540**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	6,424,000	0.43%
Gas Processing Plants	34,996,000	0.49%
Total Alaska Odorized Propane Production	**41,420,000**	**0.48%**

A.5 Odorized Propane's Impact on Arizona Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	46,669,793	45.9%
Commercial	26,424,998	26.0%
Cylinder	7,854,104	7.7%
Internal Combustion	8,118,000	8.0%
Industrial	11,581,000	11.4%
Agricultural	1,112,000	1.1%
Total Arizona Odorized Propane Demand	**101,759,894**	**100.0%**
Total Propane-Heated Households	**74,563**	
Propane Share of Arizona Home Heating		2.85%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Arizona ($1,000)	**$194,165**
Supply	$2
Transportation, Storage, and Wholesale	$8,828
Retail	$42,723
Total Direct Value Added in Arizona	**$51,553**
Indirect and Induced	$245,157
Total Odorized Propane Industry Contribution to Arizona GDP	**$296,710**

2018 Employment

Production	0
Transportation, Storage, and Wholesale	11
Retail	498
Direct Arizona Employment Related to Odorized Propane	**508**

2018 Labor Income

	($1,000)
Production	$2
Transportation, Storage, and Wholesale	$2,258
Retail	$28,692
Direct Labor Income in Arizona Odorized Propane Industry	**$30,952**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Arizona Odorized Propane Production	**-**	**0.00%**

A.6 Odorized Propane's Impact on Arkansas Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	40,421,366	44.5%
Commercial	12,831,830	14.1%
Cylinder	3,236,813	3.6%
Internal Combustion	4,782,000	5.3%
Industrial	4,218,000	4.6%
Agricultural	25,376,000	27.9%
Total Arkansas Odorized Propane Demand	**90,866,008**	**100.0%**
Total Propane-Heated Households	**82,510**	
Propane Share of Arkansas Home Heating		7.14%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Arkansas ($1,000)	**$175,427**
Supply	$1,350
Transportation, Storage, and Wholesale	$8,494
Retail	$90,456
Total Direct Value Added in Arkansas	**$100,300**
Indirect and Induced	$119,229
Total Odorized Propane Industry Contribution to Arkansas GDP	**$219,528**

2018 Employment

Production	8
Transportation, Storage, and Wholesale	10
Retail	415
Direct Arkansas Employment Related to Odorized Propane	**433**

2018 Labor Income

	($1,000)
Production	$884
Transportation, Storage, and Wholesale	$783
Retail	$21,668
Direct Labor Income in Arkansas Odorized Propane Industry	**$23,335**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	1,147,000	0.08%
Gas Processing Plants	848,000	0.01%
Total Arkansas Odorized Propane Production	**1,995,000**	**0.02%**

A.7 Odorized Propane's Impact on California Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	217,844,454	41.8%
Commercial	136,994,351	26.3%
Cylinder	45,443,707	8.7%
Internal Combustion	46,069,000	8.8%
Industrial	23,885,000	4.6%
Agricultural	50,936,000	9.8%
Total California Odorized Propane Demand	**521,172,512**	**100.0%**
Total Propane-Heated Households	**426,163**	
Propane Share of California Home Heating		3.26%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in California ($1,000)	**$985,458**
Supply	$42,898
Transportation, Storage, and Wholesale	$47,950
Retail	$209,756
Total Direct Value Added in California	**$300,604**
Indirect and Induced	$1,073,817
Total Odorized Propane Industry Contribution to California GDP	**$1,374,420**

2018 Employment

Production	267
Transportation, Storage, and Wholesale	54
Retail	2,425
Direct California Employment Related to Odorized Propane	**2,746**

2018 Labor Income

	($1,000)
Production	$30,035
Transportation, Storage, and Wholesale	$4,359
Retail	$160,511
Direct Labor Income in California Odorized Propane Industry	**$194,905**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	84,616,000	5.70%
Gas Processing Plants	16,592,000	0.23%
Total California Odorized Propane Production	**101,208,000**	**1.17%**

A.8 Odorized Propane's Impact on Colorado Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	117,715,255	63.0%
Commercial	29,139,312	15.6%
Cylinder	9,195,837	4.9%
Internal Combustion	9,046,000	4.8%
Industrial	13,756,000	7.4%
Agricultural	7,926,000	4.2%
Total Colorado Odorized Propane Demand	**186,778,404**	**100.0%**
Total Propane-Heated Households	**103,320**	
Propane Share of Colorado Home Heating		4.75%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Colorado ($1,000)	**$344,127**
Supply	$358,158
Transportation, Storage, and Wholesale	$37,428
Retail	$167,912
Total Direct Value Added in Colorado	**$563,497**
Indirect and Induced	$1,011,227
Total Odorized Propane Industry Contribution to Colorado GDP	**$1,574,724**

2018 Employment

Production	793
Transportation, Storage, and Wholesale	103
Retail	642
Direct Colorado Employment Related to Odorized Propane	**1,538**

2018 Labor Income

	($1,000)
Production	$89,037
Transportation, Storage, and Wholesale	$8,913
Retail	$38,571
Direct Labor Income in Colorado Odorized Propane Industry	**$136,521**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	3,265,000	0.22%
Gas Processing Plants	694,748,000	9.73%
Total Colorado Odorized Propane Production	**698,013,000**	**8.09%**

A.9 Odorized Propane's Impact on Connecticut Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	93,519,438	69.8%
Commercial	30,459,493	22.7%
Cylinder	3,406,005	2.5%
Internal Combustion	3,164,000	2.4%
Industrial	2,277,000	1.7%
Agricultural	1,230,000	0.9%
Total Connecticut Odorized Propane Demand	**134,055,937**	**100.0%**
Total Propane-Heated Households	**60,526**	
Propane Share of Connecticut Home Heating		4.39%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Connecticut ($1,000)	**$309,091**
Supply	$0
Transportation, Storage, and Wholesale	$11,629
Retail	$82,279
Total Direct Value Added in Connecticut	**$93,908**
Indirect and Induced	$403,504
Total Odorized Propane Industry Contribution to Connecticut GDP	**$497,412**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	11
Retail	1,099
Direct Connecticut Employment Related to Odorized Propane	**1,110**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$875
Retail	$95,979
Direct Labor Income in Connecticut Odorized Propane Industry	**$96,854**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Connecticut Odorized Propane Production	**-**	**0.00%**

A.10 Odorized Propane's Impact on Delaware Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	30,493,413	56.8%
Commercial	11,137,438	20.7%
Cylinder	921,725	1.7%
Internal Combustion	1,794,000	3.3%
Industrial	950,000	1.8%
Agricultural	8,434,000	15.7%
Total Delaware Odorized Propane Demand	**53,730,577**	**100.0%**
Total Propane-Heated Households	**37,299**	
Propane Share of Delaware Home Heating		10.14%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Delaware ($1,000)	**$119,148**
Supply	$2,422
Transportation, Storage, and Wholesale	$5,094
Retail	$65,099
Total Direct Value Added in Delaware	**$72,615**
Indirect and Induced	$149,630
Total Odorized Propane Industry Contribution to Delaware GDP	**$222,245**

2018 Employment

Production	1
Transportation, Storage, and Wholesale	6
Retail	518
Direct Delaware Employment Related to Odorized Propane	**526**

2018 Labor Income

	($1,000)
Production	$201
Transportation, Storage, and Wholesale	$475
Retail	$37,975
Direct Labor Income in Delaware Odorized Propane Industry	**$38,651**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	14,673,000	0.99%
Gas Processing Plants	-	0.00%
Total Delaware Odorized Propane Production	**14,673,000**	**0.17%**

A.11 Odorized Propane's Impact on District of Columbia Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	2,000	1.2%
Commercial	9,705	5.7%
Cylinder	47,000	27.7%
Internal Combustion	1,000	0.6%
Industrial	110,000	64.8%
Agricultural	-	0.0%
Total District of Columbia Odorized Propane Demand	**169,705**	**100.0%**
Total Propane-Heated Households	**3,024**	
Propane Share of District of Columbia Home		1.05%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in District of Columbia ($1,000)	**$9,016**
Supply	$0
Transportation, Storage, and Wholesale	$344
Retail	$5,025
Total Direct Value Added in District of Columbia	**$5,369**
Indirect and Induced	$90,867
Contribution to District of Columbia GDP	**$96,236**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	1
Retail	49
Direct District of Columbia Employment Related to Odorized Propane	**50**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$26
Retail	$1,053
Direct Labor Income in District of Columbia Odorized Propane Industry	**$1,079**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total District of Columbia Odorized Propane Production	**-**	**0.00%**

A.12 Odorized Propane's Impact on Florida Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	54,727,202	25.2%
Commercial	87,707,966	40.5%
Cylinder	19,335,722	8.9%
Internal Combustion	20,690,000	9.5%
Industrial	25,233,000	11.6%
Agricultural	9,135,000	4.2%
Total Florida Odorized Propane Demand	**216,828,891**	**100.0%**
Total Propane-Heated Households	**63,395**	
Propane Share of Florida Home Heating		0.81%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Florida ($1,000)	**$402,407**
Supply	$720
Transportation, Storage, and Wholesale	$18,820
Retail	$181,760
Total Direct Value Added in Florida	**$201,299**
Indirect and Induced	$570,070
Total Odorized Propane Industry Contribution to Florida GDP	**$771,369**

2018 Employment

Production	3
Transportation, Storage, and Wholesale	18
Retail	1,603
Direct Florida Employment Related to Odorized Propane	**1,624**

2018 Labor Income

	($1,000)
Production	$360
Transportation, Storage, and Wholesale	$1,421
Retail	$97,908
Direct Labor Income in Florida Odorized Propane Industry	**$99,689**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	673,000	0.01%
Total Florida Odorized Propane Production	**673,000**	**0.01%**

A.13 Odorized Propane's Impact on Georgia Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	86,799,713	39.8%
Commercial	44,389,627	20.3%
Cylinder	8,690,369	4.0%
Internal Combustion	27,338,000	12.5%
Industrial	9,110,000	4.2%
Agricultural	41,909,000	19.2%
Total Georgia Odorized Propane Demand	**218,236,709**	**100.0%**
Total Propane-Heated Households	**173,300**	
Propane Share of Georgia Home Heating		4.56%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Georgia ($1,000)	**$423,962**
Supply	$0
Transportation, Storage, and Wholesale	$24,087
Retail	$202,045
Total Direct Value Added in Georgia	**$226,132**
Indirect and Induced	$537,924
Total Odorized Propane Industry Contribution to Georgia GDP	**$764,056**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	37
Retail	1,431
Direct Georgia Employment Related to Odorized Propane	**1,468**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$2,983
Retail	$74,525
Direct Labor Income in Georgia Odorized Propane Industry	**$77,507**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Georgia Odorized Propane Production	**-**	**0.00%**

A.14 Odorized Propane's Impact on Hawaii Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	4,462,701	11.0%
Commercial	31,083,965	76.7%
Cylinder	515,809	1.3%
Internal Combustion	146,000	0.4%
Industrial	4,315,000	10.6%
Agricultural	-	0.0%
Total Hawaii Odorized Propane Demand	**40,523,474**	**100.0%**
Total Propane-Heated Households	**7,370**	
Propane Share of Hawaii Home Heating		1.62%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Hawaii ($1,000)	**$71,549**
Supply	$0
Transportation, Storage, and Wholesale	$3,677
Retail	$11,192
Total Direct Value Added in Hawaii	**$14,868**
Indirect and Induced	$303,842
Total Odorized Propane Industry Contribution to Hawaii GDP	**$318,711**

2018 Employment

Production	1
Transportation, Storage, and Wholesale	4
Retail	58
Direct Hawaii Employment Related to Odorized Propane	**63**

2018 Labor Income

	($1,000)
Production	$83
Transportation, Storage, and Wholesale	$311
Retail	$7,680
Direct Labor Income in Hawaii Odorized Propane Industry	**$8,074**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	5,470,000	0.37%
Gas Processing Plants	-	0.00%
Total Hawaii Odorized Propane Production	**5,470,000**	**0.06%**

A.15 Odorized Propane's Impact on Idaho Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	40,466,253	60.4%
Commercial	16,771,052	25.1%
Cylinder	1,611,952	2.4%
Internal Combustion	1,114,000	1.7%
Industrial	1,916,000	2.9%
Agricultural	5,065,000	7.6%
Total Idaho Odorized Propane Demand	**66,944,258**	**100.0%**
Total Propane-Heated Households	**31,162**	
Propane Share of Idaho Home Heating		4.87%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Idaho ($1,000)	**$123,135**
Supply	$300
Transportation, Storage, and Wholesale	$5,815
Retail	$59,975
Total Direct Value Added in Idaho	**$66,090**
Indirect and Induced	$339,921
Total Odorized Propane Industry Contribution to Idaho GDP	**$406,011**

2018 Employment

Production	1
Transportation, Storage, and Wholesale	6
Retail	180
Direct Idaho Employment Related to Odorized Propane	**186**

2018 Labor Income

	($1,000)
Production	$59
Transportation, Storage, and Wholesale	$440
Retail	$8,849
Direct Labor Income in Idaho Odorized Propane Industry	**$9,348**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	553,000	0.01%
Total Idaho Odorized Propane Production	**553,000**	**0.01%**

A.16 Odorized Propane's Impact on Illinois Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	233,158,193	60.5%
Commercial	38,186,531	9.9%
Cylinder	10,528,437	2.7%
Internal Combustion	34,544,000	9.0%
Industrial	12,762,000	3.3%
Agricultural	56,418,000	14.6%
Total Illinois Odorized Propane Demand	**385,597,162**	**100.0%**
Total Propane-Heated Households	**201,831**	
Propane Share of Illinois Home Heating		4.15%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Illinois ($1,000)	**$667,595**
Supply	-$33,238
Transportation, Storage, and Wholesale	$50,528
Retail	$659,787
Total Direct Value Added in Illinois	**$677,076**
Indirect and Induced	$1,156,225
Total Odorized Propane Industry Contribution to Illinois GDP	**$1,833,301**

2018 Employment

Production	52
Transportation, Storage, and Wholesale	58
Retail	976
Direct Illinois Employment Related to Odorized Propane	**1,085**

2018 Labor Income

	($1,000)
Production	$5,984
Transportation, Storage, and Wholesale	$4,784
Retail	$53,814
Direct Labor Income in Illinois Odorized Propane Industry	**$64,582**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	76,955,000	5.19%
Gas Processing Plants	38,528,000	0.54%
Total Illinois Odorized Propane Production	**115,483,000**	**1.34%**

A.17 Odorized Propane's Impact on Indiana Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	139,903,632	60.1%
Commercial	35,168,126	15.1%
Cylinder	7,942,604	3.4%
Internal Combustion	16,985,000	7.3%
Industrial	5,724,000	2.5%
Agricultural	27,169,000	11.7%
Total Indiana Odorized Propane Demand	**232,892,362**	**100.0%**
Total Propane-Heated Households	**184,265**	
Propane Share of Indiana Home Heating		7.09%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Indiana ($1,000)	**$402,889**
Supply	$329
Transportation, Storage, and Wholesale	$30,920
Retail	$398,171
Total Direct Value Added in Indiana	**$429,420**
Indirect and Induced	$752,536
Total Odorized Propane Industry Contribution to Indiana GDP	**$1,181,956**

2018 Employment

Production	5
Transportation, Storage, and Wholesale	58
Retail	1,137
Direct Indiana Employment Related to Odorized Propane	**1,200**

2018 Labor Income

	($1,000)
Production	$675
Transportation, Storage, and Wholesale	$4,744
Retail	$64,887
Direct Labor Income in Indiana Odorized Propane Industry	**$70,306**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	35,309,000	2.38%
Gas Processing Plants	-	0.00%
Total Indiana Odorized Propane Production	**35,309,000**	**0.41%**

A.18 Odorized Propane's Impact on Iowa Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	240,850,806	51.8%
Commercial	39,130,849	8.4%
Cylinder	6,758,726	1.5%
Internal Combustion	11,149,000	2.4%
Industrial	6,666,000	1.4%
Agricultural	160,101,000	34.5%
Total Iowa Odorized Propane Demand	**464,656,381**	**100.0%**
Total Propane-Heated Households	**165,484**	
Propane Share of Iowa Home Heating		13.05%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Iowa ($1,000)	**$797,439**
Supply	$0
Transportation, Storage, and Wholesale	$41,159
Retail	$787,969
Total Direct Value Added in Iowa	**$829,128**
Indirect and Induced	$1,109,325
Total Odorized Propane Industry Contribution to Iowa GDP	**$1,938,453**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	(2)
Retail	471
Direct Iowa Employment Related to Odorized Propane	**468**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	-$188
Retail	$23,699
Direct Labor Income in Iowa Odorized Propane Industry	**$23,511**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Iowa Odorized Propane Production	**-**	**0.00%**

A.19 Odorized Propane's Impact on Kansas Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	88,423,188	71.3%
Commercial	9,459,978	7.6%
Cylinder	3,656,546	2.9%
Internal Combustion	9,656,000	7.8%
Industrial	7,361,000	5.9%
Agricultural	5,435,000	4.4%
Total Kansas Odorized Propane Demand	**123,991,712**	**100.0%**
Total Propane-Heated Households	**89,272**	
Propane Share of Kansas Home Heating		7.88%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Kansas ($1,000)	**$217,059**
Supply	$64,282
Transportation, Storage, and Wholesale	$44,827
Retail	$214,568
Total Direct Value Added in Kansas	**$323,677**
Indirect and Induced	$690,700
Total Odorized Propane Industry Contribution to Kansas GDP	**$1,014,377**

2018 Employment

Production	129
Transportation, Storage, and Wholesale	137
Retail	311
Direct Kansas Employment Related to Odorized Propane	**577**

2018 Labor Income

	($1,000)
Production	$14,506
Transportation, Storage, and Wholesale	$11,284
Retail	$16,092
Direct Labor Income in Kansas Odorized Propane Industry	**$41,882**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	24,085,000	1.62%
Gas Processing Plants	91,203,000	1.28%
Total Kansas Odorized Propane Production	**115,288,000**	**1.34%**

A.20 Odorized Propane's Impact on Kentucky Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	61,492,485	58.3%
Commercial	21,032,273	19.9%
Cylinder	3,290,788	3.1%
Internal Combustion	9,556,000	9.1%
Industrial	4,683,000	4.4%
Agricultural	5,444,000	5.2%
Total Kentucky Odorized Propane Demand	**105,498,546**	**100.0%**
Total Propane-Heated Households	**110,523**	
Propane Share of Kentucky Home Heating		6.38%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Kentucky ($1,000)	**$182,405**
Supply	$8,515
Transportation, Storage, and Wholesale	$10,017
Retail	$180,266
Total Direct Value Added in Kentucky	**$198,799**
Indirect and Induced	$504,162
Total Odorized Propane Industry Contribution to Kentucky GDP	**$702,961**

2018 Employment

Production	19
Transportation, Storage, and Wholesale	12
Retail	512
Direct Kentucky Employment Related to Odorized Propane	**543**

2018 Labor Income

	($1,000)
Production	$2,148
Transportation, Storage, and Wholesale	$972
Retail	$27,703
Direct Labor Income in Kentucky Odorized Propane Industry	**$30,822**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	21,551,000	1.45%
Gas Processing Plants	15,636,000	0.22%
Total Kentucky Odorized Propane Production	**37,187,000**	**0.43%**

A.21 Odorized Propane's Impact on Louisiana Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	14,866,442	29.8%
Commercial	12,107,780	24.3%
Cylinder	4,249,622	8.5%
Internal Combustion	5,060,000	10.1%
Industrial	3,022,000	6.1%
Agricultural	10,600,000	21.2%
Total Louisiana Odorized Propane Demand	**49,905,844**	**100.0%**
Total Propane-Heated Households	**30,367**	
Propane Share of Louisiana Home Heating		1.75%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Louisiana ($1,000)	**$93,743**
Supply	$256,217
Transportation, Storage, and Wholesale	$18,827
Retail	$47,052
Total Direct Value Added in Louisiana	**$322,096**
Indirect and Induced	$590,939
Total Odorized Propane Industry Contribution to Louisiana GDP	**$913,035**

2018 Employment

Production	311
Transportation, Storage, and Wholesale	54
Retail	394
Direct Louisiana Employment Related to Odorized Propane	**759**

2018 Labor Income

	($1,000)
Production	$35,793
Transportation, Storage, and Wholesale	$4,663
Retail	$17,367
Direct Labor Income in Louisiana Odorized Propane Industry	**$57,823**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	341,331,000	23.01%
Gas Processing Plants	252,276,000	3.53%
Total Louisiana Odorized Propane Production	**593,607,000**	**6.88%**

A.22 Odorized Propane's Impact on Maine Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	82,868,772	50.0%
Commercial	75,979,697	45.9%
Cylinder	2,711,767	1.6%
Internal Combustion	890,000	0.5%
Industrial	2,603,000	1.6%
Agricultural	529,000	0.3%
Total Maine Odorized Propane Demand	**165,582,236**	**100.0%**
Total Propane-Heated Households	**61,194**	
Propane Share of Maine Home Heating		10.73%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Maine ($1,000)	**$354,259**
Supply	$0
Transportation, Storage, and Wholesale	$14,364
Retail	$73,874
Total Direct Value Added in Maine	**$88,238**
Indirect and Induced	$507,974
Total Odorized Propane Industry Contribution to Maine GDP	**$596,212**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	14
Retail	1,074
Direct Maine Employment Related to Odorized Propane	**1,088**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$1,081
Retail	$61,719
Direct Labor Income in Maine Odorized Propane Industry	**$62,800**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Maine Odorized Propane Production	**-**	**0.00%**

A.23 Odorized Propane's Impact on Maryland Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	71,409,000	56.0%
Commercial	28,764,220	22.6%
Cylinder	6,632,000	5.2%
Internal Combustion	4,447,000	3.5%
Industrial	4,243,000	3.3%
Agricultural	12,059,000	9.5%
Total Maryland Odorized Propane Demand	**127,554,220**	**100.0%**
Total Propane-Heated Households	**80,754**	
Propane Share of Maryland Home Heating		3.64%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Maryland ($1,000)	**$273,384**
Supply	$0
Transportation, Storage, and Wholesale	$10,735
Retail	$148,889
Total Direct Value Added in Maryland	**$159,625**
Indirect and Induced	$634,705
Total Odorized Propane Industry Contribution to Maryland GDP	**$794,330**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	10
Retail	1,008
Direct Maryland Employment Related to Odorized Propane	**1,018**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$808
Retail	$80,063
Direct Labor Income in Maryland Odorized Propane Industry	**$80,871**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Maryland Odorized Propane Production	**-**	**0.00%**

A.24 Odorized Propane's Impact on Massachusetts Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	89,359,437	64.2%
Commercial	37,477,142	26.9%
Cylinder	5,147,767	3.7%
Internal Combustion	3,949,000	2.8%
Industrial	1,573,000	1.1%
Agricultural	1,789,000	1.3%
Total Massachusetts Odorized Propane Demand	**139,295,346**	**100.0%**
Total Propane-Heated Households	**92,227**	
Propane Share of Massachusetts Home Heating		3.51%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Massachusetts ($1,000)	**$314,525**
Supply	$0
Transportation, Storage, and Wholesale	$12,084
Retail	$78,792
Total Direct Value Added in Massachusetts	**$90,876**
Indirect and Induced	$524,303
Total Odorized Propane Industry Contribution to Massachusetts GDP	**$615,179**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	11
Retail	946
Direct Massachusetts Employment Related to Odorized Propane	**958**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$909
Retail	$77,498
Direct Labor Income in Massachusetts Odorized Propane Industry	**$78,407**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Massachusetts Odorized Propane Production	**-**	**0.00%**

A.25 Odorized Propane's Impact on Michigan Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	453,302,283	79.7%
Commercial	48,229,084	8.5%
Cylinder	13,287,456	2.3%
Internal Combustion	25,275,000	4.4%
Industrial	5,456,000	1.0%
Agricultural	23,495,000	4.1%
Total Michigan Odorized Propane Demand	**569,044,823**	**100.0%**
Total Propane-Heated Households	**332,085**	
Propane Share of Michigan Home Heating		8.39%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Michigan ($1,000)	**$1,000,965**
Supply	$3,299
Transportation, Storage, and Wholesale	$50,597
Retail	$989,576
Total Direct Value Added in Michigan	**$1,043,473**
Indirect and Induced	$1,970,636
Total Odorized Propane Industry Contribution to Michigan GDP	**$3,014,109**

2018 Employment

Production	12
Transportation, Storage, and Wholesale	51
Retail	1,541
Direct Michigan Employment Related to Odorized Propane	**1,604**

2018 Labor Income

	($1,000)
Production	$1,403
Transportation, Storage, and Wholesale	$4,094
Retail	$98,331
Direct Labor Income in Michigan Odorized Propane Industry	**$103,829**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	10,494,000	0.71%
Gas Processing Plants	5,026,000	0.07%
Total Michigan Odorized Propane Production	**15,520,000**	**0.18%**

A.26 Odorized Propane's Impact on Minnesota Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	299,198,933	60.1%
Commercial	68,139,820	13.7%
Cylinder	7,996,007	1.6%
Internal Combustion	5,165,000	1.0%
Industrial	5,721,000	1.1%
Agricultural	111,575,000	22.4%
Total Minnesota Odorized Propane Demand	**497,795,759**	**100.0%**
Total Propane-Heated Households	**237,190**	
Propane Share of Minnesota Home Heating		10.81%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Minnesota ($1,000)	**$860,587**
Supply	$0
Transportation, Storage, and Wholesale	$44,789
Retail	$850,496
Total Direct Value Added in Minnesota	**$895,284**
Indirect and Induced	$1,617,032
Total Odorized Propane Industry Contribution to Minnesota GDP	**$2,512,317**

2018 Employment

Production	2
Transportation, Storage, and Wholesale	47
Retail	1,140
Direct Minnesota Employment Related to Odorized Propane	**1,189**

2018 Labor Income

	($1,000)
Production	$295
Transportation, Storage, and Wholesale	$3,723
Retail	$65,171
Direct Labor Income in Minnesota Odorized Propane Industry	**$69,188**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	25,608,000	1.73%
Gas Processing Plants	-	0.00%
Total Minnesota Odorized Propane Production	**25,608,000**	**0.30%**

A.27 Odorized Propane's Impact on Mississippi Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	58,022,034	53.0%
Commercial	15,435,863	14.1%
Cylinder	2,553,267	2.3%
Internal Combustion	4,621,000	4.2%
Industrial	6,003,000	5.5%
Agricultural	22,894,000	20.9%
Total Mississippi Odorized Propane Demand	**109,529,165**	**100.0%**
Total Propane-Heated Households	**123,545**	
Propane Share of Mississippi Home Heating		11.14%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Mississippi ($1,000)	**$214,845**
Supply	$34,311
Transportation, Storage, and Wholesale	$11,489
Retail	$112,451
Total Direct Value Added in Mississippi	**$158,251**
Indirect and Induced	$515,975
Total Odorized Propane Industry Contribution to Mississippi GDP	**$674,226**

2018 Employment

Production	69
Transportation, Storage, and Wholesale	17
Retail	673
Direct Mississippi Employment Related to Odorized Propane	**760**

2018 Labor Income

	($1,000)
Production	$7,852
Transportation, Storage, and Wholesale	$1,403
Retail	$34,344
Direct Labor Income in Mississippi Odorized Propane Industry	**$43,599**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	35,966,000	2.42%
Gas Processing Plants	52,118,000	0.73%
Total Mississippi Odorized Propane Production	**88,084,000**	**1.02%**

A.28 Odorized Propane's Impact on Missouri Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	172,848,278	60.1%
Commercial	55,685,183	19.4%
Cylinder	7,806,135	2.7%
Internal Combustion	14,647,000	5.1%
Industrial	9,754,000	3.4%
Agricultural	26,690,000	9.3%
Total Missouri Odorized Propane Demand	**287,430,596**	**100.0%**
Total Propane-Heated Households	**213,759**	
Propane Share of Missouri Home Heating		8.78%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Missouri ($1,000)	**$497,512**
Supply	$18
Transportation, Storage, and Wholesale	$30,161
Retail	$491,690
Total Direct Value Added in Missouri	**$521,869**
Indirect and Induced	$1,316,835
Total Odorized Propane Industry Contribution to Missouri GDP	**$1,838,703**

2018 Employment

Production	1
Transportation, Storage, and Wholesale	43
Retail	1,034
Direct Missouri Employment Related to Odorized Propane	**1,078**

2018 Labor Income

	($1,000)
Production	$14
Transportation, Storage, and Wholesale	$3,456
Retail	$75,543
Direct Labor Income in Missouri Odorized Propane Industry	**$79,013**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Missouri Odorized Propane Production	**-**	**0.00%**

A.29 Odorized Propane's Impact on Montana Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	74,260,091	70.5%
Commercial	25,375,582	24.1%
Cylinder	1,124,908	1.1%
Internal Combustion	593,000	0.6%
Industrial	2,093,000	2.0%
Agricultural	1,838,000	1.7%
Total Montana Odorized Propane Demand	**105,284,581**	**100.0%**
Total Propane-Heated Households	**56,685**	
Propane Share of Montana Home Heating		13.14%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Montana ($1,000)	**$194,864**
Supply	$7,607
Transportation, Storage, and Wholesale	$9,401
Retail	$95,540
Total Direct Value Added in Montana	**$112,549**
Indirect and Induced	$294,894
Total Odorized Propane Industry Contribution to Montana GDP	**$407,443**

2018 Employment

Production	35
Transportation, Storage, and Wholesale	10
Retail	281
Direct Montana Employment Related to Odorized Propane	**327**

2018 Labor Income

	($1,000)
Production	$3,963
Transportation, Storage, and Wholesale	$790
Retail	$16,402
Direct Labor Income in Montana Odorized Propane Industry	**$21,156**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	6,373,000	0.43%
Gas Processing Plants	5,441,000	0.08%
Total Montana Odorized Propane Production	**11,814,000**	**0.14%**

A.30 Odorized Propane's Impact on Nebraska Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	69,158,092	64.2%
Commercial	9,445,245	8.8%
Cylinder	2,383,486	2.2%
Internal Combustion	2,404,000	2.2%
Industrial	2,287,000	2.1%
Agricultural	22,118,000	20.5%
Total Nebraska Odorized Propane Demand	**107,795,823**	**100.0%**
Total Propane-Heated Households	**58,072**	
Propane Share of Nebraska Home Heating		7.59%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Nebraska ($1,000)	**$187,132**
Supply	$402
Transportation, Storage, and Wholesale	$36,308
Retail	$184,953
Total Direct Value Added in Nebraska	**$221,663**
Indirect and Induced	$513,786
Total Odorized Propane Industry Contribution to Nebraska GDP	**$735,449**

2018 Employment

Production	3
Transportation, Storage, and Wholesale	108
Retail	142
Direct Nebraska Employment Related to Odorized Propane	**253**

2018 Labor Income

	($1,000)
Production	$328
Transportation, Storage, and Wholesale	$8,852
Retail	$6,726
Direct Labor Income in Nebraska Odorized Propane Industry	**$15,905**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Nebraska Odorized Propane Production	**-**	**0.00%**

A.31 Odorized Propane's Impact on Nevada Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	16,823,191	35.1%
Commercial	13,420,260	28.0%
Cylinder	3,484,004	7.3%
Internal Combustion	3,777,000	7.9%
Industrial	9,528,000	19.9%
Agricultural	882,000	1.8%
Total Nevada Odorized Propane Demand	**47,914,455**	**100.0%**
Total Propane-Heated Households	**26,003**	
Propane Share of Nevada Home Heating		2.30%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Nevada ($1,000)	**$89,356**
Supply	$50
Transportation, Storage, and Wholesale	$4,162
Retail	$18,031
Total Direct Value Added in Nevada	**$22,243**
Indirect and Induced	$173,313
Total Odorized Propane Industry Contribution to Nevada GDP	**$195,556**

2018 Employment

Production	0
Transportation, Storage, and Wholesale	4
Retail	244
Direct Nevada Employment Related to Odorized Propane	**248**

2018 Labor Income

	($1,000)
Production	$43
Transportation, Storage, and Wholesale	$314
Retail	$15,699
Direct Labor Income in Nevada Odorized Propane Industry	**$16,056**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	180,000	0.01%
Gas Processing Plants	-	0.00%
Total Nevada Odorized Propane Production	**180,000**	**0.00%**

A.32 Odorized Propane's Impact on New Hampshire Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	114,861,774	61.8%
Commercial	61,926,248	33.3%
Cylinder	3,017,853	1.6%
Internal Combustion	763,000	0.4%
Industrial	5,145,000	2.8%
Agricultural	83,000	0.0%
Total New Hampshire Odorized Propane Demand	**185,796,875**	**100.0%**
Total Propane-Heated Households	**86,695**	
Propane Share of New Hampshire Home Heating		16.32%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in New Hampshire ($1,000)	**$416,114**
Supply	$0
Transportation, Storage, and Wholesale	$16,118
Retail	$101,655
Total Direct Value Added in New Hampshire	**$117,773**
Indirect and Induced	$270,246
Total Odorized Propane Industry Contribution to New Hampshire GDP	**$388,018**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	15
Retail	1,100
Direct New Hampshire Employment Related to Odorized Propane	**1,115**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$1,213
Retail	$88,581
Direct Labor Income in New Hampshire Odorized Propane Industry	**$89,794**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total New Hampshire Odorized Propane Production	**-**	**0.00%**

A.33 Odorized Propane's Impact on New Jersey Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	47,091,200	57.3%
Commercial	14,657,207	17.8%
Cylinder	6,762,294	8.2%
Internal Combustion	8,581,000	10.4%
Industrial	3,169,000	3.9%
Agricultural	1,968,000	2.4%
Total New Jersey Odorized Propane Demand	**82,228,701**	**100.0%**
Total Propane-Heated Households	**67,930**	
Propane Share of New Jersey Home Heating		2.09%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in New Jersey ($1,000)	**$182,534**
Supply	$5,638
Transportation, Storage, and Wholesale	$8,140
Retail	$99,821
Total Direct Value Added in New Jersey	**$113,599**
Indirect and Induced	$313,304
Total Odorized Propane Industry Contribution to New Jersey GDP	**$426,903**

2018 Employment

Production	3
Transportation, Storage, and Wholesale	10
Retail	745
Direct New Jersey Employment Related to Odorized Propane	**759**

2018 Labor Income

	($1,000)
Production	$468
Transportation, Storage, and Wholesale	$826
Retail	$57,413
Direct Labor Income in New Jersey Odorized Propane Industry	**$58,707**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	34,150,000	2.30%
Gas Processing Plants	-	0.00%
Total New Jersey Odorized Propane Production	**34,150,000**	**0.40%**

A.34 Odorized Propane's Impact on New Mexico Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	44,702,054	55.6%
Commercial	17,503,973	21.8%
Cylinder	3,829,608	4.8%
Internal Combustion	1,825,000	2.3%
Industrial	10,320,000	12.8%
Agricultural	2,184,000	2.7%
Total New Mexico Odorized Propane Demand	**80,364,635**	**100.0%**
Total Propane-Heated Households	**57,254**	
Propane Share of New Mexico Home Heating		7.21%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in New Mexico ($1,000)	**$158,675**
Supply	$208,747
Transportation, Storage, and Wholesale	$13,045
Retail	$83,554
Total Direct Value Added in New Mexico	**$305,346**
Indirect and Induced	$559,021
Total Odorized Propane Industry Contribution to New Mexico GDP	**$864,367**

2018 Employment

Production	730
Transportation, Storage, and Wholesale	37
Retail	526
Direct New Mexico Employment Related to Odorized Propane	**1,293**

2018 Labor Income

	($1,000)
Production	$81,730
Transportation, Storage, and Wholesale	$3,393
Retail	$25,003
Direct Labor Income in New Mexico Odorized Propane Industry	**$110,126**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	4,775,000	0.32%
Gas Processing Plants	367,423,000	5.14%
Total New Mexico Odorized Propane Production	**372,198,000**	**4.31%**

A.35 Odorized Propane's Impact on New York Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	282,955,485	67.7%
Commercial	88,962,970	21.3%
Cylinder	15,175,658	3.6%
Internal Combustion	12,300,000	2.9%
Industrial	9,048,000	2.2%
Agricultural	9,575,000	2.3%
Total New York Odorized Propane Demand	**418,017,113**	**100.0%**
Total Propane-Heated Households	**308,020**	
Propane Share of New York Home Heating		4.18%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in New York ($1,000)	**$957,297**
Supply	$43
Transportation, Storage, and Wholesale	$36,262
Retail	$537,067
Total Direct Value Added in New York	**$573,372**
Indirect and Induced	$1,130,688
Total Odorized Propane Industry Contribution to New York GDP	**$1,704,060**

2018 Employment

Production	0
Transportation, Storage, and Wholesale	34
Retail	2,776
Direct New York Employment Related to Odorized Propane	**2,811**

2018 Labor Income

	($1,000)
Production	$35
Transportation, Storage, and Wholesale	$2,729
Retail	$224,948
Direct Labor Income in New York Odorized Propane Industry	**$227,712**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total New York Odorized Propane Production	**-**	**0.00%**

A.36 Odorized Propane's Impact on North Carolina Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	188,140,751	47.8%
Commercial	84,685,722	21.5%
Cylinder	16,436,644	4.2%
Internal Combustion	16,096,000	4.1%
Industrial	17,325,000	4.4%
Agricultural	70,507,000	17.9%
Total North Carolina Odorized Propane Demand	**393,191,117**	**100.0%**
Total Propane-Heated Households	**268,167**	
Propane Share of North Carolina Home Heating		6.69%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in North Carolina ($1,000)	**$781,936**
Supply	$0
Transportation, Storage, and Wholesale	$38,961
Retail	$382,266
Total Direct Value Added in North Carolina	**$421,227**
Indirect and Induced	$792,153
Total Odorized Propane Industry Contribution to North Carolina GDP	**$1,213,381**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	50
Retail	2,680
Direct North Carolina Employment Related to Odorized Propane	**2,731**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$4,033
Retail	$150,185
Direct Labor Income in North Carolina Odorized Propane Industry	**$154,218**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total North Carolina Odorized Propane Production	**-**	**0.00%**

A.37 Odorized Propane's Impact on North Dakota Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	67,480,502	56.0%
Commercial	14,778,565	12.3%
Cylinder	2,085,210	1.7%
Internal Combustion	982,000	0.8%
Industrial	14,554,000	12.1%
Agricultural	20,649,000	17.1%
Total North Dakota Odorized Propane Demand	**120,529,276**	**100.0%**
Total Propane-Heated Households	**45,025**	
Propane Share of North Dakota Home Heating		14.10%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in North Dakota ($1,000)	**$208,804**
Supply	$312,218
Transportation, Storage, and Wholesale	$18,645
Retail	$206,364
Total Direct Value Added in North Dakota	**$537,227**
Indirect and Induced	$836,487
Total Odorized Propane Industry Contribution to North Dakota GDP	**$1,373,714**

2018 Employment

Production	1,035
Transportation, Storage, and Wholesale	49
Retail	85
Direct North Dakota Employment Related to Odorized Propane	**1,168**

2018 Labor Income

	($1,000)
Production	$115,799
Transportation, Storage, and Wholesale	$4,417
Retail	$4,870
Direct Labor Income in North Dakota Odorized Propane Industry	**$125,086**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	5,386,000	0.36%
Gas Processing Plants	488,676,000	6.84%
Total North Dakota Odorized Propane Production	**494,062,000**	**5.73%**

A.38 Odorized Propane's Impact on Ohio Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	195,708,791	62.7%
Commercial	47,109,170	15.1%
Cylinder	11,031,669	3.5%
Internal Combustion	22,733,000	7.3%
Industrial	6,622,000	2.1%
Agricultural	28,923,000	9.3%
Total Ohio Odorized Propane Demand	**312,127,629**	**100.0%**
Total Propane-Heated Households	**244,785**	
Propane Share of Ohio Home Heating		5.22%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Ohio ($1,000)	**$541,142**
Supply	$120,598
Transportation, Storage, and Wholesale	$57,044
Retail	$534,828
Total Direct Value Added in Ohio	**$712,470**
Indirect and Induced	$1,561,668
Total Odorized Propane Industry Contribution to Ohio GDP	**$2,274,138**

2018 Employment

Production	193
Transportation, Storage, and Wholesale	138
Retail	1,258
Direct Ohio Employment Related to Odorized Propane	**1,589**

2018 Labor Income

	($1,000)
Production	$21,813
Transportation, Storage, and Wholesale	$11,417
Retail	$71,018
Direct Labor Income in Ohio Odorized Propane Industry	**$104,249**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	46,182,000	3.11%
Gas Processing Plants	183,358,000	2.57%
Total Ohio Odorized Propane Production	**229,540,000**	**2.66%**

A.39 Odorized Propane's Impact on Oklahoma Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	81,818,227	59.3%
Commercial	24,897,279	18.0%
Cylinder	4,644,580	3.4%
Internal Combustion	10,164,000	7.4%
Industrial	8,147,000	5.9%
Agricultural	8,351,000	6.1%
Total Oklahoma Odorized Propane Demand	**138,022,086**	**100.0%**
Total Propane-Heated Households	**100,674**	
Propane Share of Oklahoma Home Heating		6.78%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Oklahoma ($1,000)	**$239,034**
Supply	$469,882
Transportation, Storage, and Wholesale	$57,990
Retail	$236,240
Total Direct Value Added in Oklahoma	**$764,111**
Indirect and Induced	$1,172,808
Total Odorized Propane Industry Contribution to Oklahoma GDP	**$1,936,920**

2018 Employment

Production	1,154
Transportation, Storage, and Wholesale	196
Retail	511
Direct Oklahoma Employment Related to Odorized Propane	**1,861**

2018 Labor Income

	($1,000)
Production	$129,497
Transportation, Storage, and Wholesale	$16,846
Retail	$27,205
Direct Labor Income in Oklahoma Odorized Propane Industry	**$173,549**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	33,304,000	2.25%
Gas Processing Plants	949,741,000	13.30%
Total Oklahoma Odorized Propane Production	**983,045,000**	**11.40%**

A.40 Odorized Propane's Impact on Oregon Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	26,212,966	28.4%
Commercial	38,242,661	41.4%
Cylinder	4,999,148	5.4%
Internal Combustion	5,907,000	6.4%
Industrial	11,825,000	12.8%
Agricultural	5,268,000	5.7%
Total Oregon Odorized Propane Demand	**92,454,774**	**100.0%**
Total Propane-Heated Households	**26,707**	
Propane Share of Oregon Home Heating		1.63%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Oregon ($1,000)	**$169,809**
Supply	$0
Transportation, Storage, and Wholesale	$8,020
Retail	$32,158
Total Direct Value Added in Oregon	**$40,178**
Indirect and Induced	$501,676
Total Odorized Propane Industry Contribution to Oregon GDP	**$541,854**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	8
Retail	320
Direct Oregon Employment Related to Odorized Propane	**328**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$603
Retail	$18,815
Direct Labor Income in Oregon Odorized Propane Industry	**$19,418**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Oregon Odorized Propane Production	**-**	**0.00%**

A.41 Odorized Propane's Impact on Pennsylvania Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	216,580,223	57.1%
Commercial	91,953,852	24.2%
Cylinder	10,508,566	2.8%
Internal Combustion	15,970,000	4.2%
Industrial	19,162,000	5.0%
Agricultural	25,395,000	6.7%
Total Pennsylvania Odorized Propane Demand	**379,569,641**	**100.0%**
Total Propane-Heated Households	**225,476**	
Propane Share of Pennsylvania Home Heating		4.45%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Pennsylvania ($1,000)	**$841,819**
Supply	$119,145
Transportation, Storage, and Wholesale	$45,390
Retail	$460,007
Total Direct Value Added in Pennsylvania	**$624,543**
Indirect and Induced	$1,131,076
Total Odorized Propane Industry Contribution to Pennsylvania GDP	**$1,755,619**

2018 Employment

Production	176
Transportation, Storage, and Wholesale	79
Retail	2,362
Direct Pennsylvania Employment Related to Odorized Propane	**2,617**

2018 Labor Income

	($1,000)
Production	$19,913
Transportation, Storage, and Wholesale	$6,570
Retail	$154,871
Direct Labor Income in Pennsylvania Odorized Propane Industry	**$181,354**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	43,602,000	2.94%
Gas Processing Plants	201,350,000	2.82%
Total Pennsylvania Odorized Propane Production	**244,952,000**	**2.84%**

A.42 Odorized Propane's Impact on Rhode Island Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	18,453,000	56.4%
Commercial	8,408,301	25.7%
Cylinder	1,717,000	5.2%
Internal Combustion	1,206,000	3.7%
Industrial	2,858,000	8.7%
Agricultural	86,000	0.3%
Total Rhode Island Odorized Propane Demand	**32,728,301**	**100.0%**
Total Propane-Heated Households	**11,618**	
Propane Share of Rhode Island Home Heating		2.86%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Rhode Island ($1,000)	**$71,949**
Supply	$0
Transportation, Storage, and Wholesale	$2,839
Retail	$16,546
Total Direct Value Added in Rhode Island	**$19,385**
Indirect and Induced	$440,890
Total Odorized Propane Industry Contribution to Rhode Island GDP	**$460,274**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	3
Retail	272
Direct Rhode Island Employment Related to Odorized Propane	**275**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$214
Retail	$18,562
Direct Labor Income in Rhode Island Odorized Propane Industry	**$18,775**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Rhode Island Odorized Propane Production	**-**	**0.00%**

A.43 Odorized Propane's Impact on South Carolina Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	43,475,523	40.7%
Commercial	28,357,423	26.6%
Cylinder	5,566,523	5.2%
Internal Combustion	8,787,000	8.2%
Industrial	5,491,000	5.1%
Agricultural	15,019,000	14.1%
Total South Carolina Odorized Propane Demand	**106,696,468**	**100.0%**
Total Propane-Heated Households	**67,015**	
Propane Share of South Carolina Home Heating		3.48%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in South Carolina ($1,000)	**$207,817**
Supply	$0
Transportation, Storage, and Wholesale	$14,108
Retail	$99,326
Total Direct Value Added in South Carolina	**$113,434**
Indirect and Induced	$465,184
Total Odorized Propane Industry Contribution to South Carolina GDP	**$578,618**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	27
Retail	954
Direct South Carolina Employment Related to Odorized Propane	**981**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$2,163
Retail	$54,868
Direct Labor Income in South Carolina Odorized Propane Industry	**$57,031**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total South Carolina Odorized Propane Production	**-**	**0.00%**

A.44 Odorized Propane's Impact on South Dakota Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	50,732,889	60.9%
Commercial	10,076,543	12.1%
Cylinder	1,225,667	1.5%
Internal Combustion	1,474,000	1.8%
Industrial	1,730,000	2.1%
Agricultural	18,067,000	21.7%
Total South Dakota Odorized Propane Demand	**83,306,099**	**100.0%**
Total Propane-Heated Households	**55,267**	
Propane Share of South Dakota Home Heating		16.00%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in South Dakota ($1,000)	**$144,191**
Supply	$249
Transportation, Storage, and Wholesale	$7,227
Retail	$142,504
Total Direct Value Added in South Dakota	**$149,979**
Indirect and Induced	$359,006
Total Odorized Propane Industry Contribution to South Dakota GDP	**$508,985**

2018 Employment

Production	2
Transportation, Storage, and Wholesale	7
Retail	220
Direct South Dakota Employment Related to Odorized Propane	**229**

2018 Labor Income

	($1,000)
Production	$203
Transportation, Storage, and Wholesale	$545
Retail	$10,609
Direct Labor Income in South Dakota Odorized Propane Industry	**$11,356**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total South Dakota Odorized Propane Production	**-**	**0.00%**

A.45 Odorized Propane's Impact on Tennessee Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	67,776,313	57.5%
Commercial	25,714,106	21.8%
Cylinder	4,737,979	4.0%
Internal Combustion	11,833,000	10.0%
Industrial	3,624,000	3.1%
Agricultural	4,174,000	3.5%
Total Tennessee Odorized Propane Demand	**117,859,398**	**100.0%**
Total Propane-Heated Households	**88,075**	
Propane Share of Tennessee Home Heating		3.38%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Tennessee ($1,000)	**$203,485**
Supply	$421
Transportation, Storage, and Wholesale	$10,643
Retail	$201,093
Total Direct Value Added in Tennessee	**$212,157**
Indirect and Induced	$620,324
Total Odorized Propane Industry Contribution to Tennessee GDP	**$832,481**

2018 Employment

Production	2
Transportation, Storage, and Wholesale	11
Retail	1,060
Direct Tennessee Employment Related to Odorized Propane	**1,074**

2018 Labor Income

	($1,000)
Production	$273
Transportation, Storage, and Wholesale	$891
Retail	$46,549
Direct Labor Income in Tennessee Odorized Propane Industry	**$47,713**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	13,783,000	0.93%
Gas Processing Plants	851,000	0.01%
Total Tennessee Odorized Propane Production	**14,634,000**	**0.17%**

A.46 Odorized Propane's Impact on Texas Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	147,100,865	38.1%
Commercial	104,058,395	26.9%
Cylinder	35,306,266	9.1%
Internal Combustion	42,384,000	11.0%
Industrial	42,649,000	11.0%
Agricultural	14,946,000	3.9%
Total Texas Odorized Propane Demand	**386,444,526**	**100.0%**
Total Propane-Heated Households	**276,111**	
Propane Share of Texas Home Heating		2.82%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Texas ($1,000)	**$738,276**
Supply	$2,114,003
Transportation, Storage, and Wholesale	$98,349
Retail	$376,838
Total Direct Value Added in Texas	**$2,589,189**
Indirect and Induced	$4,046,925
Total Odorized Propane Industry Contribution to Texas GDP	**$6,636,114**

2018 Employment

Production	5,106
Transportation, Storage, and Wholesale	285
Retail	2,443
Direct Texas Employment Related to Odorized Propane	**7,833**

2018 Labor Income

	($1,000)
Production	$573,255
Transportation, Storage, and Wholesale	$26,254
Retail	$170,168
Direct Labor Income in Texas Odorized Propane Industry	**$769,677**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	560,199,000	37.77%
Gas Processing Plants	3,022,628,000	42.32%
Total Texas Odorized Propane Production	**3,582,827,000**	**41.54%**

A.47 Odorized Propane's Impact on Utah Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	22,931,011	41.1%
Commercial	17,413,225	31.2%
Cylinder	4,616,473	8.3%
Internal Combustion	2,674,000	4.8%
Industrial	5,485,000	9.8%
Agricultural	2,731,000	4.9%
Total Utah Odorized Propane Demand	**55,850,709**	**100.0%**
Total Propane-Heated Households	**20,935**	
Propane Share of Utah Home Heating		2.10%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Utah ($1,000)	**$101,511**
Supply	$33,277
Transportation, Storage, and Wholesale	$7,540
Retail	$48,806
Total Direct Value Added in Utah	**$89,622**
Indirect and Induced	$415,914
Total Odorized Propane Industry Contribution to Utah GDP	**$505,536**

2018 Employment

Production	99
Transportation, Storage, and Wholesale	15
Retail	218
Direct Utah Employment Related to Odorized Propane	**333**

2018 Labor Income

	($1,000)
Production	$11,140
Transportation, Storage, and Wholesale	$1,304
Retail	$12,197
Direct Labor Income in Utah Odorized Propane Industry	**$24,640**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	6,370,000	0.43%
Gas Processing Plants	55,559,000	0.78%
Total Utah Odorized Propane Production	**61,929,000**	**0.72%**

A.48 Odorized Propane's Impact on Vermont Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	76,618,577	64.3%
Commercial	38,113,907	32.0%
Cylinder	1,026,674	0.9%
Internal Combustion	185,000	0.2%
Industrial	2,663,000	2.2%
Agricultural	470,000	0.4%
Total Vermont Odorized Propane Demand	**119,077,157**	**100.0%**
Total Propane-Heated Households	**44,423**	
Propane Share of Vermont Home Heating		17.00%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Vermont ($1,000)	**$269,170**
Supply	$0
Transportation, Storage, and Wholesale	$10,330
Retail	$67,654
Total Direct Value Added in Vermont	**$77,983**
Indirect and Induced	$399,936
Total Odorized Propane Industry Contribution to Vermont GDP	**$477,919**

2018 Employment

Production	-
Transportation, Storage, and Wholesale	10
Retail	631
Direct Vermont Employment Related to Odorized Propane	**640**

2018 Labor Income

	($1,000)
Production	$0
Transportation, Storage, and Wholesale	$777
Retail	$44,017
Direct Labor Income in Vermont Odorized Propane Industry	**$44,794**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Vermont Odorized Propane Production	**-**	**0.00%**

A.49 Odorized Propane's Impact on Virginia Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	124,859,344	49.9%
Commercial	81,799,302	32.7%
Cylinder	7,698,518	3.1%
Internal Combustion	6,031,000	2.4%
Industrial	13,817,000	5.5%
Agricultural	16,082,000	6.4%
Total Virginia Odorized Propane Demand	**250,287,164**	**100.0%**
Total Propane-Heated Households	**131,055**	
Propane Share of Virginia Home Heating		4.13%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Virginia ($1,000)	**$500,513**
Supply	$1
Transportation, Storage, and Wholesale	$21,712
Retail	$246,126
Total Direct Value Added in Virginia	**$267,839**
Indirect and Induced	$775,782
Total Odorized Propane Industry Contribution to Virginia GDP	**$1,043,621**

2018 Employment

Production	0
Transportation, Storage, and Wholesale	21
Retail	1,589
Direct Virginia Employment Related to Odorized Propane	**1,609**

2018 Labor Income

	($1,000)
Production	$1
Transportation, Storage, and Wholesale	$1,634
Retail	$98,740
Direct Labor Income in Virginia Odorized Propane Industry	**$100,374**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	-	0.00%
Gas Processing Plants	-	0.00%
Total Virginia Odorized Propane Production	**-**	**0.00%**

A.50 Odorized Propane's Impact on Washington Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	85,722,278	44.1%
Commercial	54,471,928	28.1%
Cylinder	8,952,486	4.6%
Internal Combustion	7,485,000	3.9%
Industrial	13,943,000	7.2%
Agricultural	23,620,000	12.2%
Total Washington Odorized Propane Demand	**194,194,692**	**100.0%**
Total Propane-Heated Households	**90,813**	
Propane Share of Washington Home Heating		3.14%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Washington ($1,000)	**$369,097**
Supply	$0
Transportation, Storage, and Wholesale	$17,638
Retail	$80,079
Total Direct Value Added in Washington	**$97,717**
Indirect and Induced	$560,490
Total Odorized Propane Industry Contribution to Washington GDP	**$658,208**

2018 Employment

Production	3
Transportation, Storage, and Wholesale	19
Retail	821
Direct Washington Employment Related to Odorized Propane	**842**

2018 Labor Income

	($1,000)
Production	$410
Transportation, Storage, and Wholesale	$1,495
Retail	$54,191
Direct Labor Income in Washington Odorized Propane Industry	**$56,095**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	26,859,000	1.81%
Gas Processing Plants	-	0.00%
Total Washington Odorized Propane Production	**26,859,000**	**0.31%**

A.51 Odorized Propane's Impact on West Virginia Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	25,760,304	66.0%
Commercial	8,778,806	22.5%
Cylinder	1,238,526	3.2%
Internal Combustion	1,274,000	3.3%
Industrial	1,374,000	3.5%
Agricultural	616,000	1.6%
Total West Virginia Odorized Propane Demand	**39,041,637**	**100.0%**
Total Propane-Heated Households	**34,254**	
Propane Share of West Virginia Home Heating		4.66%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in West Virginia ($1,000)	**$81,704**
Supply	$327,570
Transportation, Storage, and Wholesale	$29,066
Retail	$42,053
Total Direct Value Added in West Virginia	**$398,690**
Indirect and Induced	$722,352
Total Odorized Propane Industry Contribution to West Virginia GDP	**$1,121,041**

2018 Employment

Production	520
Transportation, Storage, and Wholesale	105
Retail	126
Direct West Virginia Employment Related to Odorized Propane	**751**

2018 Labor Income

	($1,000)
Production	$58,593
Transportation, Storage, and Wholesale	$9,087
Retail	$7,047
Direct Labor Income in West Virginia Odorized Propane Industry	**$74,727**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	523,000	0.04%
Gas Processing Plants	628,512,000	8.80%
Total West Virginia Odorized Propane Production	**629,035,000**	**7.29%**

A.52 Odorized Propane's Impact on Wisconsin Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	260,318,503	64.3%
Commercial	60,286,754	14.9%
Cylinder	6,536,704	1.6%
Internal Combustion	19,138,000	4.7%
Industrial	12,281,000	3.0%
Agricultural	46,245,000	11.4%
Total Wisconsin Odorized Propane Demand	**404,805,960**	**100.0%**
Total Propane-Heated Households	**276,217**	
Propane Share of Wisconsin Home Heating		11.65%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Wisconsin ($1,000)	**$703,166**
Supply	$0
Transportation, Storage, and Wholesale	$35,125
Retail	$694,988
Total Direct Value Added in Wisconsin	**$730,113**
Indirect and Induced	$1,269,037
Total Odorized Propane Industry Contribution to Wisconsin GDP	**$1,999,149**

2018 Employment

Production	0
Transportation, Storage, and Wholesale	33
Retail	1,308
Direct Wisconsin Employment Related to Odorized Propane	**1,342**

2018 Labor Income

	($1,000)
Production	$3
Transportation, Storage, and Wholesale	$2,645
Retail	$71,937
Direct Labor Income in Wisconsin Odorized Propane Industry	**$74,585**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	284,000	0.02%
Gas Processing Plants	-	0.00%
Total Wisconsin Odorized Propane Production	**284,000**	**0.00%**

A.53 Odorized Propane's Impact on Wyoming Economy

2018 Odorized Propane Sales Breakout

	(Gallons)	(% of State)
Residential	34,880,791	59.9%
Commercial	10,271,625	17.6%
Cylinder	934,983	1.6%
Internal Combustion	227,000	0.4%
Industrial	10,689,000	18.4%
Agricultural	1,193,000	2.0%
Total Wyoming Odorized Propane Demand	**58,196,399**	**100.0%**
Total Propane-Heated Households	**22,466**	
Propane Share of Wyoming Home Heating		9.76%

2018 Contribution to State Economy

	($1,000)
Total Market Value of Odorized Propane Sold in Wyoming ($1,000)	**$107,037**
Supply	$17,670
Transportation, Storage, and Wholesale	$6,914
Retail	$52,131
Total Direct Value Added in Wyoming	**$76,715**
Indirect and Induced	$279,488
Total Odorized Propane Industry Contribution to Wyoming GDP	**$356,203**

2018 Employment

Production	127
Transportation, Storage, and Wholesale	12
Retail	202
Direct Wyoming Employment Related to Odorized Propane	**341**

2018 Labor Income

	($1,000)
Production	$14,148
Transportation, Storage, and Wholesale	$1,012
Retail	$13,682
Direct Labor Income in Wyoming Odorized Propane Industry	**$28,842**

2018 Odorized Propane Production

	(Gallons)	(% of U.S. Total)
Refineries	5,634,000	0.38%
Gas Processing Plants	645,000	0.01%
Total Wyoming Odorized Propane Production	**6,279,000**	**0.07%**

B.Residential Sector, By State and Division

ICF's estimates of county-level households and primary space heating fuels are based on the U.S. Census Bureau's 2018 American Community Survey (ACS). The ACS survey is performed annually.

Table 20 and Table 21 below present the U.S. Census Bureau's estimates for household heating fuel by state and census division. Census Bureau's definition of "Heating Fuels", while mostly self-explanatory, does come with the caveat that utility gas, though primarily natural gas (methane), may also include a small number of households which receive odorized propane through underground pipes. These housing units include single and multi-family site-built units, as well as manufactured homes, boats, mobile homes, and any other dwelling unit that serves as a primary residence.

In addition, because the purpose of the survey is to determine the primary household heating fuel, numbers in the tables may understate the prevalence of certain fuels for secondary space heating, which in some part of the country constitute a large portion of total energy used for space heating.

Table 20: 2018 Residential Households Primary Space Heating Fuels by Division

State	Total Households in Region	Natural Gas	Propane	Electricity	Distillate[37]	Wood	Other/None[38]
New England	5,771,850	2,303,697	356,683	814,698	2,021,516	187,415	87,841
Middle Atlantic	15,687,513	9,425,486	601,426	2,526,892	2,525,626	260,338	347,745
East North Central	18,478,906	12,929,758	1,239,183	3,534,674	200,896	335,688	238,707
West North Central	8,460,833	4,913,507	864,069	2,334,501	67,463	169,380	111,913
South Atlantic	24,333,132	5,881,325	858,263	16,534,190	529,664	247,670	282,020
East South Central	7,299,667	2,295,201	426,720	4,392,645	30,097	110,884	44,120
West South Central	14,154,960	5,232,100	489,662	8,228,955	14,822	97,456	91,965
Mountain	9,015,792	5,031,998	392,388	3,168,967	27,599	259,795	135,045
Pacific	18,317,527	10,094,826	556,693	6,129,306	181,585	405,578	949,539
Total U.S.	121,520,180	58,107,898	5,785,087	47,664,828	5,599,268	2,074,204	2,288,895

Source: US Census American Community Survey

[37] Distillate includes Fuel Oil and Diesel Home Heated Households
[38] Includes Coal, Solar, Other, and No Fuel Households,

Table 21: 2018 Residential Households Primary Space Heating Fuels (1)

State	Total Households in State	Natural Gas	Propane	Electricity	Distillate	Wood	Other/None
Alabama	1,855,184	502,864	104,577	1,218,383	2,525	15,891	10,944
Alaska	254,551	122,020	5,640	34,656	73,236	12,918	6,081
Arizona	2,614,298	858,830	74,563	1,578,580	2,817	51,457	48,051
Arkansas	1,156,347	427,676	82,510	598,185	1,607	39,943	6,426
California	13,072,122	8,342,368	426,163	3,496,270	33,503	182,905	590,913
Colorado	2,176,757	1,502,352	103,320	503,980	2,500	34,473	30,132
Connecticut	1,378,091	497,422	60,526	232,420	549,036	22,954	15,733
Delaware	367,671	157,776	37,299	122,903	42,215	2,904	4,574
District of Columbia	287,476	146,306	3,024	129,222	2,581	0	6,343
Florida	7,809,358	365,966	63,395	7,210,000	11,959	10,182	147,856
Georgia	3,803,012	1,473,926	173,300	2,101,878	7,125	25,156	21,627
Hawaii	455,309	11,004	7,370	134,854	215	1,301	300,565
Idaho	640,270	334,824	31,162	212,296	10,065	44,366	7,557
Illinois	4,864,864	3,738,735	201,831	841,843	5,481	19,248	57,726
Indiana	2,599,169	1,548,536	184,265	777,784	16,551	47,601	24,432
Iowa	1,267,873	779,024	165,484	286,768	6,203	14,855	15,539
Kansas	1,133,408	733,557	89,272	283,269	2,777	16,680	7,853
Kentucky	1,732,713	636,965	110,523	911,907	14,000	43,532	15,786
Louisiana	1,737,220	572,612	30,367	1,118,248	1,084	7,104	7,805
Maine	570,307	44,328	61,194	41,759	355,904	54,843	12,279
Maryland	2,215,935	956,824	80,754	944,809	176,897	26,454	30,197
Massachusetts	2,624,294	1,374,460	92,227	434,646	657,583	28,621	36,757
Michigan	3,957,466	3,009,520	332,085	407,077	40,558	110,656	57,570
Minnesota	2,194,452	1,431,179	237,190	397,513	37,345	43,772	47,453
Mississippi	1,108,630	329,840	123,545	634,392	3,171	12,482	5,200
Missouri	2,434,806	1,218,643	213,759	902,139	4,966	77,808	17,491
Montana	431,421	225,236	56,685	105,015	3,734	34,624	6,127
Nebraska	765,490	460,086	58,072	226,898	3,114	8,610	8,710
Nevada	1,129,810	646,974	26,003	417,183	5,834	17,336	16,480
New Hampshire	531,212	113,986	86,695	50,260	232,152	35,632	12,487
New Jersey	3,249,567	2,435,183	67,930	437,888	258,889	12,069	37,608
New Mexico	794,093	501,370	57,254	165,963	1,081	53,840	14,585
New York	7,367,015	4,397,917	308,020	890,554	1,459,976	120,159	190,389
North Carolina	4,011,462	992,077	268,167	2,552,432	111,718	62,478	24,590

Source: US Census American Community Survey

Table 22: 2018 Residential Households Primary Space Heating Fuels (2)

State	Total Households in State	Natural Gas	Propane	Electricity	Distillate	Wood	Other/None
North Dakota	319,355	129,563	45,025	128,042	7,346	1,240	8,139
Ohio	4,685,447	3,067,626	244,785	1,137,973	93,915	78,335	62,813
Oklahoma	1,485,310	759,085	100,674	584,523	3,353	22,935	14,740
Oregon	1,639,970	617,243	26,707	845,916	28,320	100,126	21,658
Pennsylvania	5,070,931	2,592,386	225,476	1,198,450	806,761	128,110	119,748
Rhode Island	406,573	226,173	11,618	41,491	117,880	4,634	4,777
South Carolina	1,927,991	438,188	67,015	1,382,708	15,078	13,882	11,120
South Dakota	345,449	161,455	55,267	109,872	5,712	6,415	6,728
Tennessee	2,603,140	825,532	88,075	1,627,963	10,401	38,979	12,190
Texas	9,776,083	3,472,727	276,111	5,927,999	8,778	27,474	62,994
Utah	998,891	820,514	20,935	134,529	1,034	12,921	8,958
Vermont	261,373	47,328	44,423	14,122	108,961	40,731	5,808
Virginia	3,175,524	1,054,657	131,055	1,757,556	139,770	66,813	25,673
Washington	2,895,575	1,002,191	90,813	1,617,610	46,311	108,328	30,322
West Virginia	734,703	295,605	34,254	332,682	22,321	39,801	10,040
Wisconsin	2,371,960	1,565,341	276,217	369,997	44,391	79,848	36,166
Wyoming	230,252	141,898	22,466	51,421	534	10,778	3,155
U.S. Total	121,520,180	58,107,898	5,785,087	47,664,828	5,599,268	2,074,204	2,288,895

Source: US Census American Community Survey

C.Appendix: NAICS Codes and Definitions

Table 23. NAICS Codes and Definitions

Industry	NAICS Code	Description
Crude Petroleum and Natural Gas Extraction	211111	Engaged in (1) the exploration, development, and/or the production of petroleum from wells in which the hydrocarbons will initially flow or can be produced using normal or enhanced drilling and extraction techniques or (2) the production of crude petroleum from surface shales or tar sands or from reservoirs in which the hydrocarbons are semisolids.
Natural Gas Liquid Extraction	211112	Engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, redrilling, and directional drilling.
Drilling Oil & Gas Wells	213111	Engaged in drilling oil and gas wells for others on a contract or fee basis.
Support Activities for Oil and Gas Operations	213112	Engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related construction activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars, well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.
Petroleum Refineries	32411	Engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.
Crude Pipelines	4861	Primarily engaged in the pipeline transportation of crude oil.
Refined Petroleum Product Pipelines	48691	Engaged in the pipeline transportation of refined petroleum products.
Natural Gas Pipelines	4862	Primarily engaged in the pipeline transportation of natural gas from processing plants to local distribution systems. This industry includes the storage of natural gas because the storage is usually done by the pipeline establishment and because a pipeline is inherently a network in which all the nodes are interdependent.
Wholesale Petroleum Trade	4247	Primarily engaged in the merchant wholesale distribution of petroleum and petroleum products, including liquefied petroleum gas.
Petroleum Bulk Stations and Terminals	424710	Establishments with bulk liquid storage facilities primarily engaged in the merchant wholesale distribution of crude petroleum and petroleum products, including liquefied petroleum gas
Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)	424720	Establishments primarily engaged in the merchant wholesale distribution of petroleum and petroleum products (except from bulk liquid storage facilities).
Gasoline Stations	447	Industries in the Gasoline Stations subsector retail automotive fuels (e.g., gasoline, diesel fuel, gasohol, alternative fuels) and automotive oils or retail these products in combination with convenience store items. These establishments have specialized equipment for storing and dispensing automotive fuels.
Fuel Dealers	45431	Primarily engaged in retailing heating oil, liquefied petroleum (LP) gas, and other fuels via direct selling.
Heating Oil Dealers	454311	Primarily engaged in retailing heating oil via direct selling. This NAICS code was merged into 454310 (see above) in the second half of 2011.
LPG Dealers[39]	454312	Engaged in retailing liquefied petroleum (LP) gas via direct selling. This NAICS code was merged into 454310 (see above) in the second half of 2011.

Source: U.S. Census 2012, 2017 & 2019 NAICS Manuals

[39] The North American Industry Classification System (NAICS) suspended separate reporting of economic activity in the LPG Dealers (454312) and Heating Oil Dealers (454311) classifications starting in the 2nd quarter of 2011, merging both into the Fuel Dealers (45431) classification. 2012 employment figures are estimates derived from total 45431 reported data using historical trends in LPG Dealers and Heating Oil Dealers share of total Fuel Dealers, total number of gallons sold and customers served, state-level relationships between customer and employee numbers, and state-level economic conditions.

D.Appendix: Acronyms

API	American Petroleum Institute
BEA	Bureau of Economic Analysis (U.S. Department of Commerce)
BLS	Bureau of Labor Statistics (U.S. Department of Labor)
EIA	Energy Information Administration (U.S. Department of Energy)
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LRG	Liquefied Refinery Gas
NAICS	North American Industry Classification System is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.
NEB	National Energy Board (Canada)
NGL	Natural Gas Liquid
NPGA	National Propane Gas Association
PADD	Petroleum Administration for Defense Districts PADD 1 (East Coast) is composed of the following three sub-districts: 1A (New England): Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont. 1B (Central Atlantic): Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania. 1C (Lower Atlantic): Florida, Georgia, North Carolina, South Carolina, Virginia, West Virginia. PADD 2 (Midwest): Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Ohio, Oklahoma, Tennessee, Wisconsin. PADD 3 (Gulf Coast): Alabama, Arkansas, Louisiana, Mississippi, New Mexico, Texas. PADD 4 (Rocky Mountain): Colorado, Idaho, Montana, Utah, Wyoming. PADD5 (West Coast): Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington.
PERC	Propane Education and Research Council
QCEW	Quarterly Census of Employment and Wages (performed by the BLS)
RACC	Refiner Acquisition Cost of Crude
WTI	West Texas Intermediate crude, a futures contract traded on the New York Mercantile Exchange (NYMEX), is a blend of several U.S. domestic streams of light sweet crude oil. For WTI crude oil, the delivery point is Cushing, Oklahoma.

E. Appendix: Major Public Data Sources

1) *2015 Residential Energy Consumption Survey,* Energy Information Administration
2) *2018 American Community Survey,* U.S. Census Bureau
3) *2018 Petroleum Supply Annual,* Energy Information Administration
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