ADVANCING AMERICA'S

Pharmaceuticals

The Value of Natural Gas to the U.S. Pharmaceutical Manufacturing Sector

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AGA
American Gas Association

Table of Contents

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Letter from the President & CEO: The Essential Role of Natural Gas in the Pharmaceutical Manufacturing Sector

Over the past three years, we have become acutely aware of the miracles of modern medicine. As the COVID-19 pandemic raged, pharmaceutical manufacturers were working around the clock to develop treatments and vaccines – innovation that ultimately helped us put the pandemic behind us.

One story that has not been fully explored is the critical role that natural gas plays in America's pharmaceutical sector. In our fourth analysis of the Advancing America series, we seek to tell that story: how natural gas makes life-saving supplies and medicines possible that better our health and well-being.

From face masks and medical gloves, to disinfecting products and vaccine syringes, pharmaceutical products that rely on affordable and abundant natural gas became the backbone of our world's COVID-19 pandemic recovery that made the fight winnable. More importantly, the domestic production of natural gas supported the economic recovery of our nation while maintaining energy access for consumers and key industries such as healthcare.

Natural gas is versatile and critically integrated into the pharmaceutical supply chain, improving efficiency while limiting reliance on foreign resources. In fact, data show that 99 percent[1] of pharmaceutical feedstocks and reagents are derived from petrochemicals. These are irreplaceable products for millions of Americans who rely on prescriptions and other medications.

> **99%** of pharmaceutical feedstocks and reagents are derived from petrochemicals

Natural gas products also increase accessibility for patients who may need artificial limbs, hearing aids, or heart valves. Further still, natural gas fuels the manufacturing processes used to prepare innovative medicines while products are flown, shipped, and driven across the world thanks to natural gas in transportation.

Each year, the pharmaceutical manufacturing sector consumes 104 billion cubic feet of natural gas, which is approximately the same amount of natural gas[2] delivered annually to all residential households in Missouri, with a population of more than 6.1 million.[3]

Pharmaceutical manufacturers are also actively innovating to reduce their greenhouse gas footprint, and they're leveraging the natural gas industry to help them achieve their goals. For example, last year, AstraZeneca announced a partnership with Vanguard Renewables to obtain up to 650,000 mmBTU of

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3154246/
[2] https://www.eia.gov/dnav/ng/ng_cons_sum_a_EPG0_vrs_mmcf_a.htm
[3] https://www.census.gov/quickfacts/fact/table/MO/PST045222

renewable natural gas (RNG) per year for use in its manufacturing operations.[4] That volume of RNG could heat more than 17,800 U.S. homes each year.

Despite these advancements, there is a coordinated campaign across America to ban or restrict access to natural gas, and as we have noted in prior analyses in this series, it's not just the natural gas industry that would be harmed. Indeed, a mandated shift from natural gas to electricity within the pharmaceutical manufacturing sector would cost $1.3 billion. The states that would incur the largest proportion of that cost include Pennsylvania, Massachusetts, New Jersey, and California.

Each year, the amount of natural gas consumed by pharmaceutical manufacturing is roughly equal to the natural gas consumed by **all residential households in Missouri.**

At a more fundamental level, restricting access to natural gas would drive up the cost of medicine – an added burden to the pain millions of Americans have felt in recent years from record inflation – and could compromise the operations of existing bio-laboratories by forcing them into expensive retrofits that resort to inefficient alternatives for waste incineration and highly technical processes like sterilization.

Restricting access to natural gas would **drive up the cost of medicine** at a time when Americans are feeling the pain of record inflation with higher prices for food, childcare, and other essentials.

The costs of removing gas as a fuel option can be significant. **This analysis finds that mandated electrification of the industry would result in increased fuel expenditures of $135 million through 2050, threatening an industry that supports 1.8 million jobs, $338 billion in GDP, and accounts for $74 billion in annual federal, state, and local tax revenue**. And for many medical products, such as low-cost generics with very small margins, increased energy costs likely translate directly to higher costs for patients.

The United States sets the standard for innovative medicine development while providing world-class care for millions of patients every year. The findings of this report highlight the vital role of natural gas in the pharmaceutical manufacturing sector and the significant impact that natural gas restrictions could have in the supply chain.

[4] https://www.businesswire.com/news/home/20230609005345/en/AstraZeneca-announces-innovative-partnership-with-Vanguard-Renewables-to-decarbonize-its-United-States-sites

From creating medicines, to powering our factories and pharmacies, or transporting life-saving products, natural gas and the pharmaceutical industry go hand-in-hand. When we consider how crucial modern medicine is for America's health and well-being, this fact is simply too important to ignore.

Karen A. Harbert

President and CEO, American Gas Association

Executive Summary

The American Gas Association engaged FTI Consulting, Inc. ("FTI") to describe the economic value natural gas provides to the U.S. pharmaceutical manufacturing sector, which is defined as the discovery, development and manufacturing of drugs and medications.[5] Also included in the report are data from the U.S. Energy Information Administration and IMPLAN.

> Natural gas is an irreplaceable feedstock for everyday products such as **aspirin, medicine capsules and containers, sanitary items** and more.

Natural gas plays a critical role in pharmaceutical manufacturing, and each year, the sector consumes 104 billion cubic feet of natural gas.[6] It serves as an irreplaceable feedstock for a multitude of life-saving products and medicines including antiseptics, aspirin, medicine capsules and containers, sanitary items and more. It powers the manufacturing lines, pharmacies, and hospitals that develop and administer these innovative products and fuels the transportation needed to create and distribute these vital products across the world. And, at one-third the unit price of electricity[7], natural gas helps keep costs more affordable, ensuring that necessary prescriptions and products are accessible to those who need them most.

Unfortunately, some states and localities are advocating for restrictions on natural gas without carefully considering the effect on a variety of industries, including the manufacturers of vaccines and other critical medicines. This analysis shows that mandated electrification would incur a heavy toll on the ability of pharmaceutical manufacturers to operate.

This study finds that:

- Businesses throughout the pharmaceutical manufacturing supply chain consume over 104 billion cubic feet of natural gas annually. **This is approximately the same amount of natural gas delivered each year to all residences[8] in Missouri, with a population of more than 6.1 million.[9]**
- The U.S. pharmaceutical manufacturing sector supports **1.8 million jobs, $663 billion in economic output, $338 billion in GDP, and $30 million in state and local taxes** when accounting for direct, indirect, and induced economic impacts.

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[5] https://www.trade.gov/pharmaceuticals-and-biopharmaceuticals
[6] FTI Calculations.
[7] https://www.govinfo.gov/content/pkg/FR-2022-03-07/pdf/2022-04765.pdf
[8] https://www.eia.gov/dnav/ng/ng_cons_sum_a_EPG0_vrs_mmcf_a.htm
[9] https://www.census.gov/quickfacts/fact/table/MO/PST045222

- The U.S. pharmaceutical manufacturing sector has a strong link to petrochemical manufacturing, particularly as many products from this sector use natural gas as a feedstock. Data show that **99 percent of pharmaceutical feedstocks are derived from petrochemicals.**[10]
- Mandated electrification of the U.S. pharmaceutical manufacturing sector would **cost the U.S. economy $1.3 billion in increased fuel costs through 2050 –** much of which could be directly passed to the consumer in higher prices for prescription medicines and necessary medical products.
    - Pennsylvania would be the state to incur the highest cost for fuel switching from natural gas to all-electric ($235 million), followed by Massachusetts ($227 million), New Jersey ($206 million), and California ($164 million).

The U.S. Pharmaceutical Manufacturing Sector consumes more than

18.7 billion cubic feet

of natural gas each year, higher than Vermont's annual natural gas consumption, with a population of 647,000.

- Businesses within the pharmaceutical manufacturing sector consume 18.7 billion cubic feet (bcf) of natural gas each year, **higher than the total natural gas consumption of Vermont**.[11]
- Pharmaceutical manufacturing facilities use natural gas to maintain stable heating and temperature control, a critical factor in storing vaccines and other medicines.
- Natural gas is also used as a critical feedstock for producing active pharmaceutical ingredients, as well as producing plastic packaging and bottles for final products.
- **Pharmaceutical manufacturing facilities have limited ability to reduce energy usage through demand response or other curtailments.** For example, whereas homes and some businesses may be able to adjust thermostats or change when they use large appliances in response to high demand events, pharmaceutical manufacturing facilities have no such flexibility. Many pharmaceuticals must remain within a stable temperature and humidity range to maintain their chemical properties and maintain effectiveness.
- Of all petroleum production in the U.S., 3% is used in the pharmaceutical manufacturing process.[12]

[10] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3154246/
[11] FTI Calculations.
[12] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9640709/

Introduction and Context

For centuries, humans have used natural resources in pursuit of medical care. Ancient Persians believed that crude oil could alleviate pain and digestive issues while Holy Roman Emperor Charles V used oil as treatment for gout. In modern society, natural gas is a critical component in medical care, particularly in pharmaceutical manufacturing.

Through innovation by chemists such as Felix Hoffman in 1897, the synthetization of petrochemicals changed the landscape of capabilities for medical care. Hoffman's invention of acetylsalicylic acid, also known as aspirin, became one of the most effective and widely used drugs in the world. As technology continued to advance, natural gas expanded its reach within the industry as a feedstock source for countless medicines including cortisone, antiseptics, and vitamins. Natural gas is a vital resource for modern medicine, providing the heat and power for temperature control systems and processes that synthesize chemical compounds. In addition, natural gas is needed to manufacture the pharmaceutical packaging and to sterilize equipment required to preserve the quality of medications through the distribution from laboratory to your cabinet.

Natural gas is vital for modern medicine, providing precise temperature control for storing vaccines.

Natural gas is one-third of the unit price of electricity, keeping energy costs affordable for hospitals, pharmacies, and medical manufacturing facilities across the nation. For example, a survey by the U.S. Energy Information Administration found that 74% of hospitals - where many pharmacies are located - use natural gas for space heating and 80% of hospitals use natural gas for water heating.[13]

Pharmaceutical manufacturing accounts for $338 billion in GDP and supports 1.8 million employees across the value chain. On a broader level, the U.S. pharmaceutical market is projected to grow from $567 billion in 2022 to $903 billion by 2030.[14] As a result, this is a sector that will need additional supplies of natural gas to meet growing demand. In 2023, approximately 85,786 mmcf/d (million cubic feet per day) natural gas is consumed indirectly by the pharmaceutical industry and its supply chain while another 18,695 mmcf/d of natural gas is consumed directly by the same market.[15]

The important role of natural gas was especially apparent during the world's most vulnerable moments of the COVID-19 pandemic, where natural gas derived products such as face masks and medical gloves were critical to protect health and save lives. Similarly, each and every vaccine dose administered was

[13] FTI analysis of EIA 2018 CBECS microdata for inpatient health care principal building activity, accessed at https://www.eia.gov/consumption/commercial/data/2018/xls/cbecs2018_final_public.csv.
[14] FTI calculations.
[15] Ibid.

delivered through a petrochemical-derived syringe, highlighting the crucial role natural gas played in overcoming the pandemic.

Number of Face Masks Used Per Month in 2020[16]	Number of Vaccines Administered in the U.S[17]	Number of Medical Gloves Used Per Year[18]
129 billion	979 million	300 billion

Lopsided supply and demand during this time kickstarted a chain reaction across multiple sectors, diminishing the supply for healthcare resources and increasing costs overall. The American Hospital Association estimated that drug expenses increased by 36.9% and medical supply expenses by 20.6% from pre-pandemic times.[19]

This trend would be made even worse by several states and municipalities that are advocating for restrictions on natural gas without considering the potential impacts towards other critical aspects of modern life, including the pharmaceutical manufacturing industry. This analysis finds that a mandated shift from natural gas to electricity within the pharmaceutical manufacturing sector would cost $1.3 billion. The states that would incur the largest proportion of that cost include Pennsylvania, Massachusetts, New Jersey, and California, several of which are states that have proposed statewide or municipal bans on natural gas.

Commercially, natural gas powers the more than 57,500 pharmacies across the nation, many of which are located within grocery stores, hospitals, and other medical clinics. This direct use includes heating buildings and keeping the lights on, with the abundance and reliability of natural gas helping to dispatch power at an affordable rate.

For industrial use, natural gas is used in pharmaceutical, medicinal, and chemical manufacturing processes as an irreplaceable feedstock during the development of medications. Simultaneously, natural gas fuels the very assembly lines and transportation needed to create and distribute products all over the country and world.

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[16] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9640709/
[17] https://www.statista.com/statistics/1065481/covid-19-vaccinations-distributed-and-administered-us/
[18] https://www.medicalplasticsnews.com/medical-plastics-industry-insights/latest-medical-plastics-insights/medical-gloves-market-gathers-momentum-during-coronavirus-ou/
[19] https://www.aha.org/guidesreports/2022-04-22-massive-growth-expenses-and-rising-inflation-fuel-continued-financial

Number of Pharmacies Nationwide	Number of Prescriptions Dispensed in 2022
57,500[15]	6.7 Billion[20]

Beyond these critical uses, natural gas also helps advance the pharmaceutical sector through "indirect" uses across the supply chain, such as oilseed and grain farming, both of which are necessary in the pharmaceutical manufacturing industry. As noted in the Agriculture report in this Advancing America series, natural gas is a critical input for the agriculture sector and its suppliers – highlighting once again the massive ramifications natural gas bans could have on every sector of modern life.[21]

This report examines the full scope and scale of the pharmaceutical manufacturing industry, the sector's direct and indirect use of natural gas, and highlights the economic impact of natural gas use for the sector. It begins by describing the natural gas demand from the sector, as implied by federal economic and energy data.

Natural Gas Consumption and the U.S. Pharmaceutical Manufacturing Sector

Natural Gas Consumption[22]

The consumption of natural gas associated with the U.S. pharmaceutical manufacturing sector was estimated using IMPLAN data and data covering gas consumption from the EIA. IMPLAN is an "input-output" (or "IO") model of national and regional economies that shows the contributions of an economic sector, specific enterprise, or policy to the economy. FTI used IMPLAN to estimate the full impact of the U.S. pharmaceutical manufacturing sector ("direct") by accounting for its supply chain ("indirect") and its direct and indirect employee spending ("induced"). Appendix A describes the methodology and approach used to estimate natural gas consumption by the pharmaceutical manufacturing sector.

When including the direct use of natural gas by the U.S. pharmaceutical manufacturing sector and the indirect use in its industrial supply chain, the sector consumes roughly 18.7 Bcf, as shown in **Table 1** below. **This is higher than Vermont's total natural gas consumption (in all sectors) each year.**[23] Such a level of natural gas consumption is also equivalent to almost 0.9 percent of all commercial and industrial gas consumption across the U.S. economy, based on EIA data on monthly gas consumption by sector.

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[20] https://www.iqvia.com/insights/the-iqvia-institute/reports-and-publications/reports/the-use-of-medicines-in-the-us-2023

[21] https://www.aga.org/wp-content/uploads/2023/03/Advancing-Americas-Agriculture-The-Value-of-Natural-Gas-to-U.S.-Agriculture-and-Agrochemicals.pdf

[22] All figures and tables related to natural gas demand use full-year 2022 data as their underlying source.

[23] 13,481 MMcf in 2022 according to EIA https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_SVT_a.htm

Table 1 – U.S. natural gas consumption supported by the Pharmaceutical Manufacturing Sector

Economic Sector	Units	Direct Demand	Indirect Demand	Direct & Indirect	Share of Sector (%)
Commercial	Bcf	N/A	9.5	9.5	0.3%
Industrial	Bcf	18.7	76.3	95.0	1.2%
C + I[24]	Bcf	18.7	85.8	104.5	0.9%

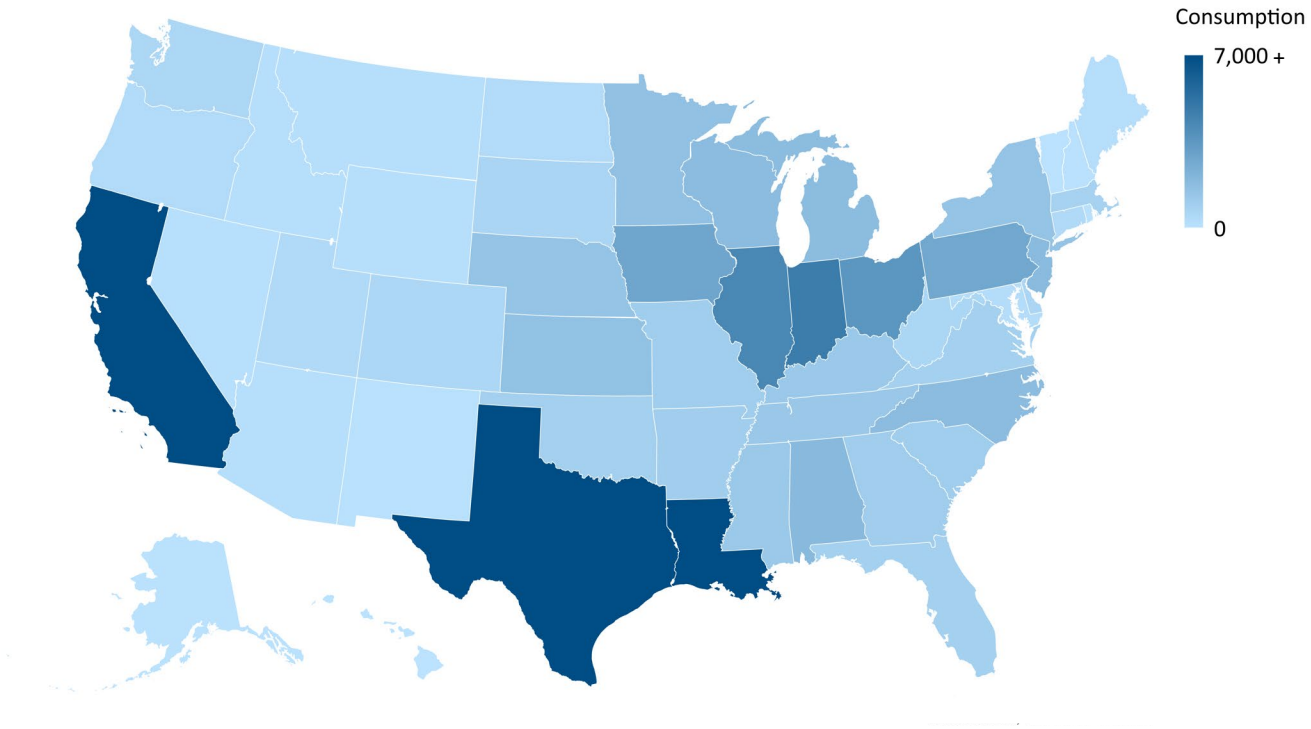
SOURCE: IMPLAN Model, EIA Natural Gas Consumption Data, FTI Calculations

The pharmaceutical industry's share of commercial and industrial consumption is highest in the Northeast and Mid-Atlantic regions of the United States. These regions are typically colder and rely more heavily on natural gas for space and water heating. Additionally, renewable energy options like solar or wind are limited due to the natural terrain and geography.

Figure 1 displays the total natural gas consumption of the pharmaceutical manufacturing sector at the state level, while **Figure 2** shows the percentage of state-level natural gas consumption that is attributable to pharmaceuticals. An important factor that drives differences between states is the size of the state, where larger state economies (e.g., Texas or California in **Figure 1**) have larger absolute results for natural gas demand. Another important factor is state specific industry mixtures (e.g., Wisconsin in **Figure 2**, where a large portion of gas consumption is attributable to the chemical manufacturing sector).

[24] Commercial sector plus industrial sector

Figure 1 – State natural gas consumption supported by the Pharmaceutical Manufacturing Sector (MMcf)

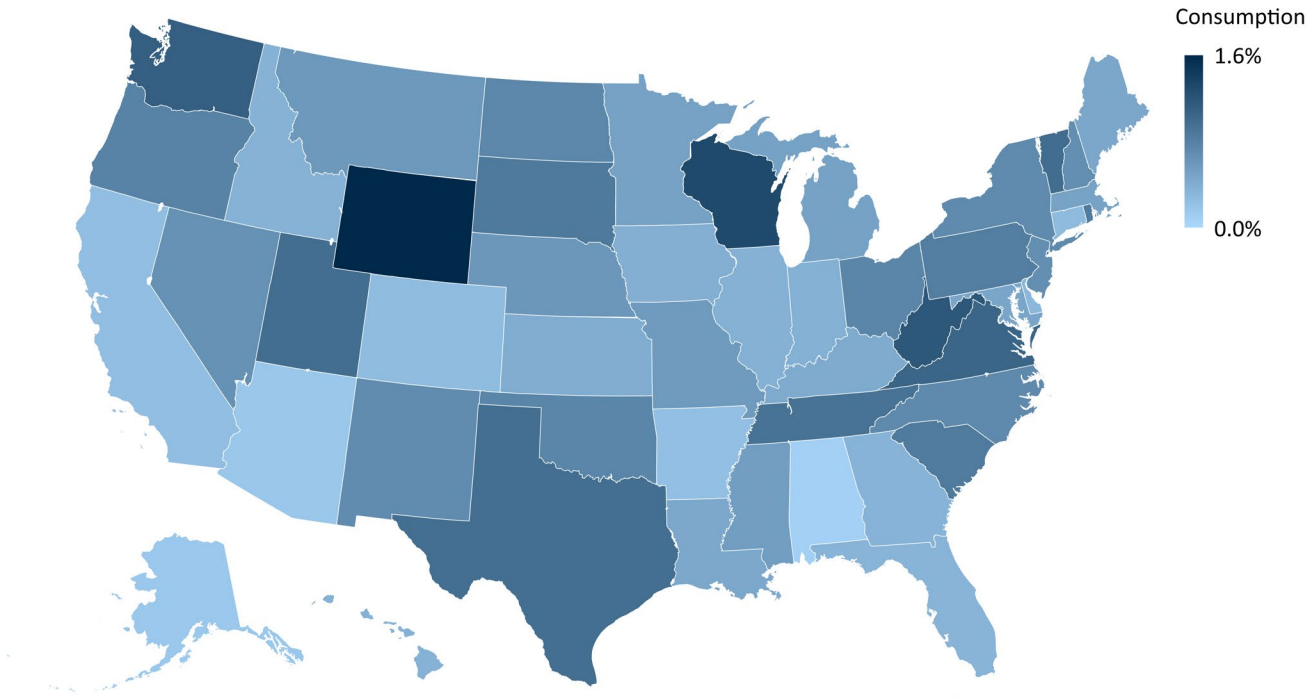


SOURCE: IMPLAN Model, EIA Natural Gas Consumption Data, FTI Calculations

Figure 2 shows the "intensity" of gas consumption supported by the U.S. Pharmaceutical manufacturing sector for each state energy sector and economy relative to all commercial and industrial gas consumption. Some of the major highlights and takeaways from **Figure 2** include:

- The share of commercial and industrial demand supported by the U.S. pharmaceutical manufacturing sector tends to be higher in the Northeast and the Midwest's East North Central region, which is the northern portion of the region and generally the coldest.
- On a per capita basis, Hawaii, D.C., and Arizona have the lowest natural gas consumption from the pharmaceutical manufacturing sector.

Figure 2 – Share of state natural gas consumption supported by the Pharmaceutical Manufacturing Sector (%)



SOURCE: IMPLAN Model, EIA Natural Gas Consumption Data, FTI Calculations

Table 2 shows the economic sectors with the highest level of gas consumption either directly or indirectly related to the U.S. pharmaceutical manufacturing sector.

Table 2 – Largest consumers of natural gas by the U.S. Pharmaceutical Manufacturing Sector and its supply chain (MMcf)

Rank	Economic Sector	Direct	Indirect
-	Pharmaceutical preparation manufacturing	15,547	0
-	Biological product (except diagnostic) manufacturing	1,248	0
-	Medicinal and botanical manufacturing	1,103	0
-	In-vitro diagnostic substance manufacturing	797	0
1	Petrochemical manufacturing	0	30,811
2	Other basic organic chemical manufacturing	0	24,377
3	Industrial gas manufacturing	0	2,580
4	Truck transportation	0	1,863
5	Couriers and messengers	0	1,739
6	Oilseed farming	0	1,502
7	Other basic inorganic chemical manufacturing	0	1,325
8	Grain farming	0	1,289
9	Wholesale - Drugs	0	1,173
10	Printing	0	1,123
	ALL OTHERS >>	0	18,006
	TOTAL >>	18,695	85,786

SOURCE: IMPLAN Model, EIA Natural Gas Consumption Data, FTI Calculations

Cost Impact of Replacing Gas in the U.S. Pharmaceutical Manufacturing Sector

FTI constructed an illustrative and representative scenario using federal energy data and information from the IMPLAN model to analyze the cost impact of replacing natural gas with electricity in the U.S. pharmaceutical manufacturing sector. This scenario is not the only possible future, but presents a plausible pathway with straightforward assumptions. The scenario relies upon the EIA's 2023 Annual Energy Outlook's Reference Case. Appendix A further describes the approach and methodology used to estimate cost impacts of replacing natural gas with electricity in the pharmaceutical manufacturing sector.

Cost Impacts

The cost impacts of the scenario modeled by IMPLAN in this report includes the following highlights:

- Between 2026 and 2050, the cumulative increase in net operational costs for the pharmaceutical manufacturing sector would be $1.3 billion. These increased costs could be passed on to customers and result in a decrease in household disposable income.
- Higher pharmaceutical costs would result in less disposable income for households and reduced overall spending. This would translate to $2.6 billion in reduced GDP across the country from 2026 through 2050.
- The reduced economic activity would lead to a loss of approximately 22,000 job-years for U.S. workers from 2026 through 2050.
- Pennsylvania alone would accumulate approximately 18 percent of the net $1.3 billion in total U.S. costs.

Table 3 shows the states with the largest cost impacts.

Table 3 – States with the highest net fuel costs from replacing gas with electricity (2023 $ millions)

Rank	State	Net Costs (2023-2050)
1	Pennsylvania	$235
2	Massachusetts	$227
3	New Jersey	$206
4	California	$164
5	Indiana	$106
6	Illinois	$72
7	New York	$47
8	Connecticut	$44
9	West Virginia	$35
10	Rhode Island	$33
	ALL OTHERS >>	$135
	TOTAL >>	$1,304

SOURCE: SEDS Energy Demand, AEO Reference Case, American Gas Association[25], FTI Calculations

[25] https://naturalalliesforcleanenergy.org/wp-content/uploads/2021/08/AGA_Study_On_Residential_Electrification_Jul2018.pdf

How Natural Gas is Used in the U.S. Pharmaceutical Manufacturing Sector

The U.S. supplies 22% of global pharmaceutical production, providing critical medications for consumers across the globe. Natural gas has several important use cases throughout U.S. pharmaceutical manufacturing where alternative energy sources, such as electricity, would not provide the same level of service nor allow for similar products.

Natural gas is a valuable energy source for heating and maintaining temperature control for pharmaceutical manufacturing facilities. It is also used to create steam used to sterilize manufacturing equipment. Importantly, natural gas is used to produce active pharmaceutical ingredients ("APIs"), which are the active ingredients in pharmaceutical drugs, and is also used in the production of plastics, which are often used in pharmaceutical packaging.

Energy Services

Maintaining temperature control is crucial across pharmaceutical manufacturing facilities. Pharmaceutical products must be kept at stable, ambient temperatures to ensure their potency and effectiveness. When pharmaceuticals are stored improperly, their chemical composition can change, limiting their effectiveness or voiding it altogether. Pharmaceutical manufacturing and storage facilities should maintain a stable temperature between 59–77 degrees Fahrenheit.[26] These temperature conditions must be met continuously to ensure proper pharmaceutical storage, and natural gas can be a key source of energy for pharmaceutical manufacturing facilities in providing reliable, round-the-clock energy.

Feedstock

Natural gas is used as a primary input for chemical feedstocks, many of which are commonly used in pharmaceutical manufacturing.[27] Pharmaceutical feedstocks are predominantly made from petrochemicals, and it is difficult to find substitutes for petroleum inputs in their production.

For example, natural gas is used to manufacture ethylene oxide, which is commonly used to combine pharmaceutical raw materials and used to sterilize surfaces.[28] While only 3% of petroleum production is used in pharmaceutical manufacturing, nearly 99% of pharmaceutical feedstocks are derived from petrochemicals.[29]

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[26] https://ispe.org/pharmaceutical-engineering/september-october-2021/temperature-humidity-requirements-pharmaceutical
[27] https://marcelluscoalition.org/2020/03/19/natural-gas-makes-life-saving-supplies-medicines-possible/
[28] https://www.ema.europa.eu/en/documents/scientific-guideline/note-guidance-limitations-use-ethylene-oxide-manufacture-medicinal-products_en.pdf
[29] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3154246/

In addition to being used to produce pharmaceuticals, natural gas is used to develop plastic bottles and packaging, in which most medications are stored in.[30] Current plastic applications in pharmaceutical storage are essential for the quality control of medicines. Plastics provide a sterile environment, which protects medicines from moisture and contaminants.[31]

Economic Contributions of the U.S. Pharmaceutical Manufacturing Sector

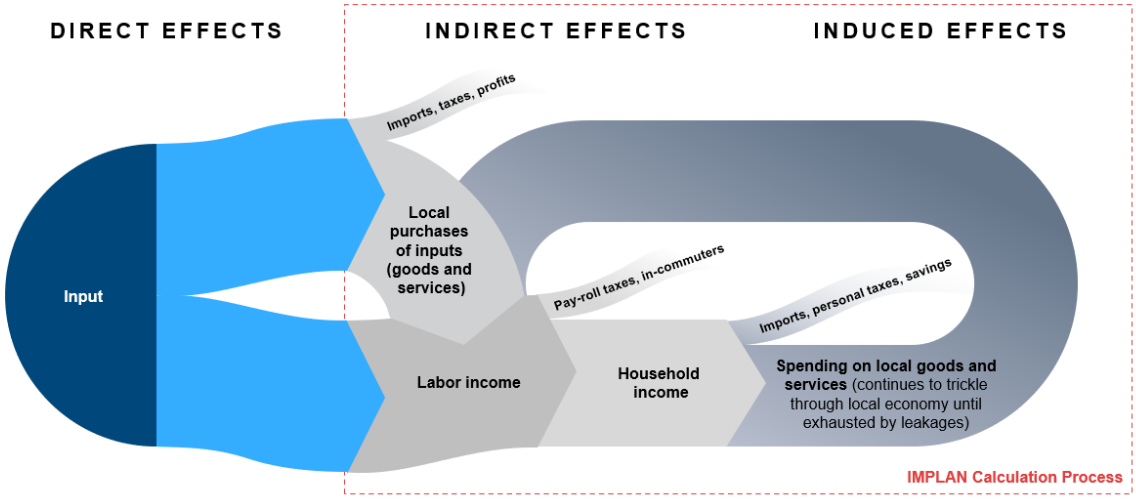
The U.S. pharmaceutical manufacturing sector represents a significant part of the U.S. economy as measured by jobs, output, labor income, and gross domestic product ("GDP"). Additionally, this economic activity contributes to federal, state, and local tax revenues.

FTI used IMPLAN to estimate the full impact of the U.S. pharmaceutical manufacturing sector ("direct") by accounting for its supply chain ("indirect") and its direct and indirect employee spending ("induced") as defined further below:

- **Indirect** – The effect of the direct impact on suppliers, such as uncompounded drug manufacturers.
- **Induced** – The direct economic sector and its suppliers compensate employees for their labor and proprietors and creditors (such as a bank) for their ownership, which in turn stimulates consumer spending when households take this income and spend it.

Figure 3 shows the calculation process for IMPLAN, including the indirect and induced effects:

Figure 3 – IMPLAN calculation process



[30] https://www.epa.gov/trinationalanalysis/plastics-product-manufacturing
[31] https://www.nsmedicaldevices.com/whitepapers/plastics-used-for-medical-device-packaging/

For an example of direct, indirect, and induced impacts working together, consider a hospital in a small town. Many members of the local economy would work at the hospital or have jobs dependent on its activities such as transportation. Visitors from outside the town would visit the hospital and spend money both at the hospital, and in surrounding businesses such as restaurants or gas stations.

Activities directly supported by the hospital would constitute the "direct" impact in IMPLAN. Supporting and supplier sectors, such as construction services to build and maintain the hospital or supporting facilities, would be part of the "indirect" impact in IMPLAN. These sectors would provide most of the jobs in the region and therefore most of the income, which supports consumer expenditures in the region by residents (e.g., hospitals and schools).

Based on the IMPLAN modeling undertaken for **Table 4**, the U.S. pharmaceutical manufacturing sector supports 300 thousand direct jobs, 600 thousand indirect jobs, and 900 thousand induced jobs. These employment results would be commensurate with the macroeconomic impacts, including $663 billion in sales output, $338 billion in U.S. GDP, and $155 billion in household labor income. As shown below, the U.S. pharmaceutical manufacturing sector supports $44 billion in federal tax revenues, mostly through federal income and payroll taxes, and $30 billion in state and local revenues.

Table 4 – Economic impact of the U.S. Pharmaceutical Manufacturing Sector

Impact	Units	Direct	Indirect	Induced	Total
Employment	Jobs (millions)	0.3	0.6	0.9	1.8
Sales Output	2023 $ billions	$344	$169	$150	$663
GDP	2023 $ billions	$164	$88	$86	$338
Labor Income	2023 $ billions	$50	$54	$51	$155
Federal Taxes	2023 $ billions	$17	$14	$13	$44
S&L[32] Taxes	2023 $ billions	$14	$7	$9	$30

SOURCE: IMPLAN Model, FTI Calculations

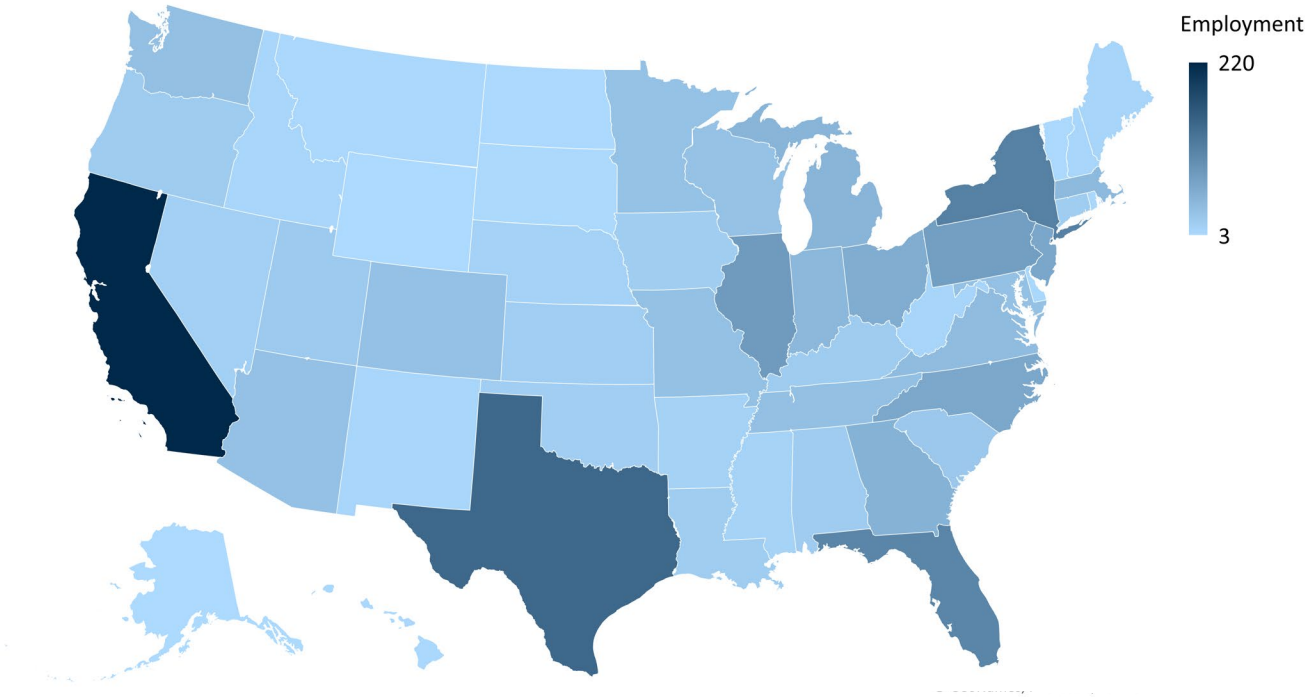
[32] "S&L" = State and local governments

As shown in **Table 4**, the U.S. pharmaceutical manufacturing sector supports $44 billion in federal tax revenues, mostly through federal income and payroll taxes, and $30 billion in state and local revenues.

Figure 4 through **Figure 7** show the results for total employment and GDP from the table above for 50 states and the District of Columbia. Major highlights include:

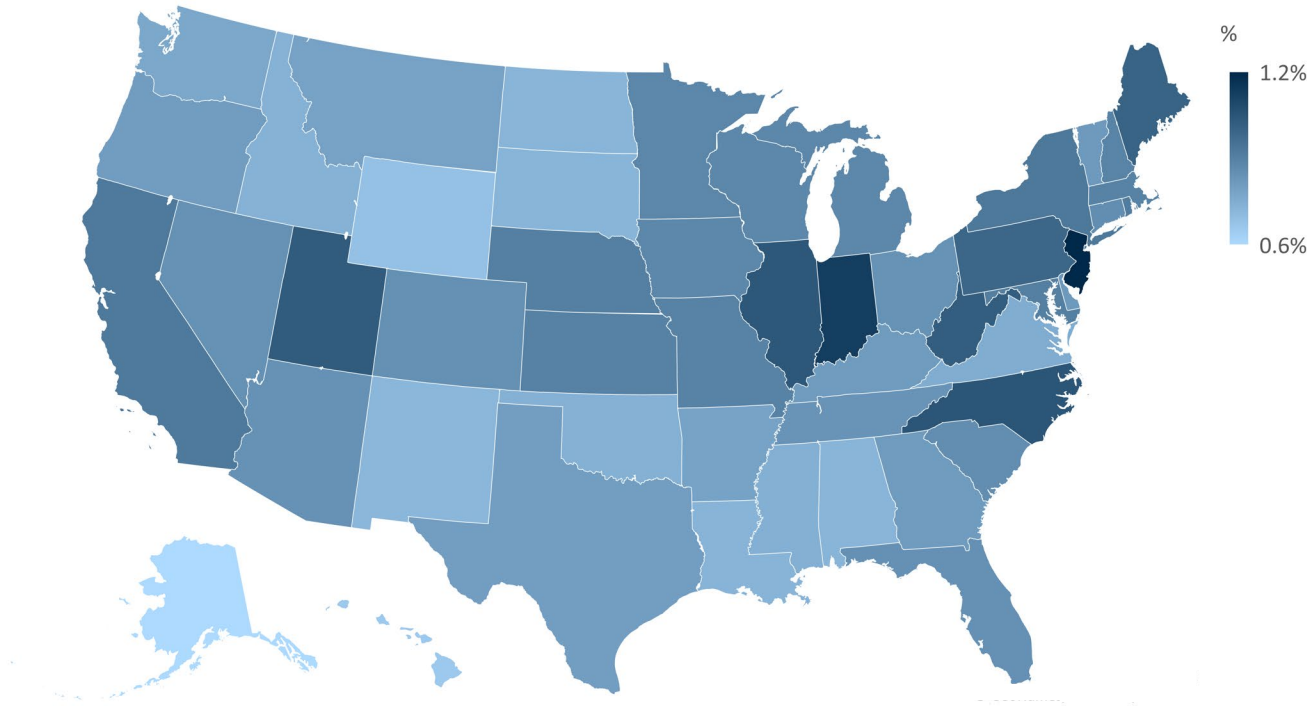
- Total employment as summarized in **Figure 4** is concentrated in larger economies and states in the Northeast, particularly the Mid-Atlantic region, such as New York, Pennsylvania, and New Jersey. Generally, the U.S. pharmaceutical manufacturing sector closely correlates with GDP by state or state population. Therefore, larger states tend to have more employees working in the pharmaceutical manufacturing sector.
- While some states have proportionally higher impacts in **Figure 5** and **Figure 7** because of interstate and international medical care, states with larger economies and populations generally have a larger pharmaceutical manufacturing sector due to their market sizes.
- **Figure 6 s**hows the total GDP impact by state, which are highest in states with larger economies such as California, Texas, and New York.

Figure 4 – Total jobs by state supported by the U.S. Pharmaceutical Manufacturing Sector (thousands)



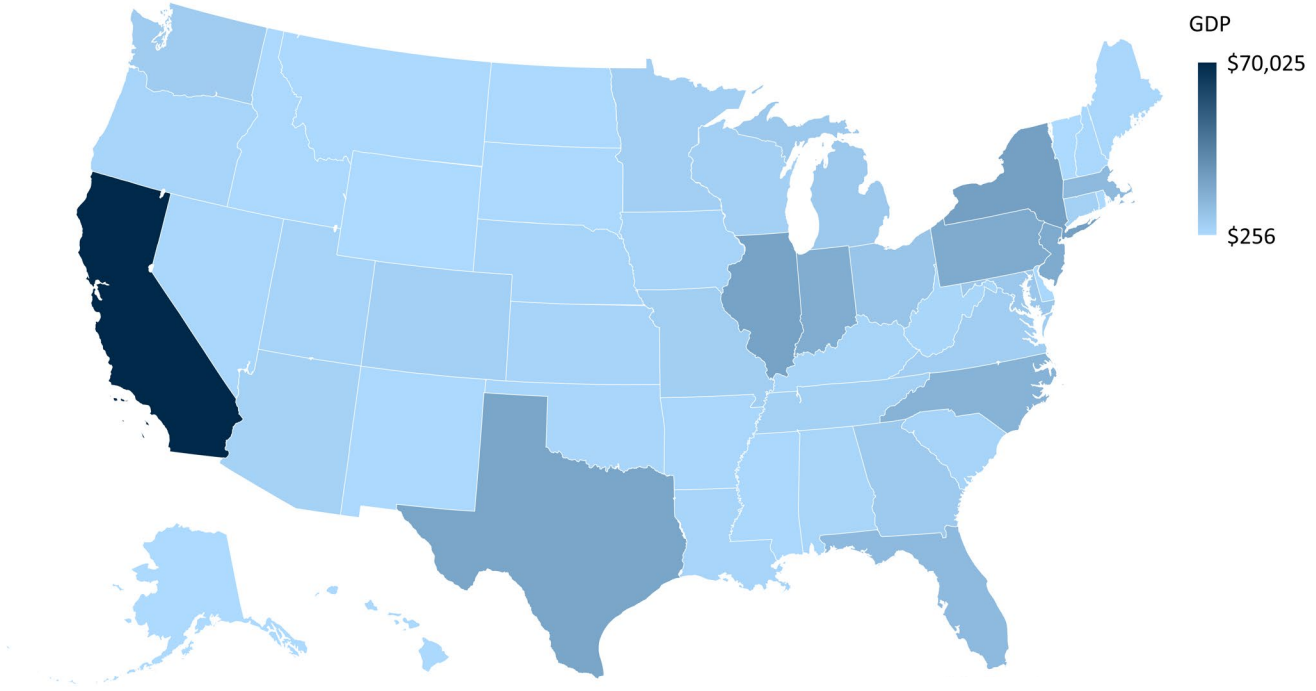
SOURCE: IMPLAN Model, FTI Calculations

Figure 5 – Share of total state jobs supported by the U.S. Pharmaceutical Manufacturing Sector (%)



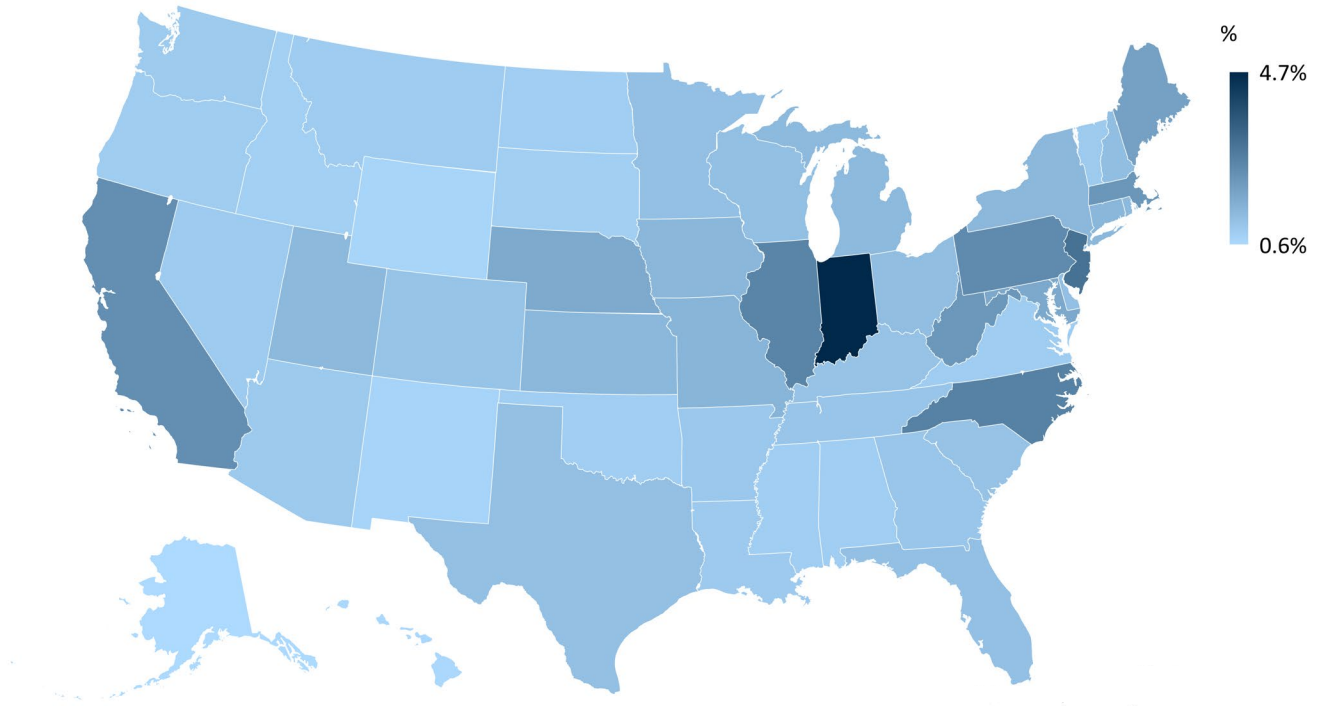
SOURCE: IMPLAN Model, FTI Calculations

Figure 6 – Total GDP by state supported by the U.S. Pharmaceutical Manufacturing Sector (2023 $ millions)



SOURCE: IMPLAN Model, FTI Calculations

Figure 7 – Share of total state GDP supported by the U.S. Pharmaceutical Manufacturing Sector (%)



SOURCE: IMPLAN Model, FTI Calculations

Appendix A

Approach and Methodology for Estimating Natural Gas Consumption

The following steps were taken to estimate natural gas consumption for the pharmaceutical manufacturing sector using EIA and IMPLAN data:

- IMPLAN provided the following datapoints:
  - Output by economic sector (all 546 in the IMPLAN database) and by state (the 50 states and including the District of Columbia, a de facto state economy).
  - Share of output dedicated to natural gas consumption from the IO table.
- Output by sector and state was multiplied by the IO coefficient for natural gas demand to estimate the dollars expended by sector and state on natural gas inputs.
- Commercial (wholesale, retail, and all services) and industrial sectors (natural resources, utilities, construction, and manufacturers) were grouped together.
- Using this data, FTI determined each IMPLAN sector's share of commercial OR industrial expenditures on natural gas made in each of the 51 regions.
- FTI compiled historical gas consumption by month by residential, commercial, industrial, and transportation customers based on EIA data.[33]
- FTI allocated the commercial and industrial consumption between IMPLAN sectors based on the estimated share of expenditures using the output and IO data.
- FTI compared this result to the output by sector and region to generate an effective rate of gas consumption (in MMcf) associated with a dollar of direct sales output.
- FTI ran IMPLAN to determine the economic impact of the U.S. pharmaceutical and used the effective rates to estimate the impact on gas demand.
- This estimate is the underlying data for the tables and maps in the next two subsections about gas demand and the U.S. pharmaceutical manufacturing sector.

[33] https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

Approach and Methodology for Assessing Cost Impacts

The following steps were taken to estimate the cost impacts to the pharmaceutical manufacturing sector:

- The cost impact scenario assumes that electrification of direct gas use is feasible for all sectors. This is a simplifying and conservative assumption for the scenario's purposes, but this is unlikely to be desirable in some cases, and unrealistic in others.
- Only fuel costs – either in the form of direct natural gas use or direct electricity use – are considered. Any differences in equipment costs are not considered.
- Gas demand for the U.S. pharmaceutical manufacturing sector and its suppliers would be converted to electricity between 2026 and 2045 at the rate of 5 percent (or 1/20th) per year. In 2045 and the years after, there would be no further conversions because everything is electrified. This trend would represent a gradual conversion to electricity as existing natural gas-fired heating equipment depreciates, buildings are replaced, and new buildings are brought online.
- According to an American Gas Association study on electrification, the thermal efficiency of air-source heat pumps depends on ambient air temperature.[34]
- Ambient temperature depends on the temperature in the hours when heating demand occurs. FTI used NOAA data[35] to construct an 8,760-hour temperature shape by state. FTI then used the shape to determine each hour's share of annual demand and the efficiency of the conversion for each hour. FTI used these two data points to create a weighted average of the conversion efficiency for each state. Conversion efficiencies tend to be highest in the warmest states (e.g., in the Southeast) and the lowest in colder states (e.g., the Midwest).
- FTI compiled energy demand and energy price data from the EIA[36], its 2023 Annual Energy Outlook ("AEO"),[37] and specifically its Reference Case.[38] EIA projects its energy demand and energy price data only at the regional level.[39] To make these series into state-level data, FTI allocated demand between states based on the historical share of demand within regions and the historical ratio of regional prices to state prices from SEDS.[40]

[34] https://www.aga.org/wp-content/uploads/2018/07/aga_study_on_residential_electrification.pdf
[35] https://www.ncdc.noaa.gov/cdo-web/search
[36] https://www.eia.gov/
[37] https://www.eia.gov/outlooks/aeo/
[38] https://www.eia.gov/outlooks/aeo/tables_ref.php, Table 2 and Table 3
[39] https://www.tampaairport.com/sites/default/master/files/landing-pages/images/census-regions-graphic.png
[40] https://www.eia.gov/state/seds/

- FTI multiplied the resulting series by the state-level data underlying **Table 1** and shown with **Figure 2**, to determine what share of total state demand for the commercial sector and for the industrial sector was ultimately supported by the U.S. pharmaceutical manufacturing sector.
- The projected demand and change in demand for gas and power was multiplied by EIA price forecasts for retail energy service to determine the change in net costs.
- The last point assumes electricity prices are not responsive to load increases resulting from the electrification of commercial buildings and industrial facilities. **This assumption is conservative and biases the results in the direction of lowering projected net costs of the electrification for the U.S. pharmaceutical manufacturing sector and its suppliers. In other words, the costs of electrification for the U.S. pharmaceutical manufacturing sector will almost assuredly be higher than what is in this analysis if this was accounted for in the model through a concept of power dispatch.**

A higher load could mean higher electricity prices for electric consumers. The increased load might mean higher hourly dispatch prices on wholesale markets and a need for new power plants or transmission upgrades, all of which can cost billions of dollars and will eventually have to fall on utility customers.

Appendix B

Table 5 – Output supported by the Pharmaceutical Industry (2023 $ millions)

State	Direct	Indirect	Induced	Total
AL	$1,075.0	$1,678.7	$1,759.0	$4,512.7
AK	$24.1	$215.1	$305.1	$544.3
AZ	$2,722.5	$2,842.9	$2,803.5	$8,369.0
AR	$386.7	$1,400.3	$1,152.2	$2,939.1
CA	$70,705.1	$22,930.0	$20,018.2	$113,653.4
CO	$3,944.7	$2,796.9	$2,711.8	$9,453.3
CT	$2,814.2	$2,040.3	$1,909.1	$6,763.6
DE	$475.9	$504.7	$530.6	$1,511.3
DC	$158.1	$719.3	$711.0	$1,588.3
FL	$9,535.1	$9,169.3	$8,549.6	$27,253.9
GA	$3,049.7	$4,924.7	$4,552.7	$12,527.1
HI	$8.1	$415.1	$578.3	$1,001.6
ID	$303.0	$598.7	$721.4	$1,623.1
IL	$27,056.4	$8,284.7	$6,345.4	$41,686.4
IN	$26,013.8	$3,175.8	$2,907.7	$32,097.4
IA	$2,378.5	$1,836.2	$1,612.1	$5,826.7
KS	$2,885.3	$1,794.8	$1,412.0	$6,092.1
KY	$1,464.3	$2,060.3	$1,777.4	$5,302.0
LA	$397.9	$2,857.2	$1,906.2	$5,161.3
ME	$1,900.0	$546.9	$532.3	$2,979.2
MD	$8,646.7	$2,223.0	$2,517.3	$13,387.0
MA	$12,679.9	$4,228.5	$3,832.5	$20,740.9
MI	$8,949.2	$4,075.0	$3,887.3	$16,911.5
MN	$3,116.2	$3,284.8	$2,854.5	$9,255.5
MS	$722.6	$1,014.6	$995.3	$2,732.5
MO	$4,566.9	$3,115.0	$2,655.4	$10,337.3
MT	$335.0	$374.9	$432.6	$1,142.5
NE	$1,864.9	$1,449.4	$1,101.1	$4,415.5
NV	$938.4	$1,131.3	$1,247.0	$3,316.8
NH	$1,075.9	$552.2	$629.9	$2,258.0
NJ	$26,450.6	$6,454.1	$4,348.3	$37,253.0
NM	$781.8	$526.2	$678.7	$1,986.6
NY	$21,289.4	$11,985.5	$11,533.5	$44,808.4
NC	$24,380.1	$4,717.2	$4,177.3	$33,274.6
ND	$144.2	$454.0	$408.9	$1,007.1
OH	$6,113.0	$6,392.1	$5,180.8	$17,685.9
OK	$802.0	$1,460.4	$1,501.4	$3,763.8
OR	$879.7	$1,857.5	$1,778.2	$4,515.4

State	Direct	Indirect	Induced	Total
PA	$22,897.6	$6,751.9	$5,726.3	$35,375.8
RI	$1,228.0	$415.7	$444.4	$2,088.0
SC	$4,255.5	$1,839.5	$1,820.4	$7,915.4
SD	$26.5	$514.5	$471.1	$1,012.1
TN	$1,823.6	$3,518.2	$3,033.4	$8,375.3
TX	$14,706.1	$16,649.6	$12,793.7	$44,149.4
UT	$5,467.8	$1,659.3	$1,477.0	$8,604.1
VT	$337.2	$254.7	$272.6	$864.6
VA	$2,714.6	$3,502.9	$3,618.3	$9,835.9
WA	$2,539.1	$3,750.6	$4,095.3	$10,385.1
WV	$3,259.0	$692.5	$552.8	$4,504.4
WI	$3,665.3	$2,981.1	$2,755.6	$9,402.0
WY	$54.8	$252.4	$264.5	$571.7

Table 6 – Employment supported by the Pharmaceutical Industry (thousands of jobs, 2022)

State	Direct	Indirect	Induced	Total
AL	1.0	7.2	11.1	19.3
AK	0.0	0.9	1.7	2.6
AZ	3.5	12.1	17.5	33.1
AR	0.4	5.4	7.1	12.9
CA	42.1	73.9	103.6	219.6
CO	5.3	11.3	16.1	32.7
CT	2.7	6.5	9.9	19.1
DE	0.5	1.6	2.7	4.8
DC	0.1	2.3	3.4	5.8
FL	9.4	39.1	57.2	105.7
GA	3.0	20.5	27.4	50.9
HI	0.0	1.9	3.6	5.5
ID	0.4	2.9	4.6	7.9
IL	18.9	26.7	34.1	79.7
IN	15.7	11.8	16.8	44.3
IA	3.1	6.1	8.7	17.9
KS	3.3	6.0	7.8	17.1
KY	1.5	8.0	10.7	20.2
LA	0.4	7.3	11.3	19.0
ME	2.4	2.3	3.6	8.3
MD	8.7	9.5	15.1	33.3
MA	7.8	13.5	20.8	42.1
MI	8.2	16.3	23.2	47.7

State	Direct	Indirect	Induced	Total
MN	4.1	12.1	16.2	32.4
MS	0.8	4.2	6.7	11.7
MO	4.8	12.2	16.4	33.4
MT	0.7	1.7	3.0	5.4
NE	1.8	4.5	5.7	12.0
NV	1.1	5.5	8.2	14.8
NH	1.6	2.4	3.8	7.8
NJ	21.5	19.4	23.8	64.7
NM	1.0	2.4	4.4	7.8
NY	20.0	36.5	55.6	112.1
NC	19.9	18.6	25.7	64.2
ND	0.2	1.6	2.3	4.1
OH	4.8	23.2	30.1	58.1
OK	0.8	6.5	9.6	16.9
OR	1.1	8.1	11.1	20.3
PA	17.1	23.7	34.1	74.9
RI	1.1	1.8	2.8	5.7
SC	4.3	8.1	11.9	24.3
SD	0.0	1.8	2.6	4.4
TN	1.9	14.1	18.5	34.5
TX	12.0	54.3	75.6	141.9
UT	6.4	6.7	9.0	22.1
VT	0.5	1.1	1.8	3.4
VA	2.8	15.3	21.4	39.5
WA	3.2	12.3	18.9	34.4
WV	2.8	2.4	3.6	8.8
WI	4.7	11.6	15.7	32.0
WY	0.1	1.0	1.6	2.7

Table 7 – GDP Supported by the Pharmaceutical Industry (2023 $ millions)

State	Direct	Indirect	Induced	Total
AL	$413.5	$722.8	$865.2	$2,001.5
AK	$3.0	$117.2	$176.0	$296.1
AZ	$587.4	$1,414.2	$1,581.6	$3,583.2
AR	$107.5	$654.7	$554.0	$1,316.3
CA	$44,623.8	$13,073.9	$12,327.0	$70,024.7
CO	$1,147.3	$1,468.2	$1,526.6	$4,142.1
CT	$1,544.0	$1,180.5	$1,207.6	$3,932.1
DE	$267.4	$279.0	$329.2	$875.6
DC	$53.9	$499.6	$496.8	$1,050.2

State	Direct	Indirect	Induced	Total
FL	$3,153.2	$4,795.8	$4,797.7	$12,746.7
GA	$1,158.0	$2,681.2	$2,569.8	$6,409.0
HI	$2.6	$205.0	$344.1	$551.7
ID	$61.2	$273.5	$350.3	$685.0
IL	$13,649.1	$4,553.2	$3,645.4	$21,847.7
IN	$14,868.3	$1,474.3	$1,469.4	$17,812.0
IA	$1,170.6	$753.0	$775.8	$2,699.4
KS	$868.7	$868.9	$695.0	$2,432.6
KY	$555.1	$958.7	$886.5	$2,400.4
LA	$150.2	$1,128.4	$944.4	$2,223.0
ME	$738.2	$262.0	$297.9	$1,298.1
MD	$4,500.2	$1,273.1	$1,516.0	$7,289.4
MA	$7,904.2	$2,487.6	$2,404.6	$12,796.5
MI	$2,807.2	$2,004.8	$2,054.7	$6,866.8
MN	$1,143.9	$1,705.5	$1,566.1	$4,415.5
MS	$117.8	$402.5	$459.4	$979.7
MO	$1,866.5	$1,519.1	$1,399.0	$4,784.7
MT	$90.5	$161.1	$212.7	$464.2
NE	$1,032.3	$654.8	$555.3	$2,242.4
NV	$209.5	$612.8	$743.3	$1,565.5
NH	$384.1	$313.5	$381.7	$1,079.3
NJ	$12,346.0	$3,674.5	$2,644.5	$18,665.0
NM	$163.3	$236.1	$350.5	$749.9
NY	$8,049.1	$7,246.5	$7,696.9	$22,992.5
NC	$10,795.7	$2,407.8	$2,298.5	$15,502.0
ND	$56.2	$215.4	$203.3	$474.9
OH	$2,481.9	$3,096.1	$2,796.6	$8,374.7
OK	$230.4	$667.3	$741.5	$1,639.2
OR	$189.6	$980.0	$994.9	$2,164.4
PA	$11,590.9	$3,802.7	$3,268.4	$18,662.0
RI	$337.0	$224.3	$262.5	$823.8
SC	$936.1	$841.4	$940.5	$2,718.1
SD	$8.9	$220.6	$236.9	$466.4
TN	$570.4	$1,728.4	$1,622.7	$3,921.4
TX	$6,174.2	$7,847.0	$6,918.8	$20,940.1
UT	$1,077.0	$791.3	$793.6	$2,661.9
VT	$55.1	$112.6	$144.7	$312.3
VA	$787.8	$1,947.1	$2,125.6	$4,860.5
WA	$964.1	$2,080.2	$2,604.3	$5,648.6
WV	$1,020.4	$301.3	$291.1	$1,612.8
WI	$1,270.1	$1,357.2	$1,396.6	$4,024.0
WY	$15.8	$110.8	$129.0	$255.6

Table 8 – Labor Income Supported by the Pharmaceutical Industry (2023 $ millions)

State	Direct	Indirect	Induced	Total
AL	$114.2	$454.1	$516.0	$1,084.3
AK	$1.5	$63.8	$98.1	$163.4
AZ	$318.0	$856.6	$941.5	$2,116.1
AR	$32.6	$401.1	$324.7	$758.4
CA	$8,576.8	$7,764.8	$7,226.2	$23,567.9
CO	$674.9	$978.0	$932.7	$2,585.6
CT	$958.0	$694.2	$726.1	$2,378.3
DE	$64.4	$127.7	$164.4	$356.6
DC	$37.0	$358.5	$348.1	$743.6
FL	$811.4	$2,775.0	$2,813.3	$6,399.8
GA	$393.8	$1,628.0	$1,469.9	$3,491.7
HI	$2.3	$130.4	$192.7	$325.4
ID	$41.4	$180.0	$216.7	$438.1
IL	$4,461.0	$2,587.1	$2,160.6	$9,208.7
IN	$3,251.5	$851.2	$879.2	$4,981.9
IA	$510.6	$488.6	$445.6	$1,444.7
KS	$349.0	$497.1	$419.2	$1,265.2
KY	$218.8	$545.5	$528.3	$1,292.7
LA	$38.5	$530.6	$528.1	$1,097.3
ME	$416.0	$159.1	$175.8	$750.8
MD	$1,664.5	$828.5	$899.9	$3,392.9
MA	$1,636.9	$1,550.6	$1,549.8	$4,737.3
MI	$980.0	$1,295.4	$1,256.9	$3,532.3
MN	$740.6	$1,154.4	$986.2	$2,881.2
MS	$56.9	$240.7	$260.6	$558.2
MO	$642.6	$930.7	$842.1	$2,415.4
MT	$48.4	$96.8	$132.9	$278.1
NE	$218.9	$369.9	$307.2	$896.0
NV	$95.3	$392.1	$414.3	$901.6
NH	$201.0	$203.0	$239.3	$643.3
NJ	$7,416.4	$2,247.9	$1,645.6	$11,309.9
NM	$78.0	$135.5	$194.5	$408.0
NY	$2,512.6	$4,376.3	$4,538.2	$11,427.2
NC	$2,601.5	$1,446.9	$1,333.7	$5,382.2
ND	$46.2	$119.7	$121.0	$286.8
OH	$587.9	$1,896.5	$1,613.7	$4,098.2
OK	$91.1	$434.2	$453.8	$979.1
OR	$92.6	$666.0	$621.0	$1,379.7
PA	$4,639.9	$2,476.6	$2,100.6	$9,217.1
RI	$187.3	$148.2	$156.7	$492.2
SC	$380.4	$528.6	$549.4	$1,458.4
SD	$4.3	$132.2	$138.4	$274.9

State	Direct	Indirect	Induced	Total
TN	$218.7	$1,085.4	$1,060.5	$2,364.6
TX	$1,651.8	$4,549.2	$4,270.5	$10,471.5
UT	$533.7	$462.6	$458.4	$1,454.7
VT	$57.6	$68.0	$89.1	$214.6
VA	$354.5	$1,305.8	$1,207.6	$2,867.9
WA	$356.2	$1,209.8	$1,408.0	$2,974.1
WV	$378.3	$165.3	$169.7	$713.3
WI	$595.4	$887.7	$832.1	$2,315.2
WY	$4.7	$62.9	$70.1	$137.6

Table 9 – Federal taxes Supported by the Pharmaceutical Industry (2023 $ millions)

State	Direct	Indirect	Induced	Total
AL	$138.5	$120.3	$106.9	$365.8
AK	$19.1	$16.9	$15.1	$51.1
AZ	$251.5	$217.7	$193.3	$662.5
AR	$93.2	$81.6	$72.5	$247.3
CA	$2,679.9	$2,057.9	$1,874.7	$6,612.5
CO	$276.4	$237.1	$210.8	$724.3
CT	$208.2	$177.0	$158.6	$543.8
DE	$42.3	$35.0	$31.5	$108.8
DC	$60.0	$53.3	$47.6	$160.8
FL	$803.9	$688.1	$613.0	$2,104.9
GA	$398.4	$345.8	$308.2	$1,052.4
HI	$38.0	$34.3	$30.5	$102.9
ID	$54.4	$48.5	$42.9	$145.8
IL	$973.2	$759.5	$686.1	$2,418.8
IN	$634.8	$454.7	$416.7	$1,506.3
IA	$159.9	$134.0	$119.6	$413.4
KS	$151.4	$124.3	$110.8	$386.5
KY	$156.6	$134.4	$119.6	$410.5
LA	$144.1	$122.1	$108.7	$374.8
ME	$79.0	$65.8	$58.7	$203.5
MD	$352.4	$286.8	$258.0	$897.2
MA	$509.6	$398.1	$361.7	$1,269.4
MI	$422.6	$347.0	$309.3	$1,078.9
MN	$286.0	$247.4	$220.2	$753.6
MS	$79.1	$68.5	$60.6	$208.3
MO	$283.3	$237.3	$211.8	$732.3
MT	$36.5	$32.3	$28.6	$97.3
NE	$111.0	$89.5	$80.5	$280.9
NV	$108.1	$95.0	$84.4	$287.6
NH	$67.3	$57.6	$51.3	$176.2

State	Direct	Indirect	Induced	Total
NJ	$944.3	$763.8	$685.7	$2,393.9
NM	$56.0	$48.0	$42.5	$146.5
NY	$1,174.5	$960.0	$861.6	$2,996.1
NC	$701.6	$531.6	$480.1	$1,713.3
ND	$32.1	$28.1	$25.0	$85.1
OH	$488.6	$409.5	$365.7	$1,263.9
OK	$120.4	$105.9	$93.9	$320.2
OR	$152.7	$135.3	$120.1	$408.2
PA	$894.9	$719.9	$647.9	$2,262.7
RI	$53.2	$44.1	$39.3	$136.6
SC	$194.2	$160.5	$142.4	$497.2
SD	$32.6	$28.6	$25.4	$86.5
TN	$266.3	$232.6	$206.7	$705.6
TX	$1,217.4	$1,019.6	$910.6	$3,147.5
UT	$191.7	$154.3	$136.8	$482.8
VT	$25.3	$22.0	$19.5	$66.8
VA	$314.1	$273.6	$243.5	$831.2
WA	$311.1	$264.1	$236.3	$811.4
WV	$91.8	$70.4	$62.9	$225.1
WI	$264.8	$225.0	$200.2	$690.0
WY	$18.1	$15.9	$14.1	$48.1

Table 10 – State and Local Taxes Supported by the Pharmaceutical Industry (2023 $ millions)

State	Direct	Indirect	Induced	Total
AL	$85.0	$45.8	$53.6	$184.5
AK	$12.3	$6.7	$7.9	$26.9
AZ	$154.3	$83.7	$97.5	$335.5
AR	$56.2	$30.5	$35.6	$122.4
CA	$2,731.8	$1,416.4	$1,717.5	$5,865.8
CO	$178.7	$97.6	$113.5	$389.8
CT	$163.3	$89.7	$105.3	$358.3
DE	$35.0	$18.4	$22.1	$75.5
DC	$44.0	$24.8	$28.9	$97.8
FL	$533.1	$285.1	$336.0	$1,154.2
GA	$267.5	$144.9	$170.3	$582.7
HI	$23.1	$12.7	$14.9	$50.7
ID	$29.9	$16.4	$19.0	$65.3
IL	$882.7	$463.8	$554.6	$1,901.2
IN	$693.4	$352.8	$430.3	$1,476.5
IA	$113.6	$61.0	$71.7	$246.3
KS	$104.0	$55.3	$64.9	$224.2
KY	$101.5	$54.6	$64.1	$220.2

State	Direct	Indirect	Induced	Total
LA	$93.8	$49.9	$58.7	$202.4
ME	$55.5	$30.0	$35.0	$120.4
MD	$296.3	$157.6	$187.6	$641.5
MA	$502.8	$262.8	$317.3	$1,083.0
MI	$292.6	$155.5	$182.6	$630.7
MN	$189.5	$104.4	$121.3	$415.3
MS	$43.2	$23.2	$26.9	$93.2
MO	$200.2	$106.9	$126.0	$433.1
MT	$20.2	$11.0	$12.7	$43.9
NE	$90.7	$47.5	$56.8	$194.9
NV	$66.4	$36.1	$42.2	$144.8
NH	$45.8	$25.0	$29.2	$99.9
NJ	$786.3	$428.5	$501.8	$1,716.6
NM	$32.6	$17.4	$20.3	$70.3
NY	$946.8	$506.0	$599.2	$2,052.0
NC	$625.8	$321.7	$387.0	$1,334.4
ND	$20.3	$11.1	$12.9	$44.2
OH	$348.3	$185.6	$219.3	$753.2
OK	$70.6	$38.4	$44.7	$153.8
OR	$92.8	$51.1	$59.4	$203.3
PA	$765.0	$408.7	$484.6	$1,658.2
RI	$35.8	$19.3	$22.5	$77.6
SC	$119.4	$63.3	$73.7	$256.4
SD	$19.9	$10.8	$12.7	$43.4
TN	$167.3	$91.4	$106.6	$365.3
TX	$872.5	$465.9	$549.9	$1,888.3
UT	$119.1	$62.7	$72.8	$254.6
VT	$14.0	$7.7	$8.8	$30.6
VA	$205.5	$112.1	$131.1	$448.8
WA	$232.9	$125.7	$148.5	$507.1
WV	$68.9	$35.7	$42.2	$146.8
WI	$172.5	$93.2	$108.8	$374.5
WY	$10.8	$5.8	$6.8	$23.5

Table 11 – Gas Consumption Supported by the Pharmaceutical Industry (MMcf)

State	Direct Commercial	Direct Industrial	Indirect Commercial	Indirect Industrial	Total Commercial	Total Industrial	Grand Total
AL	0	105	65	1,722	65	1,827	1,892
AK	0	1	32	17	32	17	49
AZ	0	30	96	65	96	95	191
AR	0	27	211	745	211	772	982
CA	0	4,864	641	2,371	641	7,235	7,876

State	Direct Commercial	Direct Industrial	Indirect Commercial	Indirect Industrial	Total Commercial	Total Industrial	Grand Total
CO	0	172	161	211	161	383	544
CT	0	67	136	197	136	264	400
DE	0	44	38	502	38	546	584
DC	0	0	14	0	14	0	14
FL	0	263	205	373	205	637	841
GA	0	152	159	700	159	852	1,011
HI	0	0	3	0	3	0	4
ID	0	16	60	109	60	125	185
IL	0	1,622	763	1,860	763	3,482	4,245
IN	0	2,376	294	2,103	294	4,479	4,773
IA	0	260	148	2,427	148	2,687	2,835
KS	0	290	138	1,121	138	1,411	1,548
KY	0	106	144	976	144	1,082	1,226
LA	0	97	90	18,099	90	18,196	18,286
ME	0	104	25	86	25	191	215
MD	0	113	125	37	125	150	274
MA	0	368	234	184	234	552	786
MI	0	464	456	863	456	1,327	1,783
MN	0	209	304	1,062	304	1,271	1,575
MS	0	83	58	1,096	58	1,179	1,236
MO	0	141	216	636	216	777	993
MT	0	20	71	96	71	116	187
NE	0	143	131	1,186	131	1,329	1,461
NV	0	15	82	41	82	56	139
NH	0	28	21	22	21	50	71
NJ	0	686	514	660	514	1,346	1,860
NM	0	24	52	33	52	57	109
NY	0	466	614	364	614	831	1,445
NC	0	926	149	726	149	1,651	1,800
ND	0	11	43	299	43	310	353
OH	0	361	532	2,665	532	3,026	3,558
OK	0	123	117	649	117	773	889
OR	0	38	78	248	78	286	364
PA	0	1,129	491	1,140	491	2,269	2,760
RI	0	51	24	28	24	79	103
SC	0	209	65	712	65	921	986
SD	0	2	31	617	31	620	651
TN	0	112	266	868	266	980	1,246
TX	0	1,617	542	25,596	542	27,213	27,755
UT	0	179	140	86	140	265	405
VT	0	3	16	5	16	9	24
VA	0	135	167	554	167	689	856

State	Direct Commercial	Direct Industrial	Indirect Commercial	Indirect Industrial	Total Commercial	Total Industrial	Grand Total
WA	0	89	140	330	140	419	559
WV	0	153	58	372	58	524	583
WI	0	196	291	1,312	291	1,508	1,798
WY	0	8	38	127	38	135	172