

The Institute

Turning Information into Insight

The Institute is a non-profit economic and social innovation research and policy organization dedicated to empowering business and community leaders with research based strategies for informed decision making. We conduct independent, non-biased research to identify the opportunities, issues and challenges unique to the region and to find innovative solutions to help solve the problems facing our communities. The Institute also offers a wide array of research, consulting and support services to help organizations boost productivity, increase profitability and be successful in their missions. The Institute is a partnership of 13 colleges and universities and the business community. The Institute has served clients in a number of states including the federal government.

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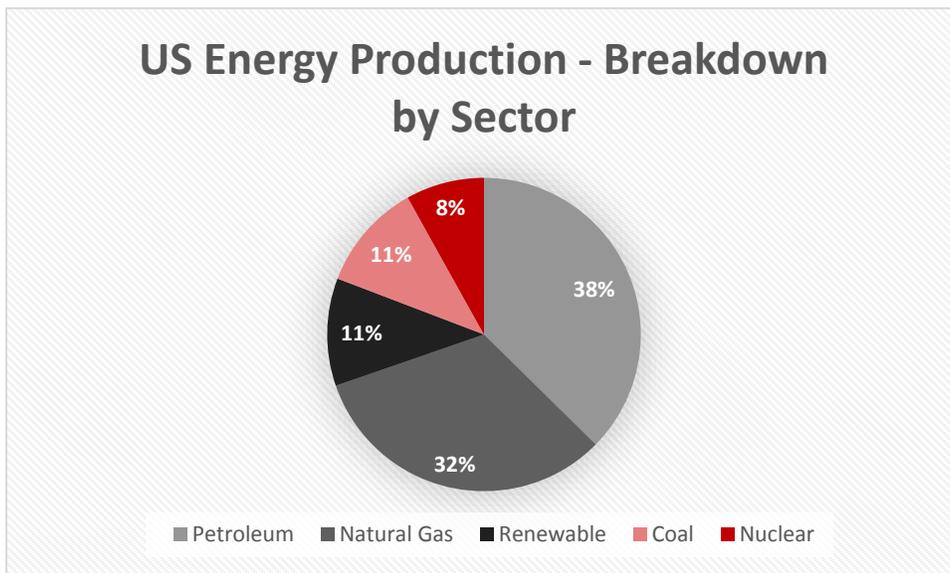
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Background

National Energy Overview

As of 2019, the United States has a diverse portfolio of energy sources in use across the country. According to the United States Energy Information Administration (EIA), “The United States uses and produces many different types and sources of energy, which can be grouped into general categories such as primary and secondary, renewable, and nonrenewable, and fossil fuels. Primary energy sources include fossil fuels (petroleum, natural gas, and coal), nuclear energy, and renewable sources of energy (such as wind, solar, and biomass). Electricity is a secondary energy source that is generated (produced) from primary energy sources.”ⁱ The breakdown of energy usage in the United States was 37 percent petroleum, 32 percent natural gas, 11 percent renewable energy, 11 percent coal, and 8 percent nuclear power.



Data Source: U.S. Energy Information Administration

Shifting energy production to non-fossil fuel energy sources (including nuclear and renewables) has been emphasized by policymakers and business leaders alike in order to mitigate greenhouse gas emissions that drive climate change. Business and industry are a key stakeholder in these efforts as major users of energy, particularly those industries centered on transportation. Together, industry and transportation account for over half of U.S. greenhouse gas emissions.ⁱⁱ

Electric and Natural Gas Industries in the Region

The energy industry is integral to the region’s economy. It has a strong footprint and contributes a significant amount of impact, and growth in this area will benefit the region as a whole.

The electric power generation industry in Lackawanna and Luzerne Counties employs a relatively small number of the workforce currently at 1,017. However, the industry is a good employer in that average annual wages per worker are \$152,366 (nearly \$30,000 higher than the national average). Employment in this sector increased from 2019 – 2020 by 2 percent. The industry is projected to continue to grow. The industry employs a variety of engineers, technicians, and mechanics. There are only six establishments in the two county area as of 2019 data).

The industry contributes 2.7 percent to our regional GDP and spends over \$23 million with suppliers in the region to operate. The Industry supports nearly 2,000 jobs and generates over \$1 billion in regional economic impact annually in a number of industry sectors.

Lackawanna and Luzerne Counties Annual Impact of Electric Power Generation				
	Direct	Indirect	Induced	Total
Employment	1,017	209	771	1,997
Sales/Output	\$963,997,029	\$31,895,041	\$124,759,734	\$1,120,651,804
Compensation	\$225,638,487	\$11,528,509	\$38,114,252	\$275,281,248

Source: JobsEQ®

Note: Figures may not sum due to rounding. Data as of 2020

The natural gas industry in Lackawanna and Luzerne Counties is primarily focused on distribution. It employs a relatively small number of the workforce currently at 490. However, the industry is a good employer in that average annual wages per worker are \$81,663. Employment in this sector increased from 2019 – 2020 by 1.2 percent. The industry is not projected to continue to grow, but through replacement demand will need more workers. The industry employs a variety of mechanics, operators and office professionals in a variety of capacities. There are only seven establishments in the two county area as of 2019 data).

The industry contributes seven percent to our regional GDP and spends nearly \$7 million with suppliers in the region to operate. The Industry supports over 750 jobs and generates over \$400 million in regional economic impact annually in a number of industry sectors.

Lackawanna and Luzerne Counties Annual Impact of Natural Gas Distribution				
	Direct	Indirect	Induced	Total
Employment	490	59	205	754
Sales/Output	\$314,985,129	\$9,522,073	\$32,629,597	\$357,136,799
Compensation	\$52,367,045	\$2,892,808	\$9,968,813	\$65,228,665

Source: JobsEQ®

Note: Figures may not sum due to rounding. Data as of 2020

In the broader northeast region, natural extraction has been a growing industry since the inception of Marcellus Shale industry in 2008. The result of this has had statewide impact both through the extraction process as an impact generator with a spillover effect but also with the distribution of funds to communities across the state for a variety of projects through the Marcellus Legacy Fund.

The natural gas extraction industry in the northeast quadrant of the state employs a relatively small number of the workforce currently at 643. However, the industry is a good employer in that average annual wages per worker are \$114,362. Employment in this sector increased from 2019 – 2020 by 2.6 percent. The industry is not projected to continue to grow, but will need workers through replacement demand. The industry employs a variety of engineers, scientists, operators and a variety of office and professional staff. There are only 15 establishments in the two county area as of 2019 data).

The industry contributes 1.9 percent to our regional GDP and spends over \$48 million with suppliers in the region to operate. The Industry supports nearly 1,188 jobs and generates over \$1 billion in regional economic impact annually in a number of industry sectors.

Greater NEPA Region Annual Impact of Natural Gas Extraction				
	Direct	Indirect	Induced	Total
Employment	643	233	313	1,188
Sales/Output	\$1,184,682,215	\$76,382,078	\$44,811,180	\$1,305,875,473
Compensation	\$100,285,881	\$20,050,574	\$13,329,691	\$133,666,146

Source: JobsEQ®

Note: Figures may not sum due to rounding. Data as of 2020

Logistics Industry Trends

Over the past five years, the two county region has seen a total employment decline of over 9,800 jobs, an average annual change of -0.8 percent, with much of this job change occurring in 2020 as a result of the COVID-19 pandemic. Several industries, however, have continued to experience employment growth. In particular, transportation and warehousing has added over 4,100 jobs in the last five years. This single industry group is responsible for negating nearly one-third of the net negative job decline across other industry groups. It also employs over 23,400 workers in the counties, making it the third largest industry by employment size after Health Care & Social Assistance and Manufacturing. No other industry in the region saw comparable growth in both raw and percentage increase during the five year time period analyzed.ⁱⁱⁱ

Within the Transportation & Warehousing sector, the vast majority of employment growth, and over half of total employment, are classified as General Warehousing & Storage, a category that includes distribution centers and similar warehouse operations. As e-commerce has continued to grow and innovate during the pandemic, this industry is also well-positioned to play an important role in the region’s economic resilience and recovery in 2021 and beyond. Recent published reports and anecdotal evidence from the business and economic development community further corroborates the continued interest in the development of distribution centers and similar operations in the area. Nationwide, many retailers expanded e-commerce offerings during the pandemic, and industry experts have forecast much of this shift to become permanent even as brick-and-mortar retail reopens. Firms in this sector typically need access to ground transportation infrastructure, particularly close access to Interstate highways, as truck transportation is the primary means of transporting goods into and out of distribution centers.

Alternative Fuel Vehicle Applications

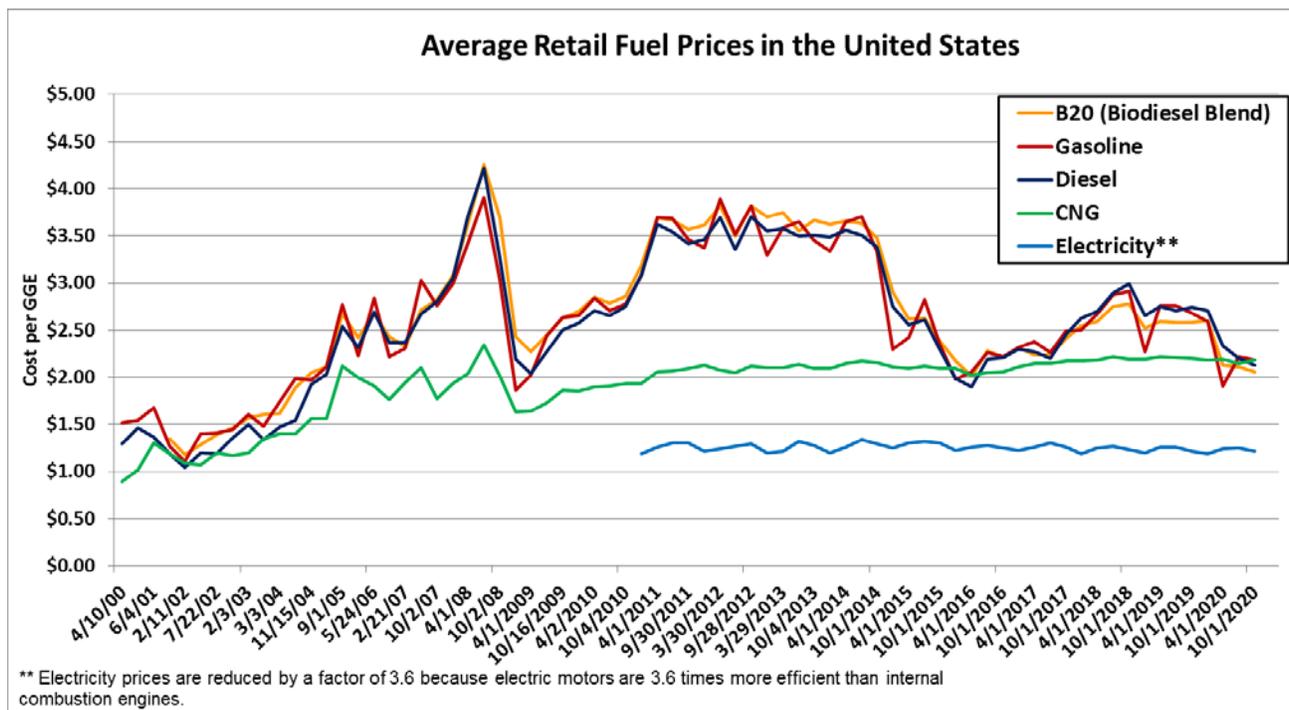
Several alternative fuels exist that are seeing adoption among commercial vehicles. Traditionally, conventional diesel fuel has been the primary fuel for heavy vehicles. Two of the most common alternative fuels are biodiesel and renewable diesel. Biodiesel is typically only in use when blended with conventional diesel due to its unsuitability at cold temperatures. Renewable diesel (also called green diesel or biomass-based diesel) is a product produced from animal fats, vegetable oils, or used cooking oils. It is chemically very similar to conventional diesel and can fully replace diesel produced from conventional sources.^{iv} Compressed natural gas (CNG) has been in use as a vehicle fuel for decades. As with renewable diesel, there is also a renewable equivalent to natural gas (RNG). CNG from renewable and conventional sources are indistinguishable and share pipeline networks.^v CNG vehicles offer power and speed approximately equivalent to conventionally-fueled vehicles. Light-, medium-, and heavy-duty NGVs are widely manufactured, and many medium- and heavy-duty vehicles can be retrofit for use with CNG.^{vi}

The usage of these alternative fuels in heavy vehicles has grown in recent years. While conventional diesel still makes up the vast majority of heavy-duty vehicle fuels in the US (about 90 percent as of 2018), alternative sources have grown, particularly natural gas and biodiesel. Renewable forms of diesel and natural gas (RNG) have grown from a zero percent share in 2009 to six percent in 2018.^{vii} However, nearly all renewable diesel produced in the U.S. is consumed in California, due to economic incentives to do so under California’s Low Carbon Fuel Standard.^{viii}

Another alternative energy source seeing increasing use in transportation is electric battery technology. While battery electric vehicles have not yet seen wide adoption in heavy-duty applications, the market share of electric vehicles is quickly growing among passenger cars. Several manufacturers of heavy-duty vehicles have plans to begin production of electric Class 8 semi-trucks in the coming years. Electric vehicles are limited by their range due to their need to be charged, but ranges and charging times have increased as technology continues to advance. An electric Volvo truck set to begin production in in 2021 offers a 150-mile range, while planned models from Tesla and Nikola have a target range of 300-500 miles and 500-750 miles, respectively.^{ix}

Cost Comparison

The cost of various vehicle fuels per GGE (gasoline gallon equivalent) varies. Gasoline, diesel, and B20 (a biodiesel blend) have fluctuated across a wide range over the past 20 years. The volatility in the market cost of petroleum is a primary reason for this variation. The equivalent price of CNG has typically been lower than petroleum-based fuels, and the price has been much more stable. The cost of electricity for battery-powered vehicles is substantially lower after accounting for their increased energy efficiency compared to internal combustion engines.



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

Due to the region’s proximity to the Marcellus shale formation, it is expected that natural gas costs in Northeastern Pennsylvania will be lower than other regions due to extensive pipeline infrastructure and lower costs of transporting natural gas to its end use.

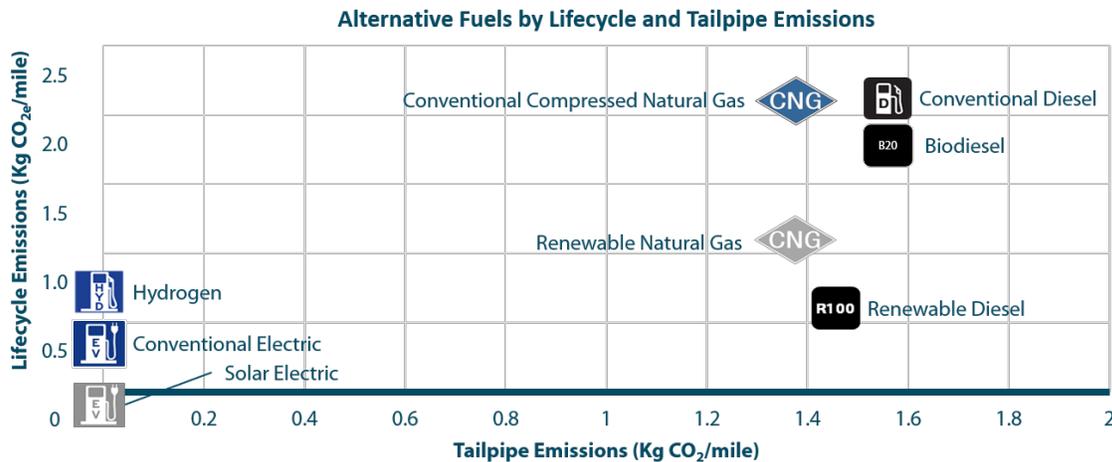
Further, investments in renewable energy may result in additional cost savings from local, state, and federal tax incentives. Federal incentives that are available for natural gas include biofuel feedstock incentives, fuel excise tax credits, tax credits for fuel infrastructure, tax exemptions for alternative fuels used in certain applications, and incentives for research and demonstration projects. Federal tax credits are also offered for qualified plug-in electric vehicles.^x

Pennsylvania also offers alternative fuel vehicle (AFV) rebates for electric vehicles (\$750) and CNG vehicles (\$500) and grant programs for fuel infrastructure that covers up to 50 percent of the project cost up to \$600,000.^{xi} Pennsylvania also has a truck and bus fleet grant program to replace or repower fleets of six or more Class 4-8 trucks, shuttle buses, transit, port drayage trucks, or school buses.^{xii}

Emissions Comparison

When considering environmental and air quality impacts due to emissions, alternative fuel performance varies, but each fuel discussed above has reduced emissions compared with conventional diesel, in lifecycle emissions, tailpipe emissions, or both. Conventional battery electric vehicles perform very well in lifecycle emissions, and have no tailpipe emissions. Lifecycle emissions of electric vehicles can also be expected to decline over time as the U.S. electrical grid, used to charge these vehicles, increasingly produces energy from non-fossil fuel sources.

CNG, RNG, biodiesel, and renewable diesel still result in tailpipe emissions of CO₂, but offer varying degrees of savings in lifecycle emissions. Renewable diesel and RNG offer the greatest savings in lifecycle emissions of these fuels because their production reuses waste products such as used cooking oil, dairy waste, and landfill gases that would otherwise produce carbon emissions.^{xiii}



Data Source: Breakthrough Fuel, Environmental Protection Agency

Fleet Vehicles & Other Applications

Commercial vehicles other than heavy trucks are also seeing shifts toward alternative fuels. Most of UPS' fleet of delivery vehicles are powered by natural gas, and the company is making investments in electric vehicles as well. FedEx and DHL have also begun to build fleets of electric vehicles.^{xiv} In early 2021, the US Postal Service announced a new mail delivery vehicle that will be built in both gasoline and battery electric versions.

For delivery vehicles and other fleet vehicles that do not typically travel long distances, electric vehicle range with current technology may not be an obstacle. Companies may benefit from consumer goodwill towards alternative energy vehicles in addition to cost and emissions savings. IKEA Canada has begun a transition to an all-electric vehicle fleet for last mile delivery, and IKEA in the US has announced plans to do the same in certain cities.^{xv} Several cities and regions in the United States have also deployed or demonstrated the use of electric vehicles for paratransit.

As with electric vehicles, natural gas vehicles are appropriate for centrally-fueled, high mileage fleets.^{xvi} For these instances, lack of fueling or charging infrastructure that may be found on long-haul routes is not problematic.

Alternative Fuel Infrastructure

Most alternative fuel sources require some additional infrastructure. Availability of charging stations and the speed of charging are important. According to US Department of Energy data, there are 912 electric vehicle charging stations in Pennsylvania, including about nine locations in Lackawanna and Luzerne Counties, mostly within a few miles of the Interstate 81 corridor.

Compressed natural gas (CNG) is available through at least two locations in Northeastern Pennsylvania, and there are over 50 CNG filling stations statewide. Most of these, including those in the Northeastern PA region, are accessible to heavy-duty vehicles.^{xvii}

Summary, Conclusions & Recommendations

Several alternative fuels are coming into prominence for transportation, each with unique features and benefits. These include natural gas, renewable diesel, and battery electric vehicles. Of these, electric vehicles have the lowest lifecycle emissions, especially as the US power grid transitions to a larger share of renewable sources. Many vehicle manufacturers see electric vehicles as the dominant technology of the future for passenger vehicles, especially given increasing focus on mitigating the impacts of climate change and improving technology in batteries and charging equipment.

Limiting factors of electric vehicles for commercial use include present limitations on range, charging speed, and availability of charging infrastructure, though a considerable number of charging stations are available across Pennsylvania and neighboring states. For Northeastern Pennsylvania, the electric range of incoming generation of heavy vehicles (150 – 500 miles) will be appropriate for transporting goods between distribution centers in Northeastern Pennsylvania and ports in the Mid-Atlantic region. Alternative fuels will be essential for long-haul freight transport in the coming years due present range limitations of electric vehicles. For such routes, electric charging infrastructure may not yet exist.

In the short to medium term, there are significant benefits associated with other alternatives – CNG (conventional and renewable), biodiesel (blended only), and renewable diesel (currently used primarily in

California). Each of these can offer cost savings, emissions savings, or both. In Northeastern Pennsylvania, CNG may offer a particularly noticeable cost reduction compared with other fuels due to close proximity to sources of natural gas in the Marcellus formation. CNG is also subject to less price fluctuation than other fossil fuel sources, and can be an effective fuel source for high mileage fleets when central fueling is possible. The possibility of retrofitting older vehicles to use CNG is another reason CNG can be a useful energy source for commercial vehicles, at least until further advances in battery electric technology overcome limitations for high-mileage and/or long-haul uses. In light of this, policymakers should consider ways to expand incentives for CNG retrofits.

Hydrogen fueled vehicles are unlikely to play a significant role in the region in the near future due to limited nationwide adoption of the technology and lack of public fueling infrastructure in the United States outside of California.

Investment in new infrastructure for charging and alternative fuel filling is critical for economic development in the region. Ensuring sufficient electric and CNG facilities (including those with a capacity for heavy-duty vehicles) will increase the region's competitive advantage in transportation-reliant industries and help position the region as an attractive place to do business. Investing in a diverse portfolio of alternative energies will be necessary to sustain the region's important logistics sector. This recommendation aligns with federal policy goals on green job creation and reduction of greenhouse gas emissions.

Major stakeholders that could be positioned to lead this effort are enterprises with large fleets (including businesses and government agencies) and economic development agencies and business park developers. Existing business and industrial parks are likely to be a critical location for fueling and charging infrastructure investment. Public/private partnerships with equipment manufacturers (e.g. Tesla) and the logistics industry (including carriers, distribution center operators, etc.) should be pursued.

Finally, the energy industry is an important economic driver to the region. Increased transition to CNG and electric power has the dual benefit of improving our environment and growing our economy.

Endnotes

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- ⁱⁱ Environmental Protection Agency. Sources of Greenhouse Gas Emissions. 2019.
- ⁱⁱⁱ JobsEQ Industry Profile. Chmura Economics
- ^{iv} Fueling the Future: An Overview of Alternative Transportation Fuels. Breakthrough Fuels. 2020.
- ^v Ibid.
- ^{vi} Natural Gas Vehicles. Alternative Fuels Data Center. U.S. Energy Information Administration.
- ^{vii} Fueling the Future: An Overview of Alternative Transportation Fuels. Breakthrough Fuels. 2020.
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