



Energy Analysis

ENERGY ANALYSIS AND STANDARDS
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Benefits to the Economy through the Direct Use of Natural Gas

Introduction

Over 69 million American households rely on natural gas utilities to provide energy to appliances inside their homes. Another 5.7 million more commercial and industrial businesses are supplied through the same local gas utilities to meet their daily needs. This feat is made possible by hundreds of thousands of individuals employed by gas utilities and their extended supply chains. However, job creation and economic development don't end with the actions of utilities or by producers. Through this service, job opportunities exist across the entire U.S. economy through the direct, indirect, and induced effects of supplying energy to homes and businesses.

In addition to the 138 thousand individuals employed by natural gas utilities, companies that supply these utilities create associated natural gas jobs too, and the grand sum of all employed individuals encourages additional economic activity through the consumption of goods or services by individuals. These companies also provide a critical intermediate service for other businesses to operate. This analysis will determine both the total impact on employment from the natural gas direct use supply chain as well as to uncover the extent to which utility jobs stay local.

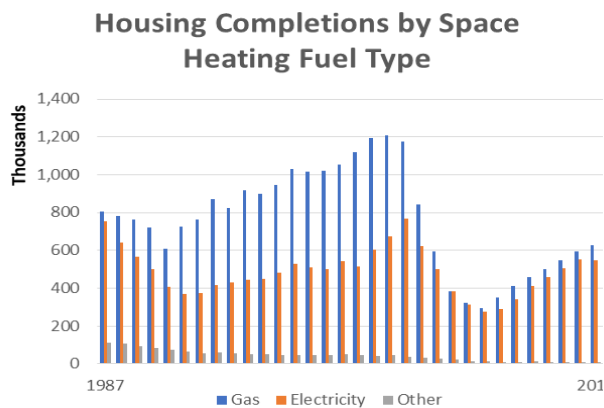
Based on the findings from the REMI model, in 2018, over 3.4 million jobs were connected to the direct use of natural gas. These jobs added \$408 billion to GDP and paid \$152 billion in personal income. The model also indicated a strong relationship between natural gas utilities and the local economy, with as much as 83 percent of all employment remaining local. Also, the prospects for new sales and the more specific inclusion of converting electric homes to natural gas have positive economic growth beyond the potential savings sustained by individual households.

Regional Economic Activity	Employment (Thousands)	Value Added (Billions \$)	Personal Income (Billions \$)
New England	160.2	\$ 18.43	\$ 7.51
Mid Atlantic	395.0	\$ 52.29	\$ 20.14
East North Central	397.0	\$ 49.44	\$ 19.00
West North Central	300.0	\$ 35.02	\$ 12.16
South Atlantic	570.6	\$ 62.62	\$ 23.54
East South Central	191.5	\$ 19.34	\$ 7.22
West South Central	767.4	\$ 95.94	\$ 34.66
Mountain	337.2	\$ 34.43	\$ 12.85
Pacific	323.2	\$ 40.76	\$ 15.28
Total	3,441.9	\$ 408.27	\$ 152.36

What Local Distribution Companies, or LDCs, Bring to the Economy

In 2018, the energy industry delivered over 101 quadrillion Btus of energy to homes and businesses around the country. As a national source of energy, natural gas contributed to 31% of all energy consumption in America. The core reason why it dominates our energy system has to do with a long history of abundance, efficient means of transporting it, the fact that it can be stored when we need it most, and its ability to be used on demand by end-users.

LDCs have connected this form of energy to all sectors and maintained significant market shares amongst end-users' total energy demand. For residential and commercial customers, LDCs supplied over 40% of the energy consumed in 2018. For industrial customers, LDCs make up nearly 32% of the total energy consumed by the sector, with an additional 8% more coming from interstate pipelines or other sources. Through the direct use of natural gas in heating appliances, these customers can make the most out of every molecule. In addition to distributing energy, LDCs have also played a part in supplying solutions for many end-users to meet their energy needs. Two examples include the application of combined heat and power, as well as the services provided by operating energy efficiency programs.



Source: US Census Bureau, Characteristics of New Housing 2018

For more than 50 years, direct use applications have been a part of our national energy plan because of its comparable cost, method of transport, and superior full fuel cycle efficiency relative to other fossil fuels. For 30 consecutive years, natural gas has been the fuel of choice for the new residential construction market. Even with the increased demand for heat pump appliances compared to 10 years prior, natural gas still maintains a greater than 50% market share in regions that experience average to above average winters.

When it comes to the individual consumer, households have shown a growing demand not only for gas service but for multiple appliances. On average, for every new residential customer gain over the last 20 years, between two and three appliances were added. In total, out of the 69 million households using natural gas, there are over 175 million burner tips making use of that service. These services include space heating, water heating, gas cooking and clothes drying¹.

The lifespan of these appliances tends to range from 15 to 20 years assuming regular maintenance is observed. This lifespan does not differ much for appliances of the same function but different fuel sources. For new and replacement furnaces, this market demand is between 5 to 8 million new units every year.

Defining Job Creations and Economic Impact

¹ US Census Bureau, American Housing Survey 2017

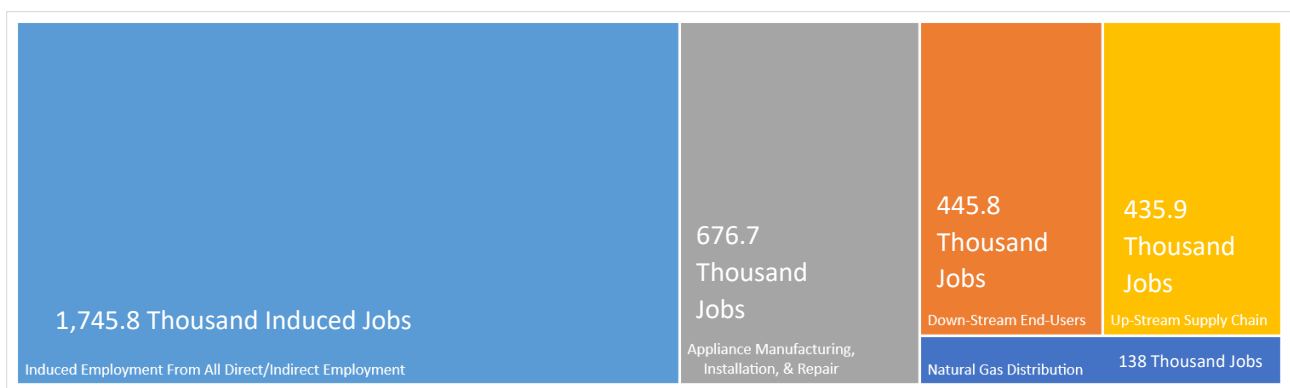
Any individuals employed by companies involved in the extraction, distribution from wells to meters, and the manufacturing of appliances that use natural gas are counted as direct job creation. In 2018, natural gas utilities employed 138 thousand people, while a critical upstream industry like oil and gas production employed an estimated 90 thousand associated jobs. These jobs are the easiest to account for because their employees come in direct contact with the product, but it is not a complete picture.

Secondly, indirect jobs are created by any company that supplies a direct use industry. For example, natural gas extraction companies may outsource accounting or technology needs to other companies. Despite not being directly involved in the extraction process, these jobs are still a part of the final product that is delivered to customers and count as indirect. Due to the complexity of sourcing goods and services to so many industries, the direct and indirect implications of natural gas service reach all parts of the U.S. economy.

For upstream producers, in 2018, there were more than 435 thousand direct and indirect jobs associated with natural gas utilities. The entire supply chain from producers to end-users as well as manufactures of gas appliances, the direct and indirect impact totaled over 1.7 million jobs in 2018. This amounts to a factor of more than 11 times the job creation from the original 138 thousand supported by just local gas utilities.

Lastly, jobs created directly or indirectly through the production, distribution, as well as those industries supplying these activities also create jobs through the personal purchasing of goods and services by employees. These jobs are called induced jobs because they are not a part of the natural gas supply chain despite their association. In 2018, 69% of the total GDP in the U.S. was attributed to the consumption of goods and services. Consumption is such a large part of the broader economy that removing any significant source of direct/indirect employment would have rippling effects unless an employment transfer can occur of equal or greater size.

Direct & Indirect vs. Total Induced Jobs (Thousands)



This model estimated that more jobs are created from induced impacts than were from direct or indirect involvement. Over 1.74 million jobs are induced by the use of natural gas supplied from gas utilities. This impact does not consider the even higher value brought to households by using a lower cost of energy.

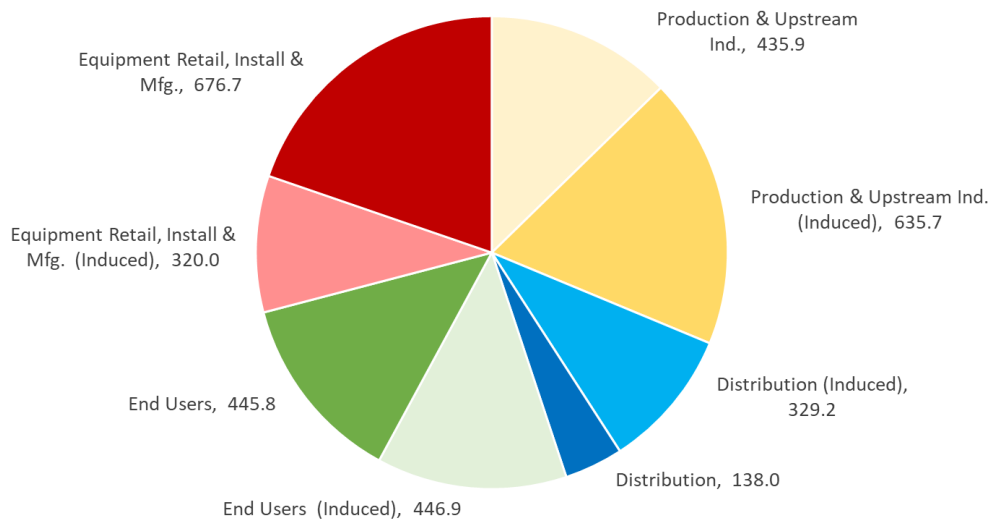
Since 2009, residential customers have saved approximately \$143 billion from the lower price of energy since the start of the shale boom. These are savings that would otherwise be lost to higher energy costs and less consumption of goods and services. Businesses also saved as much as half a trillion over the same ten years.

Using the REMI model (Regional Economic Modeling Inc.), the economic contribution that LDCs bring is measured in three parts. First as the sum of the direct input from LDCs, then the indirect contribution from supplying industries such as natural gas production, and finally the induced economic contribution that results from workers spending their incomes on other goods and services. This analysis found that in 2018, over 3.4 million jobs were connected to the direct use of natural gas. These jobs added \$412 billion to GDP and paid \$152 billion in personal income.

Looking at LDCs only, in 2018, nearly 138 thousand people were employed directly by that industry alone. These jobs provided almost \$12 billion in personal income and \$67 billion in value-added to GDP. Not including the upstream industries supplying LDCs, the total direct, indirect, and induced mid-stream activity totals 467 thousand jobs or more than two times as many jobs as the initial count. The overall impact on income also had a profoundly positive effect, with over \$26 billion in added personal income and almost \$100 billion in total value added to GDP.

Industries supplying LDCs showed far higher job numbers but with lower personal income and value-added multipliers. Gas production provided an estimated 90 thousand jobs in 2018, with a total income impact of \$2.4 billion and adding \$22.5 billion to GDP. The full effect of the direct, indirect, and induced jobs from the industries supplying LDCs reaches over 1.4 million people with a total income impact of more than \$60 billion and value-added, contributing approximately \$152 billion to GDP.

Direct & Indirect vs. Induced Jobs by Value Chain Segment (Thousands)



End-User Contributions

Commercial and industrial companies rely on natural gas appliances for space/water heating as well as cooking. Based on the results of the EIA commercial energy buildings consumption 2012 survey, the use of natural gas for space heating accounts for more than 68 percent of total square footage, and it is consumed in 53 percent of all commercial buildings. Most of the natural gas consumed by commercial buildings was for space heating (59.6 percent). However, cooking and water heating each have nearly equal demand for the remaining 40.4 percent of consumption (all other uses only accounts for 4% of total natural gas usage).

End-users or any business that purchased natural gas from LDCs adds to the total number of associated natural gas jobs in two significant ways. First, there are the jobs created as a percent of any discrete company's output based on its need for natural gas as a share of labor and capital. Typically seen as just another overhead cost, expenses paid to utilities are very hard to eliminate from any business model. If the price of energy changes, this can constrain other functions of output like labor or capital, even if it is not directly linked to the final cost of goods sold.

For example, the food industry heavily relies on natural gas for cooking. However, it is not the initial cost to be factored into the final bill at a restaurant. If the cost of energy were to increase, and assuming nothing else changes to the menu's quality, this could impact jobs or wages or both on a regional scale.

The sale of natural gas by LDCs is estimated to affect employment positively by at least 892 thousand jobs in 2018. This impact provided more than \$39 billion in personal income and added \$90.5 billion to GDP, almost as much as the total impact from LDCs mid-stream.

The second significant way that the direct use of natural gas contributes to the economy is through the manufacturing, sale, and repair or installation of appliances that use natural gas. Sixty-nine million households have natural gas service, and 56 million households use natural gas for primary space heating. Unlike business, these customers won't produce any products from the use of natural gas. However, the creation of these end-use appliances will create its own direct, indirect, and induced jobs.

The manufacturing, sale, repair, and installation of natural gas appliances were estimated to contribute to over 1 million jobs in 2018, \$54 billion in personal income, and added \$99 billion to GDP.

Inputs for the REMI model originate from the report compiled by ICF for API on the topic of "*benefits and opportunities of natural gas use, transportation, and production.*" This analysis is comparable to this report but includes the total consumption of natural gas domestically and isn't looking at the impact of just the services provided by LDCs. The report provides an estimate of total direct output from the cost, sale, and maintenance of residential and commercial gas appliances made in the U.S. to be over \$53 billion a year.

Impact from Appliance Manufacturing, Retail, Repair and Maintenance

\$2018 Millions

	Cost to Users	Value Added	Personal Income	Jobs Created
Manufacturing	\$ 11,147	\$ 14,311	\$ 7,184	129,005
Repair and Installation	\$ 17,898	\$ 32,844	\$ 17,858	365,507
Retail	\$ 24,642	\$ 51,912	\$ 28,457	515,655
Total	\$ 53,688	\$ 99,066	\$ 53,499	1,010,167

Regional Trade Implications for Job Creation

Because of the physical connection to the local community, jobs created directly by natural gas utilities tend to remain regional. Most electric power or natural gas utility consumption remains within the originating region. Nearly all parts of the country source more than 75 percent of these industries locally. Other than utilities, the installation, sale, and repair of gas appliances remains highly local, with most of that activity staying within the originating region as well.

Upstream jobs, on the other hand, will be more concentrated in parts of the country associated with oil and natural gas production, the processing of natural gas, and the refining of oil. With exception to the West South Central and Mountain regions, less than half of oil and gas production is associated with the same region as the originating LDC.

Manufacturing jobs tell a different story. Some jobs are local, but few regions have a very high share of local demand. Most regions source these appliances and boilers from the same region as the originating LDC, about 30 to 50 percent of the time. General residential appliances have an even small share of local demand, with less than 20 percent coming from the same region. This drop is mainly due to overseas trade, as well as the mixture of other appliances within this category that may not reflect just gas end uses.

Despite some industries not originating from the same region as a given LDC's service territory, most jobs remain locally linked even if appliances or source energy does not. Based on the REMI model, between 62 and 83 percent of all jobs created by a given LDC within a region, stay within that region. In the case of New England, where there are almost no oil and gas production and some appliance manufacturing, every job created directly by an LDC multiplies to more than 11 jobs throughout the local economy and four more throughout the country. These impacts are typical for all parts of the country, and on average create 17 local jobs and seven more in other regions.

Local vs National Employment from Gas Utilities 2018 (Thousands)

	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	National
LDC Employment (Thousands)	8.0	19.0	20.3	10.0	19.4	5.4	26.9	9.5	19.3	137.7
Regional	11.4x	14.4x	13.5x	18.7x	21x	28.1x	18.6x	27.5x	12.6x	17.3x
National	4.3x	4.8x	6.1x	10.9x	6.5x	17.5x	6.8x	10.2x	2.8x	6.6x
Total	15.8x	19.3x	19.6x	29.7x	27.5x	45.7x	25.4x	37.8x	15.5x	24x

Future Hurdles and Opportunities for Growth

Based on the findings from the REMI model, in 2018, over 3.4 million jobs were connected to the direct use of natural gas. These industries added \$408 billion to GDP and paid \$152 billion in personal income. However, this is only a snapshot of how interconnected natural gas utilities are to the greater national economy. This model also suggests that more than 62 percent of these impacts stay within the region that the original LDC service territory operates.

In the future, how this employment base will grow or shrink has two major market-based hurdles. The first is continued service from LDCs to more customers. Throughput from utilities may fluctuate as a function of consumption, but historically, residential and commercial usage has remained flat over time. However, over the past 30 years, the number of residential and commercial users has more than doubled. Even in a shorter time frame, utilities have added over 500,000 customers every year for the last five years. Continuing to expanding that user base could be a big motivator for more jobs linked to LDCs.

Energy efficiency and lower cost service have been a core part of LDCs business for decades. Based on the Energy Information Administration's 2015 Residential Energy Consumption Survey, a detailed comparison of energy use for a natural gas home versus a heat pump home show that electricity bills are higher in all nine regions with an average savings of \$373 per year. In 2015, there were over 3.3 million households using a heat pump near a gas main. These savings passed on to customers do not come without an initial cost to the economy (reduced electric utility sales). Because customers are getting a comparable service (space and water heating) for a lower price, total output would be lower by that amount unless households spend those savings elsewhere.

Applying the energy savings into the REMI model, the induced impact resulted in an average outcome of negative \$5 locally and positive \$103 nationally. The \$103 would be a net gain for the national economy on top of the initial savings from conversions. For local economies, a reduction in electric utility sales had a negative impact on overall output with the expectation of New England, South Atlantic, and Pacific regions where total output far exceeded the initial savings. For each region with local negative output, after excluding the initial gains/losses to utilities, the average impact was \$371 locally and \$479 nationally with all but one region showing any losses (Mountain). Additionally, many of the regions saw

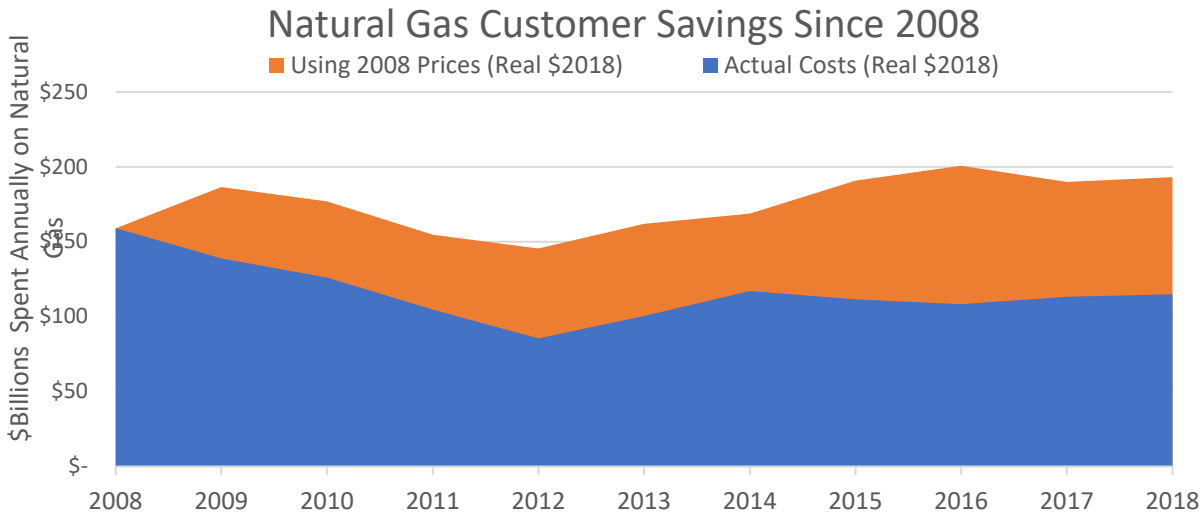
additional growth in both natural gas and electric power generation from other activities outside residential space and water heating conversions.

Average Customer Impact on Local and National Output from Heat Pump to Natural Gas Conversions (\$2018)



The second hurdle is the cost of energy, and this will primarily impact both the down-stream aspects of this model and the level of induced jobs created. If prices increase and occupy a larger share of inputs for industries relying on natural gas, that change could inversely impact employment, value-added, and income associated with natural gas. Without a low costing alternative source of energy, this is a net loss for the economy that cannot be quickly regained. The savings of \$148 billion to households and \$500 billion to business since 2008 account for an overall savings of 33 to 50 percent of what could have been based on pre-2008 Energy Information Administration based forecasts².

² Source: U.S. Energy Information Administration, Short-Term Energy Outlook



Gas utilities form a broad base for the national economy to operate. This happens both because of the multitude of end-users provided by LDCs and the economic impacts of making that service possible. LDCs can link their operations to as much as 2 percent of total national GDP. The product they provide is also available to all sectors of the economy, with nearly all industries relying on it in some capacity at affordable prices. Building on the REMI model, an increase of 100 percent from the 2018 Henry Hub price could remove as many as 468 thousand jobs from the market and reduce GDP by over \$60 billion in the following year. Since 2009, the opposite has occurred, and commodity prices have dropped, saving customers approximately \$65 billion annually.

Conclusions

The energy industry will always act as a significant pillar for any nation’s economic output. LDCs fill an essential part of the economy by transporting large quantities of energy efficiently, just when it is needed, and in a form that not only heats our homes but also drives signature industrial processes that otherwise may be cost-prohibitive. By providing safe and reliable energy service to local homes and businesses, these companies have become a core part of local job and economic growth for decades.

Through this analysis, it was determined that as many as 1.7 million jobs and over \$236 billion in value-added to national GDP could be directly or indirectly linked to LDCs. The impact more than doubles by 1.74 million through the induced effect on wages paid to direct and indirect employees. These 3.4 million jobs in total bring over \$408 billion in total value-added and \$152 billion in annual personal income.

As a midstream/downstream supplier, LDCs create a lot of economic activity through the distribution of energy. They do not create nor make a final standardized product, yet they provide a service that links to all sectors and fills vital energy needs not easily accomplished through conversion. This service has and remains to be a low-cost option with total savings near \$1 trillion over ten years and the potential to not only save customers who use it but stimulate further growth beyond the meter by reallocating lost income to other goods and services other than energy.

Natural gas distribution companies will continue to add value to the national economy in several ways, in part because it is an industry capable of providing cost-effective, efficient, and storable energy to customers across the nation. Encouraging the efficient use of energy from source to end use will always push continued economic growth as well as job creation. LDCs are uniquely positioned to provide that service and can further support end-use sectors so they can continue to grow.

Appendix A: Total Employment Activity in 2018

Total Employment Activity 2018	Production		Distribution	Direct Use		Equipment Mfg.		Total
	Direct	Induced	Direct	Direct	Induced	Direct	Induced	Direct
	Indirect		Indirect	Indirect		Indirect		Indirect
Accommodation and food services	18.5	25.1	17.7	36.6	21.1	20.7	17.1	156.8
Administrative, support, waste management	31.2	36.9	18.5	13.4	41.0	20.9	26.9	188.9
Arts, entertainment, and recreation	9.3	13.0	9.7	12.4	10.3	11.0	8.3	74.0
Construction	46.1	177.8	50.2	38.8	68.2	57.7	41.5	480.3
Educational services; private	7.3	9.3	8.2	75.2	7.2	9.2	4.5	120.8
Finance and insurance	26.2	32.8	21.4	15.3	24.7	23.9	19.6	164.0
Forestry, fishing, and hunting	0.5	1.2	0.5	0.4	3.7	0.6	0.8	7.6
Health care and social assistance	29.6	38.7	34.2	42.0	27.2	39.3	18.3	229.2
Information	4.6	8.4	4.5	2.9	6.5	5.1	5.3	37.3
Management of companies and enterprises	3.3	10.6	3.7	4.8	13.1	4.2	8.7	48.4
Manufacturing	14.6	46.6	15.9	65.6	40.7	48.4	23.1	255.0
Mining	93.0	19.6	2.7	4.1	10.1	3.1	3.9	136.5
Other services (except public administration)	25.5	32.9	26.9	34.0	25.5	190.2	5.6	340.6
Professional, scientific, and technical services	26.4	43.6	15.9	10.3	32.6	17.9	23.8	170.6
Real estate and rental and leasing	15.7	25.0	15.4	26.9	19.0	137.0	58.8	297.8
Retail trade	34.3	52.0	37.2	24.7	33.0	43.6	24.0	248.7
State and Local Government	18.0	16.7	25.1	10.9	12.4	17.9	7.9	108.9
Transportation and warehousing	19.9	24.2	12.3	20.4	26.6	13.9	16.2	133.5
Utilities	1.0	1.6	137.7	0.8	2.9	1.0	1.1	146.0
Wholesale trade	11.0	19.3	9.5	6.3	21.3	11.1	18.5	97.1
Total (Thousands)	435.9	635.7	467.2	445.8	446.9	676.7	333.8	3,441.9

Appendix B: Total Value Added to GDP in 2018

Total Value Added to GDP in 2018	Production		Distribution	Direct Use		Equipment Mfg.		Total
	Direct	Induced	Direct	Direct	Induced	Direct	Induced	Direct
	Indirect		Indirect	Indirect		Indirect		Indirect
Accommodation and food services	\$ 789	\$ 1,064	\$ 745	\$ 1,576	\$ 894	\$ 864	\$ 720	\$ 6,653
Administrative, support, waste management	\$ 1,472	\$ 1,885	\$ 939	\$ 757	\$ 2,075	\$ 1,055	\$ 1,332	\$ 9,516
Arts, entertainment, and recreation	\$ 428	\$ 599	\$ 456	\$ 577	\$ 477	\$ 518	\$ 371	\$ 3,426
Construction	\$ 3,935	\$ 15,094	\$ 4,268	\$ 3,294	\$ 5,795	\$ 4,839	\$ 3,502	\$ 40,727
Educational services; private	\$ 318	\$ 402	\$ 359	\$ 3,340	\$ 317	\$ 409	\$ 199	\$ 5,343
Finance and insurance	\$ 3,358	\$ 4,023	\$ 2,718	\$ 2,087	\$ 3,266	\$ 3,118	\$ 2,581	\$ 21,151
Forestry, fishing, and hunting	\$ 18	\$ 49	\$ 21	\$ 18	\$ 148	\$ 23	\$ 31	\$ 308
Health care and social assistance	\$ 2,145	\$ 2,802	\$ 2,452	\$ 2,842	\$ 1,954	\$ 2,829	\$ 1,323	\$ 16,349
Information	\$ 1,258	\$ 2,255	\$ 1,266	\$ 834	\$ 1,747	\$ 1,446	\$ 1,419	\$ 10,226
Management of companies and enterprises	\$ 309	\$ 981	\$ 343	\$ 454	\$ 1,226	\$ 391	\$ 814	\$ 4,517
Manufacturing	\$ 2,119	\$ 6,849	\$ 2,331	\$ 10,448	\$ 6,350	\$ 7,006	\$ 3,145	\$ 38,248
Mining	\$ 22,575	\$ 3,220	\$ 463	\$ 808	\$ 1,989	\$ 512	\$ 689	\$ 30,257
Other services (except public administration)	\$ 1,033	\$ 1,324	\$ 1,028	\$ 1,330	\$ 1,099	\$ 14,252	\$ (624)	\$ 19,443
Professional, scientific, and technical services	\$ 2,772	\$ 4,696	\$ 1,743	\$ 1,132	\$ 3,481	\$ 1,955	\$ 2,525	\$ 18,304
Real estate and rental and leasing	\$ 4,487	\$ 7,275	\$ 4,586	\$ 7,962	\$ 5,876	\$ 22,110	\$ 4,675	\$ 56,970
Retail trade	\$ 2,113	\$ 3,199	\$ 2,268	\$ 1,499	\$ 2,010	\$ 2,617	\$ 1,452	\$ 15,157
State and Local Government	\$ 1,502	\$ 1,377	\$ 2,164	\$ 959	\$ 1,065	\$ 1,531	\$ 628	\$ 9,224
Transportation and warehousing	\$ 3,914	\$ 2,020	\$ 873	\$ 1,458	\$ 2,216	\$ 996	\$ 1,148	\$ 12,625
Utilities	\$ 466	\$ 767	\$ 66,915	\$ 379	\$ 1,481	\$ 485	\$ 540	\$ 71,033
Wholesale trade	\$ 2,160	\$ 3,814	\$ 1,845	\$ 1,205	\$ 4,098	\$ 2,092	\$ 3,581	\$ 18,795
Total Value Added to GDP in 2018	\$ 57,169	\$ 63,696	\$ 97,782	\$ 42,959	\$ 47,565	\$ 69,048	\$ 30,051	\$ 408,270

Appendix C: Total Effect on Personal Income in 2018

Total Personal Income 2018	Production		Distribution	Direct Use		Equipment Mfg.		Total
	Direct	Induced	Direct	Direct	Induced	Direct	Induced	Direct
	Indirect		Indirect	Indirect		Indirect		Indirect
Accommodation and food services	\$ 422	\$ 562	\$ 402	\$ 860	\$ 484	\$ 479	\$ 393	\$ 3,601
Administrative, support, waste management	\$ 924	\$ 1,166	\$ 587	\$ 463	\$ 1,282	\$ 666	\$ 839	\$ 5,926
Arts, entertainment, and recreation	\$ 203	\$ 284	\$ 213	\$ 275	\$ 231	\$ 246	\$ 187	\$ 1,639
Construction	\$ 1,975	\$ 7,538	\$ 2,174	\$ 1,667	\$ 2,924	\$ 2,427	\$ 1,753	\$ 20,458
Educational services; private	\$ 241	\$ 299	\$ 274	\$ 2,555	\$ 242	\$ 312	\$ 152	\$ 4,075
Finance and insurance	\$ 1,688	\$ 2,039	\$ 1,394	\$ 1,046	\$ 1,640	\$ 1,584	\$ 1,285	\$ 10,676
Forestry, fishing, and hunting	\$ 9	\$ 25	\$ 10	\$ 7	\$ 73	\$ 11	\$ 16	\$ 151
Health care and social assistance	\$ 1,386	\$ 1,796	\$ 1,605	\$ 1,914	\$ 1,274	\$ 1,842	\$ 864	\$ 10,681
Information	\$ 415	\$ 752	\$ 406	\$ 265	\$ 596	\$ 457	\$ 478	\$ 3,369
Management of companies and enterprises	\$ 367	\$ 1,132	\$ 407	\$ 528	\$ 1,414	\$ 456	\$ 941	\$ 5,246
Manufacturing	\$ 917	\$ 3,054	\$ 1,008	\$ 4,155	\$ 2,686	\$ 3,047	\$ 1,495	\$ 16,362
Mining	\$ 2,399	\$ 1,149	\$ 154	\$ 210	\$ 507	\$ 166	\$ 231	\$ 4,816
Other services (except public administration)	\$ 618	\$ 776	\$ 626	\$ 812	\$ 629	\$ 5,271	\$ 30	\$ 8,762
Professional, scientific, and technical services	\$ 1,545	\$ 2,714	\$ 990	\$ 641	\$ 1,976	\$ 1,087	\$ 1,403	\$ 10,356
Real estate and rental and leasing	\$ 242	\$ 428	\$ 235	\$ 402	\$ 309	\$ 4,709	\$ 1,345	\$ 7,668
Retail trade	\$ 945	\$ 1,426	\$ 1,031	\$ 693	\$ 918	\$ 1,238	\$ 675	\$ 6,926
State and Local Government	\$ 924	\$ 834	\$ 1,313	\$ 622	\$ 646	\$ 918	\$ 393	\$ 5,650
Transportation and warehousing	\$ 1,369	\$ 1,031	\$ 457	\$ 732	\$ 1,126	\$ 528	\$ 634	\$ 5,877
Utilities	\$ 94	\$ 150	\$ 11,986	\$ 77	\$ 278	\$ 95	\$ 101	\$ 12,780
Wholesale trade	\$ 829	\$ 1,448	\$ 724	\$ 480	\$ 1,594	\$ 846	\$ 1,394	\$ 7,316
Total Personal Income 2018	\$ 17,510	\$ 28,603	\$ 25,995	\$ 18,405	\$ 20,827	\$ 26,386	\$ 14,610	\$152,336

Appendix D: Regional Jobs in 2018

Total Direct, Indirect, and Induced Employment from Gas Utilities 2018 (Thousands)

Job Creation by Region											Multipliers		
LDC Job Creation by Origin	LDC Employment	New England	Mid-Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	National	Local	National
		New England	8.01	99.19	13.79	4.23	1.63	6.82	1.50	4.61	0.92	1.06	133.75
Mid-Atlantic	18.96	17.34	291.54	15.49	4.76	30.88	4.97	13.10	2.66	2.34	383.09	14.4x	4.8x
East North Central	20.27	5.98	20.91	292.00	17.42	25.87	13.89	23.10	6.70	9.80	415.67	13.4x	6.1x
West North	10.02	3.52	10.15	24.92	195.67	12.50	6.92	27.25	11.08	13.01	305.01	18.5x	10.9x
South Atlantic	19.39	9.11	35.35	24.35	8.49	424.53	14.80	22.69	4.36	7.09	550.77	20.9x	6.5x
East South Central	5.36	3.32	10.54	19.64	6.66	25.12	155.27	19.93	3.23	5.37	249.08	28x	17.5x
West South Central	26.87	7.31	20.57	30.90	25.56	29.13	18.15	522.61	20.27	29.81	704.30	18.4x	6.8x
Mountain	9.53	2.68	7.43	12.25	11.10	8.16	4.44	20.34	270.17	31.26	367.83	27.3x	10.2x
Pacific	19.31	1.48	3.91	7.16	6.13	4.28	2.61	12.43	16.96	262.34	317.29	12.6x	2.8x
National	137.72	149.93	414.18	430.94	277.42	567.29	222.56	666.05	336.35	362.07	3426.78	17.3x	6.6x

Appendix E: Regional Impacts on Net Output

Total Net Gain in Output from Heat Pumps to Natural Gas Conversions (\$2018)

		Total Economic Output Created vs Initial Customer Savings						
		Customer		National		Non Utility Output		
		Heat Pump	Natural Gas	Savings from	Change in Local	Change in	Non Utility Local	Created From the
		Heating Bill	Heating Bill	Conversion	Output	Output	Output Created	Conversions
Revenue Creation by Origin	New England	\$ 879.5	\$ 667.0	\$ 212.5	\$ 49.0	\$ 174.0	\$ 261.5	\$ 386.5
	Mid-Atlantic	\$ 890.2	\$ 420.0	\$ 470.2	\$ (85.0)	\$ 107.0	\$ 385.2	\$ 577.2
	East North Central	\$ 806.5	\$ 656.1	\$ 150.4	\$ (140.0)	\$ 272.0	\$ 10.4	\$ 422.4
	West North Central	\$ 1,603.4	\$ 735.2	\$ 868.2	\$ (292.0)	\$ (156.0)	\$ 576.2	\$ 712.2
	South Atlantic	\$ 519.8	\$ 466.8	\$ 53.0	\$ 56.0	\$ 192.0	\$ 109.0	\$ 245.0
	East South Central	\$ 790.3	\$ 322.6	\$ 467.7	\$ (114.0)	\$ 26.0	\$ 353.7	\$ 493.7
	West South Central	\$ 775.5	\$ 241.4	\$ 534.0	\$ (90.0)	\$ (24.0)	\$ 444.0	\$ 510.0
	Mountain	\$ 451.2	\$ 442.6	\$ 8.7	\$ (22.0)	\$ 143.0	\$ (13.3)	\$ 151.7
	Pacific	\$ 1,245.5	\$ 278.6	\$ 966.9	\$ 328.0	\$ 92.0	\$ 1,294.9	\$ 1,058.9
	Average of all Heat Pumps Users		\$ 776	\$ 403	\$ 373	\$ (5)	\$ 103	\$ 371

Appendix F: Net Savings to Customers by State since 2008

10 Year Savings per Sector (Real \$2018 Billions)

State	Residential	Commerical	Industrial	Total	State	Residential	Commerical	Industrial	Total
US	\$ 143.26	\$ 122.76	\$ 381.79	\$ 647.82	MO	\$ 1.90	\$ 1.78	\$ 2.31	\$ 5.99
AL	\$ 0.95	\$ 0.82	\$ 10.17	\$ 11.94	MT	\$ 0.67	\$ 0.71	\$ 0.80	\$ 2.18
AK	\$ (0.16)	\$ (0.01)	\$ 0.01	\$ (0.16)	NE	\$ 0.90	\$ 0.94	\$ 3.65	\$ 5.49
AZ	\$ 0.61	\$ 1.02	\$ 0.77	\$ 2.41	NV	\$ 1.03	\$ 1.04	\$ 0.57	\$ 2.64
AR	\$ 0.79	\$ 1.36	\$ 3.25	\$ 5.40	NH	\$ 0.11	\$ 0.23	\$ 0.32	\$ 0.66
CA	\$ 9.13	\$ 8.75	\$ 30.26	\$ 48.13	NJ	\$ 10.65	\$ 7.14	\$ 2.45	\$ 20.24
CO	\$ 2.06	\$ 0.93	\$ 2.53	\$ 5.52	NM	\$ 1.10	\$ 0.94	\$ 0.91	\$ 2.94
CT	\$ 1.91	\$ 2.24	\$ 1.31	\$ 5.47	NY	\$ 17.51	\$ 14.23	\$ 3.80	\$ 35.53
DE	\$ 0.22	\$ 0.29	\$ 0.49	\$ 0.99	NC	\$ 2.84	\$ 2.78	\$ 5.41	\$ 11.03
DC	\$ 0.51	\$ 0.41	\$ -	\$ 0.92	ND	\$ 0.28	\$ 0.37	\$ 1.21	\$ 1.86
FL	\$ 0.26	\$ 2.09	\$ 4.45	\$ 6.80	OH	\$ 12.40	\$ 8.89	\$ 17.13	\$ 38.43
GA	\$ 3.70	\$ 2.61	\$ 8.91	\$ 15.23	OK	\$ 1.10	\$ 1.23	\$ 12.25	\$ 14.58
HI	\$ 0.00	\$ 0.10	\$ 0.01	\$ 0.11	OR	\$ 0.89	\$ 0.59	\$ 1.46	\$ 2.94
ID	\$ 0.67	\$ 0.48	\$ 1.06	\$ 2.21	PA	\$ 9.85	\$ 6.53	\$ 6.88	\$ 23.26
IL	\$ 14.53	\$ 8.33	\$ 11.74	\$ 34.60	RI	\$ 0.34	\$ 0.32	\$ 0.26	\$ 0.91
IN	\$ 4.98	\$ 2.69	\$ 14.96	\$ 22.64	SC	\$ 1.01	\$ 1.15	\$ 4.89	\$ 7.05
IA	\$ 1.80	\$ 1.63	\$ 7.12	\$ 10.55	SD	\$ 0.37	\$ 0.35	\$ 1.47	\$ 2.20
KS	\$ 1.64	\$ 1.07	\$ 5.80	\$ 8.51	TN	\$ 2.75	\$ 2.20	\$ 6.07	\$ 11.01
KY	\$ 1.61	\$ 1.58	\$ 6.19	\$ 9.38	TX	\$ 5.21	\$ 7.02	\$ 83.58	\$ 95.82
LA	\$ 1.44	\$ 1.33	\$ 53.37	\$ 56.14	UT	\$ 0.05	\$ 0.15	\$ 0.63	\$ 0.83
ME	\$ 0.04	\$ 0.26	\$ 1.23	\$ 1.53	VT	\$ 0.11	\$ 0.27	\$ 0.08	\$ 0.46
MD	\$ 3.09	\$ 2.22	\$ 0.76	\$ 6.07	VA	\$ 3.34	\$ 2.80	\$ 4.64	\$ 10.78
MA	\$ 4.11	\$ 3.72	\$ 2.46	\$ 10.28	WA	\$ 1.20	\$ 1.06	\$ 1.45	\$ 3.70
MI	\$ 7.72	\$ 4.45	\$ 4.94	\$ 17.12	WV	\$ 0.95	\$ 0.99	\$ 2.05	\$ 3.99
MN	\$ 3.35	\$ 3.20	\$ 6.36	\$ 12.91	WI	\$ 4.77	\$ 3.44	\$ 5.97	\$ 14.18
MS	\$ 0.91	\$ 0.83	\$ 5.85	\$ 7.58	WY	\$ 0.17	\$ 0.22	\$ 1.38	\$ 1.77

*States were calculated independently from total US consumption and may not add up to the national total

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