



# LNG EXPORT

## GREATER PHILADELPHIA AREA

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PREPARED FOR:  
PHILADELPHIA LNG EXPORT TASK FORCE  
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### **LNG Demand**

Global demand for Liquefied Natural Gas (LNG) is rising and the increased use of this fuel source is having a positive impact on emissions.

01



### **PA Energy Supply**

Pennsylvania maintains a robust natural gas supply but faces challenges with pipeline takeaway capacity and finding ample end-market uses.

02



### **Economic Impact Study**

An LNG export facility in the greater Philadelphia area would have economic benefits for the county, region, and commonwealth as a whole.

03



### **Summary**

Suggestions and recommendations to policy-makers to attract LNG export facilities to Pennsylvania.

10

# LNG DEMAND

Global demand is high and rising



**13,520% INCREASE**  
in US LNG exports  
from 2015-2022



**500-MILLION TONNES**  
of CO2 emissions reduced  
since 2010 because of  
natural gas utilization



**60% INCREASE**  
in European LNG imports  
from 2021 to 2022

“

Natural gas is one of the mainstays of global energy. Where it replaces more polluting fuels, it improves air quality and limits emissions of carbon dioxide. In this analysis, we explore how widespread and durable this role might be in some of today's key energy markets.

DR FATIH BIROL, IEA  
EXECUTIVE DIRECTOR

## CHALLENGES

As economies and countries move away from coal, crude oil, and other fuel sources, global demand for LNG is steadily rising. Conflict initiated by Russia and European support for Ukraine has greatly decreased Russia's exports to the European Union (EU). Before 2021, the EU was the largest purchaser of Russian LNG.<sup>1</sup> This market change creates an opportunity for the United States to supply European allies with this needed commodity.

## SOLUTIONS

The United States is rapidly expanding LNG export capabilities. In 2015 the US exported 28,318 (MCF) compared to 3,865,643 (MCF) in 2022.<sup>2</sup> With the United States now being the largest producer of natural gas in the world, the overall supply of natural gas is available to meet domestic needs while supplying geopolitical allies.

## END USERS

### Countries

1

The top importing countries for natural gas are: Japan, China, South Korea, France, and Taiwan. Seven of the top 12 importing countries are in Europe.<sup>3</sup>

### Industries

2

The top two industries for LNG end-use throughout the world are power generation and manufacturing. Specific to manufacturing, the top five industries are: metallurgical, food, chemical, textile, and ceramic.<sup>4</sup>

## ENVIRONMENTAL BENEFITS

LNG exports have displaced coal usage. "Since 2010, coal-to-gas switching has saved around 500 million tonnes of CO2 - an effect equivalent to putting an extra 200 million EVs running on zero-carbon electricity on the road over the same period."<sup>5</sup>

1 - International Energy Agency. Russia (Countries & Region). 2023. [www.iea.org/countries/russia](http://www.iea.org/countries/russia)

2 - U.S. Energy Information Agency. Liquefied U.S. Natural Gas Exports. 2023. [www.eia.gov/dnav/ng/hist/n9133us2a.htm](http://www.eia.gov/dnav/ng/hist/n9133us2a.htm)

3 - EnterData. World Energy & Emissions Statistics. 2023. [yearbook.enerdata.net/natural-gas/balance-lng-trade-world.html](http://yearbook.enerdata.net/natural-gas/balance-lng-trade-world.html)

4 - CyroSpain. Growing Importance of LNG Industry. 2021. [cryospain.com/the-growing-importance-of-the-liquefied-natural-gas-lng-industry](http://cryospain.com/the-growing-importance-of-the-liquefied-natural-gas-lng-industry)

5 - EIA. The Role of Gas in Today's Energy Transitions. 2019. [iea.org/reports/the-role-of-gas-in-todays-energy-transitions](http://iea.org/reports/the-role-of-gas-in-todays-energy-transitions)



# PA NATURAL GAS SUPPLY

In 2022, Pennsylvania accounted for 19% of U.S. marketed natural gas production

#2

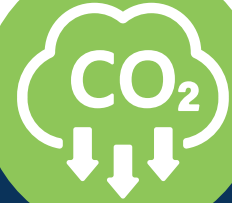
## NATIONAL LEADER

Pennsylvania is now the second largest producer of natural gas in the nation, behind Texas. When it comes to natural gas exports, Pennsylvania ranks third behind Texas and Wyoming, largely because of a lack of pipeline networks to neighboring states.<sup>6</sup>



## REGIONAL BENEFITS

The Marcellus and Utica Shale region, combined, is the largest natural gas play in the United States and contains 214 trillion cubic feet of undiscovered, technically recoverable continuous resources of natural gas.<sup>7</sup> This alone could sustain US natural gas consumption for nearly a decade.



## LOWER EMISSIONS

In Pennsylvania, the decline of coal and rise of natural gas led to a 42% drop in emissions from 2008-2020 while power generation rose almost 4%.<sup>8</sup> With constraints on natural gas from Russia, European nations such as Germany are turning back to coal for electricity generation because of a lack of access to LNG, causing higher emissions.<sup>9</sup>

## CHALLENGES TO GROWTH: TAKEAWAY CAPACITY

"The main issue surrounding increasing production in Pennsylvania is not a lack of land to drill, but rather a lack of the necessary takeaway capacity to bring the gas to market. No material increase... is possible in the short-term, and is then dependent on whether future pipelines taking gas out of the basin come online."

-Jarand Rystad, Rystad Energy, 2022

"There is no question that the basin represents the fastest growing, and therefore the incremental source of natural gas supply in the United States. But if enough of that gas cannot move out of the region, it can only have so much impact on the price of gas in other parts of the country... Whether growing takeaway capacity will be enough to improve basis differentials in the Marcellus will depend on a number of factors, such as the continued pace of development in the Marcellus itself; competing supply from the nearby Utica Shale; the ability of Eastern Canada to accept more imports from the U.S., and throughput at the Cove Point LNG export facility in Maryland."

-Natural Gas Intelligence, 2018

6 - USGS. Assessment of Undiscovered Gas Resources in the Middle Devonian Marcellus Shale of the Appalachian Basin Province. 2019. <https://pubs.er.usgs.gov/publication/fs20193050>

7 - *ibid.*

8 - Independent Fiscal Office. RGGI Testimony. March, 2022.

9. NPR. Climate Activists Are Fuming as Germany Turns to Coal to Replace Russian Gas. Dec, 2022.

[npr.org/2022/12/26/1144709223/climate-activists-are-fuming-as-germany-turns-to-coal-to-replace-russian-gas](https://www.npr.org/2022/12/26/1144709223/climate-activists-are-fuming-as-germany-turns-to-coal-to-replace-russian-gas)

# CASE STUDY: LNG EXPORT TERMINAL GREATER PHILADELPHIA AREA

Analyzing how an LNG export facility would benefit the economies of Delaware County, the Greater Philadelphia area, and Pennsylvania as a whole.



## TOOLS

The main analysis tool used for this study is IMPLAN. IMPLAN is a regional economic analysis software application that is designed to estimate the impact or ripple effect (specifically backward linkages) of a given economic activity within a specific geographic area through the implementation of its Input-Output model.

## INPUTS

The inputs for the economic analysis are based on existing information from the Cove Point LNG facility in Lusby, Maryland. Completed in 2018, this LNG export facility is the closest in proximity to Delaware County, PA, and is supplied by Marcellus and Utica Shale gas. Cove Point was a former LNG intake facility that was converted to handle both intake-outtake. The Cove Point LNG Terminal has a storage capacity of 14.6 billion cubic feet (BCF) and a daily send-out capacity of 1.8 BCF.

A study completed by Sage Policy Group found that during the four years of the construction project to build the Cove Point LNG Terminal, there was an average of 4,323 construction jobs supported, per year. These construction jobs consist of the following categories:

- 1,017 Environmental and Technical Services
- 3,213 Construction of Manufacturing Facility
- 93 Industrial Equipment Servicing and Repair

The study conducted by the Pennsylvania Manufacturers' Association will use these same inputs for a four-year construction phase of a project in Delaware County, PA.

The full-time, ongoing operations at the facility consist of 204 "Industrial Gases Manufacturing" jobs. Because this category does not assume LNG production, a commodity event was added to the model to show potential natural gas intake. Based on industry knowledge of the Cove Point LNG terminal, this facility utilizes a conservative average of 1BCF of natural gas feedstock per day. Assuming plant operations will be maintained 365 days per year, the minimum feedstock required would be 365BCF of natural gas per year. Transportation costs are estimated at a conservative total of \$.50/MCF. The EIA predicts \$2.91/MCF as an average for 2023 +\$.50/MCF = \$3.41/MCF. Using 2023 dollars and values, the needed natural gas input to the model equals \$1,244,650,000 per year. This value of natural gas will be added to the model as a commodity event.

## REGION

This economic analysis was completed as a Multi-Regional Input-Output, including all of Pennsylvania in the model area. The impacts will take place in Delaware County, which is one of the regions in this model. The second region is a combined Philadelphia, Bucks, Chester, and Montgomery counties. The third region includes the other 62 counties within the Commonwealth of Pennsylvania. All model impacts take place in Delaware County, but the spending patterns for occupations and industries will be captured throughout the entire state.



## TERMINOLOGY

### Jobs

An industry-specific mix of full-time, part-time, and seasonal employment. An annual average that accounts for seasonality and follows the same definition used by the Bureau of Labor Statistics and Bureau of Economic Analysis.

### Direct Effects/Jobs

The set of expenditures applied to the I-O multipliers for impact analysis. It is one or more production changes or expenditures made by producers/consumers because of an activity or policy. Direct effects can be positive or negative. These initial changes are determined by an analyst to be a result of this activity or policy being analyzed. Applying these initial changes to the multipliers in IMPLAN will then display how the Region will respond economically to these initial changes.

### Indirect Effects/Jobs

Economic Effects stemming from business-to-business purchases in the supply chain.

### Induced Effects/Jobs

Economic Effects stemming from household spending of Labor Income, after removal of taxes, savings, and commuter income.

# RESULTS: CONSTRUCTION PHASE

## CONSTRUCTION PHASE

Direct Employment inputs assumes: 1,017 "Environmental and Technical Services," 3,213 "Construction of Manufacturing Facility," 93 "Industrial Equipment Servicing and Repair," jobs per year. The project would take approximately four years to complete.

Note: Construction phase totals will likely be much higher because this model does not assume any new pipeline infrastructure which will likely be needed in large quantity to sustain operations of this type.

### Construction - Estimates Per Year (2023 \$value)

#### Impact Results Overview

Impact	Employment	Labor Income	Value Added	Output
Direct	4,323	\$ 378,622,178.24	\$ 389,102,116.67	\$ 645,195,101.26
Indirect	1,062	\$ 8,954,964.49	\$ 138,832,802.55	\$ 252,796,377.24
Induced	1,677	\$ 106,834,895.04	\$ 179,948,209.75	\$ 297,614,517.10
<b>TOTAL</b>	<b>7,062</b>	<b>\$ 575,352,037.00</b>	<b>\$ 707,833,128.97</b>	<b>\$ 1,195,605,955.60</b>

### Top 10 Industries Impacted by Growth Percentage

	Industry	Impact Output	Growth %
1	Construction of new manufacturing structures	\$ 493,605,845	15.18
2	Environmental and other technical consulting	\$ 2,216,200,957	6.37
3	Commercial and industrial machinery repair	\$ 2,813,110,797	0.5
4	Ready-mix concrete manufacturing	\$ 1,267,267,996	0.42
5	Fabricated pipe and fitting manufacturing	\$ 402,891,106	0.33
6	Mineral wool manufacturing	\$ 408,162,590	0.32
7	Stone mining and quarrying	\$ 1,607,309,329	0.24
8	Other concrete product manufacturing	\$ 970,301,240	0.23
9	Other fabricated metal manufacturing	\$ 1,038,172,042	0.21
10	Wholesale - machinery supplies	\$ 7,173,800,081	0.2

# RESULTS: CONSTRUCTION PHASE

## TERMINOLOGY

### Top 7 Employment Growth - Indirect

	Industry	Employment
1	Employment Services	103
2	Other real estate	63
3	Truck transportation	56
4	Architectural, engineering services	43
5	Wholesale durable goods	43
6	Wholesale machinery supply	40
7	Accounting, bookkeeping, payroll services	38

### Top 7 Employment Growth - Indirect

	Industry	Employment
1	Hospitals	80
2	Individual and family services	80
3	Offices of physicians	67
4	Full service restaurants	64
5	Limited service restaurants	59
6	Higher education/school services	53
7	Retail - food and beverage stores	50

#### Labor Income

All forms of Employment income, including Employee Compensation (wages, salaries, and benefits) and Proprietor Income.

#### Value Added

The difference between an Industry's or establishment's total Output and the cost of its Intermediate Inputs; it is a measure of the contribution to GDP. Value Added is a large portion of Output, as it encompasses Labor Income (LI), Other Property Income (OPI), and Taxes on Production and Imports (TOPI).

#### Output

For all Industries, output equals the value of Industry production, which is equal to sales plus net inventory change. In IMPLAN these are annual production estimates for the year of the dataset in producer prices. Note that for wholesale and retail sectors, Output is equal to gross wholesale margin or gross retail margin, respectively, not gross sales. The value of production for wholesale and retail sectors is the value of the services they provide; it does not include the value of the items sold within their establishment.

#### Taxes

Includes sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments

# RESULTS: CONSTRUCTION PHASE



## Construction - Indirect/Induced Jobs Supported Per Year (2023 \$value) Delaware/Philadelphia/Chester/Montgomery/Bucks Counties

Impact	Employment	Labor Income	Value Added	Output
Indirect	1,003	\$ 85,263,926.59	\$ 131,381,913.21	\$ 235,824,548.25
Induced	1,625	\$ 103,883,219.29	\$ 174,950,960.94	\$ 288,894,875.15
<b>TOTAL</b>	<b>2,628</b>	<b>\$ 189,114,145.88</b>	<b>\$ 206,332,874.15</b>	<b>\$ 524,719,423.40</b>

## Construction - Jobs Supported Over 4-year Project 62 Remaining PA Counties

Impact	Employment	Labor Income	Value Added	Output
Indirect	59	\$ 4,591,037.89	\$ 7,450,889.35	\$ 16,971,828.99
Induced	52	\$ 2,951,675.74	\$ 4,997,248.81	\$ 8,719,641.96
<b>TOTAL</b>	<b>111</b>	<b>\$ 7,542,713.64</b>	<b>\$ 12,448,138.16</b>	<b>\$ 25,691,470.94</b>

## Tax Impacts - 4 Year Construction Phase

Sub County General	Sub County Special	County	State	Federal	Total
\$15,869,180.93	\$ 35,016,801.31	\$ 6,084,427.04	\$ 78,897,316.51	\$ 391,373,829.35	\$527,241,555.15

## Construction - Estimates Per Year (2023 \$value) Impact Results Overview Total over 4-Year Project

Impact	Employment	Labor Income	Value Added	Output
Direct	17,292	\$ 1,514,648,712.94	\$ 1,556,408,446.68	\$ 2,580,780,405.03
Indirect	4,248	\$ 359,417,857.96	\$ 555,331,210.21	\$ 1,011,185,508.95
Induced	6,709	\$ 427,339,580.15	\$ 719,792,839.01	\$ 1,190,458,068.41
<b>TOTAL</b>	<b>28,249</b>	<b>\$ 2,301,408,151.04</b>	<b>\$ 2,831,532,515.90</b>	<b>\$ 4,782,423,982.39</b>



# RESULTS: FULL-TIME OPERATIONS



## FULL-TIME OPERATIONS

Once construction is completed, the IMPLAN model assumes the 204 full-time "Industrial Gases Manufacturing" jobs on the site in Delaware County. Because this industry is not specific to a liquified natural gas plant, a commodity event was created, estimating \$1,244,650,000 of natural gas as feedstock for the plant per year. This is the approximate amount of natural gas input to the Cove Point facility and was replicated for the purposes of this study.

The figures in the following tables reflect one year of model results. These results will be sustained as long as the plant is operational and will likely increase in dollar value with inflation. Dollar values start in 2027, assuming the four-year construction phase.

Note: "Petroleum refineries" industry in results will likely not see an actual increase in employment, labor income, value-added, or output. The commodity code for natural gas includes petroleum which is a limitation of the model. These values are still likely to be present, but in industries more related to natural gas than petroleum.

Full-Time Operations Impact Results Overview				
Impact	Employment	Labor Income	Value Added	Output
Direct	514	\$ 201,004,368.76	\$ 1,105,773,453.80	\$ 1,752,329,368.10
Indirect	1,280	\$ 153,908,047.99	\$ 281,582,555.62	\$ 475,226,417.63
Induced	1,205	\$ 77,498,998.68	\$ 130,597,762.89	\$ 216,928,828.47
<b>TOTAL</b>	<b>2,999</b>	<b>\$ 432,411,415.43</b>	<b>\$ 1,517,953,772.31</b>	<b>\$ 2,444,484,614.19</b>

Top 10 Industries Impacted by Growth Percentage*			
	Industry	Impact Output	Growth %
1	Industrial gas manufacturing	\$ 2,191,956,366.67	16.23
2	Oil and gas extraction	\$ 10,223,106,846.13	8.45
3	Electric power generation	\$ 3,815,574,032.71	0.59
4	Waste management/remediation services	\$ 5,186,857,657.78	0.44
5	Electric power transmission and distribution	\$ 15,372,170,881.52	0.34
6	Pipeline transportation	\$ 7,972,359,499.06	0.32
7	Custom computer programming services	\$ 9,030,089,159.04	0.31
8	Maintenance and repair non-residential structures	\$ 6,781,673,367.40	0.19
9	Rail transportation	\$ 3,241,566,389.02	0.14
10	Water transportation**	\$ 527,499,198.97	0.13

\*excludes petroleum-industry related results

\*\*likely much higher due to LNG export on Delaware River

# RESULTS: FULL-TIME OPERATIONS



## Top 3 Employment Growth - Direct

	Industry	Employment
1	Oil and gas extraction	216
2	Industrial gas manufacturing	204
3	Waste management/remediation services	50

## Top 10 Employment Growth - TOTAL

	Industry	Employment
1	Oil and gas extraction	258
2	Industrial gas manufacturing	209
3	Custom computer programming services	204
4	Management of companies	109
5	Truck transportation	104
6	Waste management/remediation services	82
7	Employment services	81
8	Other real estate	65
9	Full-service restaurants	62
10	Hospitals	57

## Top 7 Employment Growth - Indirect

	Industry	Employment
1	Custom computer programming services	202
2	Management of companies	98
3	Truck transportation	94
4	Employment services	61
5	Maintenance and repair of non-residential	43
6	Oil and gas extraction	43
7	Services to buildings	41

## Top 7 Employment Growth - Indirect

	Industry	Employment
1	Hospitals	57
2	Individual and family services	57
3	Offices of physicians	48
4	Full service restaurants	48
5	Limited service restaurants	46
6	Higher education/school services	43
7	Retail - food and beverage stores	38

## Tax Impacts - Yearly Operations

Sub County General	Sub County Special	County	State	Federal	Total
\$10,362,112.22	\$ 30,903,874.76	\$5,808,518.88	\$ 52,181,040.71	\$ 84,486,955.90	\$ 183,742,512.46

# PROJECT IMPACT

## Construction

Construction of facility requires an average of **4,323** direct jobs per year for four years



## Construction Impact

The **4,323** construction jobs support **2,739** indirect and induced jobs related to the project, per year



## Construction over 4-years

**28,249** direct, indirect, and induced jobs are supported over four years of construction adding **\$2.8B** in GSP and **\$4.8B** in economic output



## Full-Time Operations

After construction, **514** direct jobs will be created in the areas of industrial gas manufacturing and gas extraction/services



## Operations Impact

**514** jobs will support **2,485** indirect and induced jobs, per year



## Operations Yearly

**2,999** direct, indirect, and induced jobs are supported, every year, adding **\$1.5B** in GSP and **\$2.5B** in economic output



## OVERALL IMPACT

IN FIVE YEARS (FOUR YEARS OF CONSTRUCTION, ONE YEAR OF OPERATIONS) THIS PROJECT COULD SUPPORT:

**31,248**

TOTAL JOBS

**\$2.7B**

IN LABOR INCOME EARNED

**\$4.3B**

IN GROSS STATE PRODUCT

**\$7.1B**

IN TOTAL OUTPUT

**\$714M**

IN TOTAL TAXES PAID

# POLICY RECOMMENDATIONS



## PERMITTING REFORM FOR PIPELINE/INFRASTRUCTURE

PA lost significant business investment in the past due to the slow and cumbersome process to connect major end users of natural gas to feedstock via pipelines. Policymakers should prioritize streamlining the permitting process and supporting infrastructure connections to industrial end users. This will attract new investment, lower business operations costs, and lower emissions as industries continue to transition from coal and crude oil to natural gas and alternative energy.

1

2

## PERMITTING REFORM FOR CONSTRUCTION OF MANUFACTURING FACILITIES

Similar to pipeline/ infrastructure challenges, manufacturers face backlogs on new construction and expansion permits. PA's land use requirements are far more strict than federal standards and this should be amended for uniformity and simplicity. Additionally, a comprehensive review of all existing regulations should be completed to remove duplicative and/or contradicting regulations.



3

## FOCUS ON WORKFORCE AND TRAINING PROGRAMS

According to IMPLAN, 30% of the jobs for this model require a certificate, some college, or an associate's (or equivalent). In Delaware County, 24% currently possess these needed levels of certification. The public sector needs to assist in identifying areas of need and expand local best practices to best meet the needs of the workforce to maximize the number of Pennsylvanians who can work and benefit from these projects.



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## JONES ACT: FEDERAL

Currently, the Jones Act requires goods shipped between U.S. ports to be transported on ships that are built, owned, and operated by United States citizens or permanent residents. Therefore, American LNG cannot be sent between US ports unless it is on a US-built and flagged carrier. At present, there are no U.S.-flagged LNG carriers and thus no American LNG can be transported from port to port. Relief from the Jones Act is needed to curb foreign LNG imports from being distributed through US ports for domestic use.



## ENHANCE PA BUSINESS COMPETITIVENESS

The goal of Pennsylvania policymakers should be to make it the smart business decision for employers to locate, expand, and hire here in this commonwealth rather than in one of our competitor states. This means we must restrain state spending, enact pro-growth business tax relief, provide limits on lawsuit abuse, improve the regulatory climate, and ensure we have a trained workforce.