Economic and Fiscal Impacts of Expanding the Natural Gas Infrastructure in Maryland

Prepared for
The Maryland Natural Gas LDCs

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1.0 Executive Summary

RESI calculated the economic and fiscal impacts of an expansion of the natural gas infrastructure on industrial, commercial, and residential users for a projected ten-year period from 2016 through 2026. Beyond the economic and fiscal impacts, this report briefly addresses the environmental and health impacts of such an expansion.

1.1 Current Natural Gas Infrastructure in Maryland

The U.S. Energy Information Administration (EIA) estimates that nearly 44.2 percent of all Maryland households use natural gas as a main heating source, a percentage which ranks natural gas number one in heating energy use.[1] According to their own customer data, Maryland Natural Gas Local Distribution Companies currently service more than 1.1 million Maryland households with natural gas. An additional 67,986 of their commercial and industrial establishments also use natural gas every day.

Natural gas is now readily recognized as a lower-cost and abundant source of energy. U.S. natural gas consumption is growing for a variety of reasons—not only through households' and businesses' increased adoption but also through statewide infrastructure expansion efforts. In particular, several states, including the majority of those surrounding Maryland, are "increasingly adopting innovative regulatory mechanisms to align utility incentives with policy goals of improving energy usage, providing access to natural gas, and reducing emissions."[2] Households and establishments stand to realize considerable savings when making the switch from other energy sources to natural gas.

1.2 Natural Gas Cost Savings in Maryland

As consumers of natural gas, Maryland residents and businesses benefit from significant savings when compared with other energy sources. Annually, households using natural gas could save on average:

- $806 more than households using heating oil,
- $1,172 more than households using electricity, and
- $1,705 more than households using propane.

While households comprise the greatest share of natural gas users, commercial and industrial entities benefit from higher savings due to greater energy needs. When compared to other energy sources, Maryland commercial and industrial entities using natural gas could save on average:

- $12,615 more than entities using heating oil,

[1] U.S. Energy Information Administration, "Maryland State Energy Profile," accessed November 4, 2015, http://www.eia.gov/state/print.cfm?sid=MD.
[2] American Gas Association, "Got Growth? Defining US Gas Utility Growth in an Era of Efficiency and Natural Gas Resource Abundance," September 18, 2015, 10, accessed November 4, 2015, https://www.aga.org/sites/default/files/ea_2015-4_got_growth.pdf.

- $10,730 compared to using electricity, and
- $25,650 more than those using propane.

1.2 Economic Impacts Associated with Expansion

RESI estimated that 134 additional miles of lines will be added to the existing State infrastructure to accommodate potential new customers.[3] The results of this construction investment and resulting conversion activity would yield significant benefits to the State.

- Over ten years, an average of 7,318 jobs would be supported each year.
- New natural gas pipelines, household conversions, and hookups would add an average $395.7 million in output and $349.7 million in wages each year to Maryland's economy.

Using the difference between existing forecasted natural gas demand and RESI's new natural gas demand estimates due to expansion, RESI estimated that the costs savings would annually support an average of 1,306 jobs with an average wage of $61,417, $80.2 million in wages, and $185.7 million in output.

1.3 Fiscal Impacts Associated with Expansion

RESI also estimated the following fiscal impacts as a result of the expansion of new lines.

- Nearly $19.5 million yearly in state and local tax revenues will be created for Maryland on average over the ten-year period.
- Of that total, the largest revenues will be property tax revenues, at an average of $6.0 million per year.
- Average annual sales and income will account for $5.6 million and $4.2 million, respectively, of new tax revenues collected throughout the investment in new lines and conversions.

RESI estimated the following fiscal impacts related to Maryland residents increasing their demand for natural gas.

- An average of nearly $5.9 million in new state and local tax revenues will accrue annually over the ten years.
- The largest portion of new revenues will be property tax revenues—a gain of $1.8 million on average per year from 2016 to 2026.
- Sales and income tax revenues will account for the second highest contribution to fiscal rolls from 2016 to 2026, contributing on average $1.7 million and $1.3 million, respectively, per year.

[3] The mileage of pipeline required to reach areas that are more remote from existing infrastructure would be much longer. The longer, higher pressure pipelines that would be needed to reach these remote areas would most likely be constructed by interstate pipeline companies, which are federally regulated, rather than LDCs.

1.4 Environmental and Health Impacts from Expansion

The expansion of natural gas infrastructure and household conversions should be viewed as an opportunity to reduce greenhouse emissions when compared to high-carbon options such as coal and oil and should be considered among the suite of greenhouse gas emissions reduction tools. Today, the increased conversion to natural gas from carbon-intensive, coal-based generation has contributed to lower carbon emissions in the U.S.

In addition, improving Maryland households' access to natural gas can help the state continue to meet its Regional Greenhouse Gas Initiative (RGGI) targets. The reduction of emissions from electricity generators switching to natural gas was a significant contributor to CO_2 emissions levels that were lower than expected during the RGGI baseline period in 2007.[4]

As well as the environmental impacts, scientists have theorized a strong link between carbon-reduction strategies and positive health outcomes.[5] Strategies that reduce greenhouse gas—such as moving away from carbon-depending energy sources—can reduce indoor and outdoor air pollution, improve water quality, and help to decrease health concerns associated with poor air quality.

[4] Maryland Department of the Environment, "Regional Greenhouse Gas Initiative and the Maryland CO2 Budget Trading Program," accessed December 21, 2015, https://www.mwcog.org/uploads/committee-documents/bV1dVl1d20120913081025.pdf.
[5] Margaret Chan, "Cutting carbon, improving health," *The Lancet* (2009): 2, accessed December 21, 2015, http://www.who.int/globalchange/publications/LCT_Climate_09cmt7843.pdf.

2.0 Introduction/Overview

A group of Maryland Natural Gas Local Distribution Companies[6] (MD Natural Gas LDCs) tasked the Regional Economic Studies Institute (RESI) of Towson University with completing an economic and fiscal impact analysis of expanding the LDCs' natural gas infrastructure in Maryland.[7] Beyond the economic and fiscal impacts, this report briefly addresses environmental and health impacts of such an expansion. For this analysis, RESI examined the expansion of the natural gas infrastructure on industrial, commercial, and residential users for a projected ten-year period of construction, expansion, and installation from 2016 through 2026.

2.1 Study Assumptions

To analyze the potential economic and fiscal impacts associated with expansion of natural gas service in Maryland, RESI analyzed the ten-year period from 2016 through 2026. RESI relied on data that the MD Natural Gas LDCs provided to develop a base market of current natural gas consumption. RESI estimated the universe of existing homes that could potentially convert to natural gas using publicly available data on household counts. Using both sets of data, RESI established a possible base from which future impacts associated with the construction of new pipelines and households converting to natural gas could be estimated.

To analyze the current market size, RESI relied on data that the MD Natural Gas LDCs provided regarding current household customers. Households were divided into two categories: (1) current natural gas customers as reported by the MD Natural Gas LDCs and (2) the total universe of households within Maryland (or current non-serviced households). The non-serviced household units are those units within Maryland that could be serviced, but either have not converted or do not have access to convert to natural gas. Analyzing historical trends associated with conversion indicated that the rates of conversion for existing households within a region that have access to natural gas pipelines tends to be approximately 17 to 23 percent over a six-year period.[8] For households on newly constructed service lines, RESI found that, for the Northeast region, an estimated 50 to 60 percent of new homes constructed will choose natural gas.[9] Using these rates, RESI estimated the potential number of households that would become new customers over the ten-year period.

[6] Baltimore Gas and Electric, Chesapeake Utilities, Columbia Gas, Elkton Gas, and Washington Gas.
[7] Maryland Natural Gas LDCs, or local distribution companies, provide natural gas distribution and sales service to retail customers and are regulated by the Public Service Commission of Maryland.
[8] Richard Ready, Ph.D., "Analysis of Potential Demand for the Extension and Expansion of Natural Gas Distribution Infrastructure in Pennsylvania: A Report in Response to Senate Resolution," The Center for Rural Pennsylvania (November 2013): 29, accessed November 4, 2015, www.rural.palegislature.us/documents/reports/Natural-Gas-Infrastructure-SR29.pdf.
[9] U.S. Energy Information Administration, "Everywhere but Northeast, fewer homes choose natural gas as heating fuel," September 25, 2014, accessed December 22, 2015, https://www.eia.gov/todayinenergy/detail.cfm?id=18131.

In addition to the rates of conversion to natural gas, RESI made assumptions regarding the potential areas of expansion and construction costs. Using the National Pipeline Mapping System (NPMS), RESI estimated the miles from current pipelines to feasible areas of expansion (based on household density), then multiplied the distance by cost per mile of expansion.

Finally, to determine the potential savings to commercial and industrial entities, RESI used data that the MD Natural Gas LDCs provided to analyze the current loads of use for commercial and industrial entities. RESI estimated future loads and costs using the current database of known establishments by size category by NAICS codes according to County Business Patterns data. To estimate the potential economic impacts, RESI weighted the current loads by business size category and applied the costs/savings to the estimated conversions by County. This analysis is further discussed in Appendix A.

To develop some of the key assumptions for the study, RESI conducted a literature review of similar studies and expansion efforts in other states. These studies and findings associated provided a base for all assumptions and estimation methods in this report.

2.2 Literature Review

Studies regarding natural gas infrastructure expansion in states such as Alaska, Pennsylvania, and Connecticut have been published. The study completed for Fairbanks, Alaska, was an in-depth analysis of both possible natural gas demand using current conversion rates and possible demand derived from business interviews and a household survey.[10] The study assumed that conversion decisions depend on at least three variables: cost of installation, annual energy costs/savings, and repayment timeframe.[11] In addition, the researchers found that conversion decisions also depend on resident age (older populations have higher conversion rates) and mobility (highly transient areas have lower conversion rates). [12]

To estimate household demand, the Pennsylvania study sought to measure the willingness to pay (WTP) and possible conversion rates when customers were presented with an option to convert to natural gas. The study relied on a customer phone survey administered in summer 2013. The survey specifically presented homeowner survey respondents with different scenarios regarding the upfront costs to connect/convert to natural gas and the anticipated annual savings that would result, and were asked whether they would or would not connect/convert under those scenarios.[13]

[10] Cardno ENTRIX, "IEP Natural Gas Conversion Analysis: Fairbanks LNG Distribution System Demand Analysis," January 14, 2014, ES-2, accessed November 4, 2015, http://www.interiorenergyproject.com/Resources%20and%20Documents/IEP_Conversion_Analysis_Final.pdf.
[11] Ibid, ES-3.
[12] Ibid, 2-5.
[13] Ready, "Analysis of Potential Demand for the Extension and Expansion of Natural Gas Distribution Infrastructure in Pennsylvania: A Report in Response to Senate Resolution," 29.

The survey included nine different scenarios regarding conversion cost estimates and payback timeframes. Findings indicated that the cost of conversion may be a less important factor when considering the change to natural gas in cases where the benefit of a smaller payback period outweighs the upfront costs over time. Nevertheless, the study found that half (or even more) of Pennsylvania households would not connect to natural gas regardless of the upfront cost or payback period of their investment.[14]

In 2011, Connecticut measured the economic impact of expanding natural gas access in the state. The study assumed that all "utilities pay for the infrastructure buildout and home and business owners pay for equipment conversion."[15] In addition, the analyses concluded that the largest impacts to jobs, taxes, and output occurred during the buildout and conversion period. The economic impacts during this period were significant—amounting to approximately 8,000 jobs per year for the first five years, and 3,100 for the last four.[16] The impacts were significant in this study mostly as a result of the high conversion rates—and volume of conversions to natural gas—for the residential, commercial, and industrial sectors. In addition, the number of oil users within the Connecticut region is sizeable. In a region with high consumption and colder winters, the cost/benefit of switching favored conversion to natural gas.

2.3 Expansion Programs

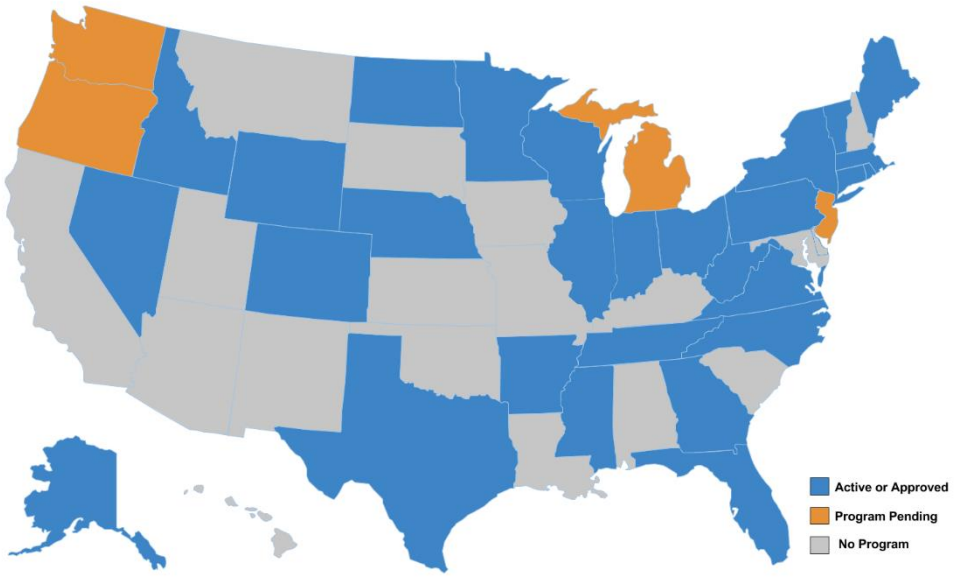
U.S. natural gas consumption is growing for a variety of reasons—due not only to households' and businesses' increased adoption but also to statewide infrastructure expansion efforts. In particular, several states, the majority of those surrounding Maryland, are "increasingly adopting innovative regulatory mechanisms to align utility incentives with policy goals of improving energy usage, providing access to natural gas, and reducing emissions."[17] As shown in Figure 1, a number of states have engaged in or are currently pursuing natural gas expansion efforts to bring online households and businesses that are currently underserved by existing infrastructure. These investments are predicated on a recognition that access to natural gas enables both economic and environmental benefits.

Programs employ a multitude of methods, including incentives for converting, funding for infrastructure expansion, and cost recovery programs for providers. While some of these programs have been implemented through legislation, others are part of state energy strategies

[14] Ready, "Analysis of Potential Demand for the Extension and Expansion of Natural Gas Distribution Infrastructure in Pennsylvania: A Report in Response to Senate Resolution 29," 6.
[15] Stanley McMillen, Ph.D., and Nandika Prakash, "The Economic Impact of Expanding Natural Gas Use in Connecticut," Department of Economic and Community Development (December 2011): 1, accessed November 4, 2015, www.ct.gov/deep/lib/deep/energy/cep/decd-the_economic_impact_of_expanding_natural_gas_use_in_connecticut.pdf.
[16] Ibid.
[17] American Gas Association, "Got Growth? Defining US Gas Utility Growth in an Era of Efficiency and Natural Gas Resource Abundance," 10.

or provider initiatives. Through increases in availability and affordability, these programs seek to expand residents' natural gas utilization.

Figure 1: States Engaged in Natural Gas Expansion



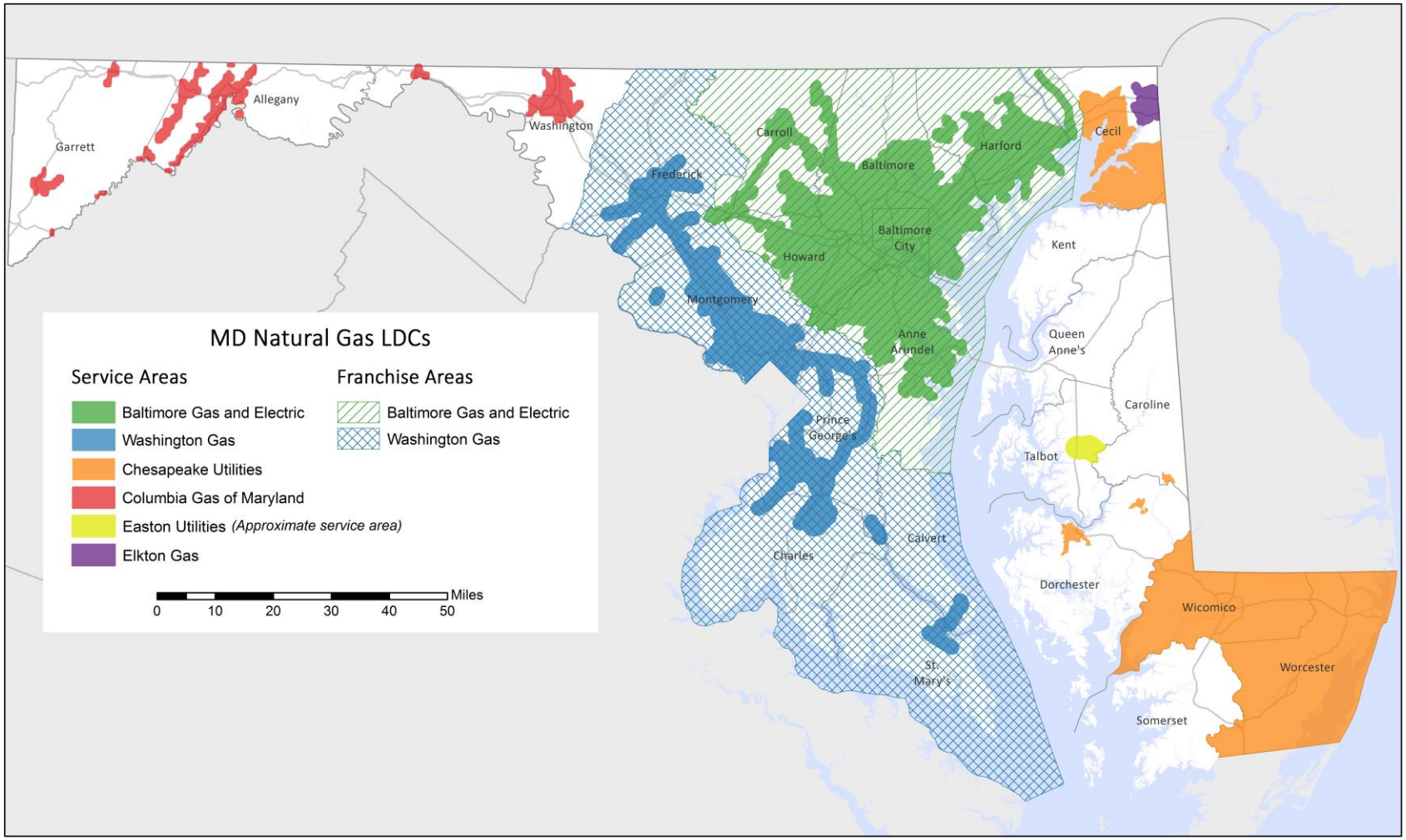
Sources: American Gas Association, RESI

3.0 Current Natural Gas Infrastructure in Maryland

The U.S. Energy Information Administration (EIA) estimates that nearly 44.2 percent of all Maryland households use natural gas as a main heating source, ranking it number one in heating energy use.[18] In Maryland, the majority of residents and firms across all counties have the opportunity to be serviced by natural gas. Figure 2 represents the current natural gas service areas for each of the five gas utilities that commissioned this report.

[18] U.S. Energy Information Administration, "Maryland State Energy Profile," accessed November 4, 2015, http://www.eia.gov/state/print.cfm?sid=MD.

Figure 2: Service and Franchise Areas by LDC, 2015



Source: MD Natural Gas LDCs, CGIS

As shown in Figure 2, Central Maryland and parts of Western and Eastern Maryland are currently serviced by MD Natural Gas LDCs such as Baltimore Gas and Electric (BGE), Washington Gas, Columbia Gas, Chesapeake Utilities, Easton Utilities, and Elkton Gas. The state is also serviced by other smaller utilities that were not part of this study.[19] To operate distribution pipelines, Maryland public utilities have been granted franchises from the Maryland Public Service Commission (MD PSC).[20] The MD PSC also reviews small utilities' prices and purchasing to ensure safety, reliability, and "reasonable costs."[21] Specific pipeline locations and franchise areas for all utilities that commissioned this study were not available for this report. However, to provide more detail regarding the current natural gas infrastructure in Maryland, Figure 3 details active natural gas distribution lines by county.

Figure 3: Current Natural Gas Distribution Lines by County, 2015

County	Transmission Lines
Allegany County	Yes
Anne Arundel	Yes
Baltimore City	Yes
Baltimore County	Yes
Calvert County	Yes
Caroline County	Yes
Carroll County	Yes
Cecil County	Yes
Charles County	Yes
Dorchester County	Yes
Frederick County	Yes
Garrett County	Yes
Harford County	Yes
Howard County	Yes
Kent County	No
Montgomery County	Yes
Prince George's County	Yes
Queen Anne's County	No
St. Mary's County	Yes
Somerset County	No
Talbot County	Yes
Washington County	Yes
Wicomico County	Yes
Worcester County	Yes

Sources: NPMS, RESI

[19] "Consumer Corner - Natural Gas," Maryland Office of People's Counsel, accessed January 8, 2016, http://www.opc.state.md.us/ConsumerCorner/NaturalGas.aspx.
[20] Ibid.
[21] Ibid.

To quantify the current natural gas customer base, the MD Natural Gas LDCs provided data that RESI used to determine the breakdown of their current customers across counties. Figure 4 reports the current natural gas customer base by county. [22]

Figure 4: Current Natural Gas Customers in Maryland by Type by County, 2015[23]

County	Residential	Commercial/Industrial	Total
Allegany County	15,579	1,490	17,069
Anne Arundel	93,622	7,142	100,764
Baltimore City	190,532	12,719	203,251
Baltimore County	204,374	14,195	218,569
Calvert County	1177	315	1,492
Caroline County	0	0	0
Carroll County	14,034	1,581	15,615
Cecil County	6,387	546	6,933
Charles County	16,882	801	17,683
Dorchester County	0	0	0
Frederick County	27,195	2,944	30,139
Garrett County	1548	341	1,889
Harford County	42,888	3,050	45,938
Howard County	55,129	4,080	59,209
Kent County	0	0	0
Montgomery County	228,307	11,284	239,591
Prince George's County	174,605	11,650	186,255
Queen Anne's County	0	0	0
St. Mary's County	5,599	396	5,995
Somerset County	0	0	0
Talbot County	0	0	0
Washington County	11,970	1,947	13,917
Wicomico County	0	0	0
Worcester County	2,400	0	2,400
Total	**1,092,228**	**74,481**	**1,166,709**

Sources: Maryland Natural Gas LDC, RESI

The existing residential, commercial, and industrial establishments served as a variable to evaluate customer savings, usage, and potential conversions in Sections 4.0 and 5.0. Note that a zero does not necessarily indicate a lack of natural gas customers in a specific county as these

[22] Only data provided by MD Natural Gas LDCs is reported in Figure 4 and does not represent to total universe of current household customers in Maryland.

[23] Establishments listed here may include self-employed establishments. For Baltimore City, these establishments are approximately 44,000 as of ACS 2013 Estimates.

numbers only reflect data that the LDCs that commissioned report provided to RESI during the study period.

4.0 Cost Savings

Natural gas is now readily recognized as a lower-cost and abundant source of energy. Households and establishments stand to realize considerable savings when making the switch from other energy sources to natural gas.

To estimate current market savings, RESI relied on a number of data sources. For instance, the MD PSC tracks data regarding natural gas service, providers, and natural gas costs within Maryland on a quarterly basis. RESI combined industry data from the Natural Gas LDCs and federal data sources (i.e., Bureau of Labor Statistics (BLS), American Community Survey (ACS) and EIA) for data on consumption and pricing. RESI developed current market demographic data across all counties within Maryland. Figure 5 reports relevant baseline economic data for each county.

Figure 5: Economic Baseline Variables by County for Maryland, 2015

County	Total Number of Establishments	Total Number of Households
Allegany County	1,613	33,271
Anne Arundel	13,750	214,191
Baltimore City	12,280	296,256
Baltimore County	19,782	335,679
Calvert County	1,688	33,996
Caroline County	585	13,482
Carroll County	4,255	62,499
Cecil County	1,784	41,431
Charles County	2,622	55,645
Dorchester County	717	16,607
Frederick County	5,955	90,910
Garrett County	906	18,889
Harford County	5,319	96,312
Howard County	8,946	110,576
Kent County	636	10,585
Montgomery County	26,739	377,824
Prince George's County	14,281	328,432
Queen Anne's County	1,348	20,285
St. Mary's County	1,928	41,847
Somerset County	366	11,116
Talbot County	1,467	19,742
Washington County	3,426	60,804
Wicomico County	2,530	41,240
Worcester County	2,109	55,666
Total	**135,032**	**2,387,285**

Sources: ACS, REMI PI+, CBP, RESI

Figure 5 represents the universe of total establishment and households in Maryland. However, it is important to note that, for a variety of reasons, the total universe may not have the ability to connect to natural gas and therefore may be unable to obtain service even through an expansion of the current system. For example, the existing distance from transmission or distribution lines could prohibit expansion in certain areas without some form of large-scale external funding. Other factors could include outdated zoning laws[24] or low population density in more rural areas of the state.

As reported in Figure 4, there are more than 1.1 million residential units and 74,481 commercial and industrial entities using natural gas as an energy source in Maryland. Using information

[24] "WASHINGTON GAS LIGHT COMPANY v. PRINCE GEORGE COUNTY COUNCIL," FindLaw, March 25, 2013, accessed November 18, 2015, http://caselaw.findlaw.com/us-4th-circuit/1625809.html.

regarding existing customers' household energy usage and the current price per MMBTU, RESI estimated the current costs and savings to Maryland households by energy type, as reported in Figure 6. For a more detailed discussion on the methodology, please refer to Appendix A.1.

Figure 6: Current Costs and Savings to Maryland Households using Natural Gas, 2015[25]

Energy Type	Total Annual Consumption (MMBTUs)	Price per MMBTUs[26]	Average Annual Costs per Household	Average Annual Savings per Household[27]
Natural Gas	93,077,493	$11.10	$946	-
Heating Oil[28]	93,077,493	$20.56	$1,752	$806
Electricity[29]	93,077,493	$24.85	$2,117	$1,172
Propane[30]	93,077,493	$31.10	$2,650	$1,705

Sources: EIA, RESI

RESI estimated that the costs associated with household natural gas consumption are $946 per year. To generate the same level of usage from oil heat, households would need to spend $806 more per year. It would cost a household an additional $1,172 per year to use electricity; propane would increase the cost by $1,705 per year. Figure 7 highlights these cost differentials visually.

[25] The natural gas price at the time of the report was $11.18 per cf. This is divided by the product of the conversion of 1.028 multiplied by the effective efficiency of 98 percent. The result is the price of $11.10 per MMBTU.

[26] BTUs refer to British thermal units, where 1.028 thousand cubic feet of natural gas is equivalent to 1 BTU.

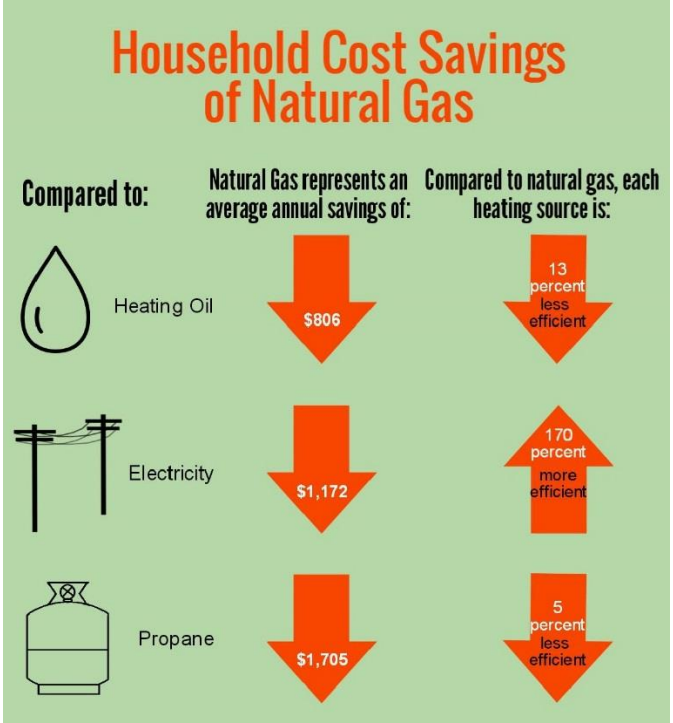
[27] Average annual costs to households are the total MMBTUs divided by the number of households, creating a per-household use multiplied by the MMBTU pricing. Savings are the difference between alternative sources and natural gas.

[28] The price of heating oil at the time of the report was $2.42 per gallon. This is divided by the product of the conversion of 0.1385 multiplied by the effective efficiency of 85 percent. The result is the price of $20.56 per MMBTU.

[29] The average electricity price at the time of the report was $0.141 per kilowatt hour. This is divided by the product of the conversion of 0.003412 multiplied by the effective efficiency of 166.3 percent. The result is the price of $24.85 per MMBTU.

[30] The propane price at the time of the report was $2.67 per gallon. This is divided by the product of the conversion of 0.091333 multiplied by the effective efficiency of 94 percent. The result is the price of $31.10 per MMBTU.

Figure 7: Household Savings of Natural Gas[31] [32] [33]



Sources: EIA, HVAC Partners, Piktochart, RESI

The total possible savings for households using natural gas instead of other energy sources in Maryland is reported by various energy types in Figure 8.

Figure 8: Total Household Costs using Other Energy Sources, 2015

Energy Type	Total Household Costs using Other	Total Household Costs with Natural Gas	Total Possible Savings to Maryland Households
Heating Oil	$1,913,336,446	$1,032,921,436	$880,415,009
Electricity	$2,312,652,024	$1,032,921,436	$1,279,730,588
Propane	$2,894,678,677	$1,032,921,436	$1,861,757,240

Sources: EIA, RESI

31 American Gas Association, "Got Growth? Defining US Gas Utility Growth in an Era of Efficiency and Natural Gas Resource Abundance," 17.
32 Southwest Gas, "Why Natural Gas," accessed November 16, 2015, http://www.swgasliving.com/content/why-natural-gas.
33 International Comfort Products, LLC, "Oil Furnaces," 2010, accessed November 16, 2015, http://dms.hvacpartners.com/docs/1011/Public/07/09comfor747_Entry_Oil_Furnace_ICP_22572.pdf.

The total possible savings to Maryland from households consuming natural gas ranges from $880.4 million to nearly $1.9 billion per year in energy costs. As noted above, this translates to a range of $806 to $1,705 in annual energy savings per household.

Maryland commercial and industrial entities also save from consuming natural gas compared to other energy sources. To estimate the total potential costs, RESI used a similar method and energy prices to that of the household calculations and derived annual savings to all Maryland commercial and industrial establishments. Figure 9 reports the average annual costs of natural gas and other energy sources for commercial/industry establishments.

Figure 9: Current Costs and Savings to Maryland Commercial/Industrial Establishments using Natural Gas, 2015

Energy Type	Total Annual Consumption (MMBTUs)	Price per million BTUs[34]	Average Annual Costs per Establishment	Average Annual Savings per Establishment[35]
Natural Gas	92,084,690	$10.35	$12,800	-
Heating Oil	92,084,690	$20.56	$25,415	$12,615
Electricity	92,084,690	$19.03	$23,529	$10,730
Propane	92,084,690	$31.10	$38,450	$25,650

Sources: EIA, RESI

Maryland commercial and industrial establishments that use natural gas spend approximately $12,800 per year in energy costs. Other energy sources cost $10,730 to $25,650 more per year. The total energy costs and possible savings if establishments convert to natural gas is reported in Figure 10.

Figure 10: Total Commercial/Industrial Establishments Costs Using Other Energy Sources, 2015

Energy Type	Total Establishment Costs using Other	Total Establishment Costs with Natural Gas	Total Savings to Maryland Establishments
Heating Oil	$1,892,928,008	$953,350,390	$939,577,619
Electricity	$1,752,498,630	$953,350,390	$799,148,240
Propane	$2,863,802,838	$953,350,390	$1,910,452,448

Sources: EIA, RESI

[34] BTUs refer to British thermal units, where 1.028 thousand cubic feet of natural gas is equivalent to 1 MMBTU.
[35] Average annual costs to establishments is the total MMBTUs divided by the number of establishments creating a per establishment use multiplied by the MMBTU pricing. Savings are the difference between alternative sources and natural gas.

The total possible savings to Maryland commercial and residential establishments from consuming natural gas ranges from $799.1 million to $1.9 billion per year. For more details on the methodology and calculations for the results above, please refer to Appendix A.1.

5.0 Economic and Fiscal Impacts Associated with Expansion

Using data provided by the Natural Gas LDCs and government databases, RESI constructed a series of economic and fiscal impacts associated with expansion of the natural gas infrastructure in Maryland.

- **Section 5.1** discusses the methodology of the analysis regarding construction of the lines as well as the potential conversion rates.
- **Section 5.2** discusses the methodology associated with the establishment data and estimates for the analysis of newly converted business entities.
- **Section 5.3** introduces the REMI PI+ model used within the economic and fiscal impacts analysis.
- **Section 5.4** discusses the economic impacts of the construction phase of the new lines and the results by county.
- **Section 5.5** reports the overall economic and fiscal impacts associated with the current market and the future market of natural gas consumption in Maryland by county.

5.1 Methodology Overview—Residential Customers

To estimate the current and potential demand for natural gas in Maryland, RESI requested data from the Natural Gas LDCs regarding residential and commercial/industrial establishment consumption to date. To determine the universe of households, RESI relied on the American Community Survey (ACS) 5-year 2013 estimates. The breakdown of customers is reported in Figure 4 in Section 3.0 and again here in Figure 11.

Figure 11: Current Natural Gas Customers in Maryland by Type by County, 2015

County	Residential	Commercial/Industrial	Total
Allegany County	15,579	1,490	17,069
Anne Arundel	93,622	7,142	100,764
Baltimore City	190,532	12,719	203,251
Baltimore County	204,374	14,195	218,569
Calvert County	1,177	315	1,492
Caroline County	0	0	0
Carroll County	14,034	1,581	15,615
Cecil County	6,387	546	6,933
Charles County	16,882	801	17,683
Dorchester County	0	0	0
Frederick County	27,195	2,944	30,139
Garrett County	1,548	341	1,889
Harford County	42,888	3,050	45,938
Howard County	55,129	4,080	59,209
Kent County	0	0	0
Montgomery County	228,307	11,284	239,591
Prince George's County	174,605	11,650	186,255
Queen Anne's County	0	0	0
St. Mary's County	5,599	396	5,995
Somerset County	0	0	0
Talbot County	0	0	0
Washington County	11,970	1,947	13,917
Wicomico County	0	0	0
Worcester County	2,400	0	2,400
Total	**1,092,228**	**74,481**	**1,166,709**

Sources: Maryland Natural Gas LDC, RESI

Analyzing the data provided by the MD Natural Gas LDCs, RESI found that more than 1.1 million residential units in Maryland use natural gas, and of currently available data, 74,481 commercial/industrial establishments use natural gas. As noted in Figure 3 in Section 3.0, more than 90 percent of Maryland counties report a natural gas transmission line or a pipeline. It is important to note that, in some areas, the lines run along borders, allowing for residents from adjacent counties the ability to access natural gas for use.

To estimate the potential existing households that will be serviced by the expansion of lines for natural gas distribution, RESI reviewed the current transmission lines and the density of areas nearby. Measuring distance from current lines into other densely populated regions, RESI estimated approximately 134.1 miles of new lines would be needed to meet the highest demand markets. After establishing the theoretical lines, RESI estimated the conversion rate of existing households to be approximately 3.2 percent annually using historical natural gas

conversion rates and an assumption of increased demand to account for the additional households that will now be serviced through the infrastructure expansion.

RESI based additional customers as a result of potential new housing construction on estimates from REMI PI+'s population forecast and the Maryland Department of Planning's estimated people per household forecast. RESI applied the population forecast from 2016 through 2026 to derive the individuals per household and determine the total new housing demand needed through 2026. Using information collected on household counts from the ACS, RESI estimated the feasible gaps in current housing available for new residents by region. It is important to note that, in the last ten years, nearly 65 percent of constructed households have chosen natural gas for heating and cooking needs.[36] RESI used this estimate to derive an additional potential customer base for natural gas associated with newly constructed homes through 2026. Figure 12 estimates the potential new residential customers of natural gas by 2026.

[36] U.S. Energy Information Administration. "Natural Gas and the Environment." Accessed December 21, 2015.

Figure 12 Forecasted New Residential Customers as a Result of Expansion by County, 2026

County	Residential Customers (2015)	Existing Home Conversions	Customers from New Housing Construction	Total Residential Customers by 2026
Allegany County	15,579	3,008	62	18,649
Anne Arundel	93,622	20,497	7,318	121,437
Baltimore City	190,532	20,449	354	211,335
Baltimore County	204,374	28,569	4,702	237,645
Calvert County	1,177	5,697	21	6,895
Caroline County	0	2,292	11	2,303
Carroll County	14,034	8,239	122	22,395
Cecil County	6,387	5,957	34	12,378
Charles County	16,882	7,533	854	25,269
Dorchester County	0	2,823	21	2,844
Frederick County	27,195	12,079	3,368	42,642
Garrett County	1,548	2,948	46	4,542
Harford County	42,888	9,086	2,586	54,560
Howard County	55,129	9,542	5,764	70,435
Kent County	0	1,799	21	1,820
Montgomery County	228,307	2,455	13,770	244,532
Prince George's County	174,605	34,866	8,232	217,703
Queen Anne's County	0	0	0	0
St. Mary's County	5,599	6,603	29	12,231
Somerset County	0	1,890	18	1,908
Talbot County	0	0	0	0
Washington County	11,970	8,302	34	20,306
Wicomico County	0	7,011	33	7,044
Worcester County	2,400	9,055	229	11,684
Total	**1,092,228**	**210,700**	**47,627**	**1,350,555**

Sources: Natural Gas LDCs, ACS, RESI

RESI estimated that a total of 47,627 newly constructed households will become natural gas customers within Maryland by 2026. RESI also assumed that roughly 210,700 existing households will convert to natural gas over this ten-year period. Conversions are based on data that Maryland Natural Gas LDCs provided as well as current historical conversion patterns.

More households may convert past 2026, but this report focuses only on households converting until that point. Using the data calculated within this section and in Sections 3.0 and 4.0, RESI created inputs for the REMI PI+ input/output model to complete the economic and fiscal impact analysis. More information on the REMI PI+ model is included in Section 5.2.

5.2 Methodology Overview—Commercial and Industrial Customers

RESI employed a methodology similar to the methodology detailed in Section 5.1 to examine the current commercial and industrial customers of natural gas within Maryland and estimate the potential total customers by 2026. Using data that the Maryland Natural Gas LDCs provided regarding current commercial and industrial natural gas customers, RESI found that a total of 74,481 establishments used natural gas in Maryland as of 2015. Reviewing Figure 11 in Section 5.1, RESI used this total as the current number of natural gas customers for commercial and industrial use as of 2016. Using a historical rate of conversion among establishments for the past ten years and information that the Maryland Natural Gas LDCs provided regarding potential future conversions, RESI estimated the change in commercial and industrial customers of natural gas. The base as of 2015, the estimated number of conversions, and the total new customer base are provided in Figure 13.

Figure 13: Estimated Commercial and Industrial Natural Gas Customers by 2026

County	Establishment Customers as of 2015	New Establishment Conversions	Total Establishment Customers by 2026
Allegany County	1,490	59	1,549
Anne Arundel	7,142	1,322	8,464
Baltimore City	12,719	246	12,965
Baltimore County	14,195	1,117	15,312
Calvert County	315	273	588
Caroline County	0	12	12
Carroll County	1,581	535	2,116
Cecil County	546	248	794
Charles County	801	384	1,185
Dorchester County	0	14	14
Frederick County	2,944	764	3,708
Garrett County	341	118	459
Harford County	3,050	454	3,504
Howard County	4,080	973	5,053
Kent County	0	13	13
Montgomery County	11,284	3,040	14,324
Prince George's County	11,650	1,500	13,150
Queen Anne's County	0	0	0
St. Mary's County	396	381	777
Somerset County	0	7	7
Talbot County	0	0	0
Washington County	1,947	377	2,324
Wicomico County	0	51	51
Worcester County	0	42	42
Total	**74,481**	**11,929**	**86,410**

Sources: Maryland Natural Gas LDC, RESI

Using County Business Patterns data, RESI estimated the total establishment counts by County. Applying a historical growth rate of establishments across counties, RESI then estimated the potential number of establishments that could convert to natural gas each year. As reported in Figure 13, RESI estimated that an additional 11,929 commercial and industrial establishments within Maryland will convert to natural gas by 2026, bringing the total commercial and industrial consumer base for natural gas to 86,410 customers by 2026. These customers were phased in over the ten-year period with regard to new builds and conversions. The investment costs associated with the conversion and hook-ups to natural gas were phased into budgets

over a five-year period, similar to the residential household investment terms. Using the estimates in Sections 5.1 and 5.2, RESI established a feasible set of variables to determine consumption of natural gas over the ten-year period between 2016 and 2026 within Maryland as a result of expanding natural gas service. These inputs were used within the REMI PI+ model to estimate potential economic and fiscal impacts as a result of investments and savings to Maryland's economy. The REMI PI+ model is discussed in more detail in Section 5.3.

5.3 REMI PI+ Model

RESI used the REMI PI+ model to analyze the potential impact from natural gas expansion in Maryland. The REMI PI+ model is a high-end dynamic modeling tool used by various federal and state government agencies in economic policy analysis. Utilization of REMI PI+ helps RESI to build a sophisticated model that is calibrated to the specific demographic features of the study area—in this case, Maryland. This model enumerates the economic and fiscal impacts of each dollar earned and spent by the following: employees relating to the economic events, other supporting vendors (business services, retail, etc.), each dollar spent by these vendors on other firms, and each dollar spent by the households of the event's employees, other vendors' employees, and other businesses' employees. The REMI PI+ model also accounts for changes to the economy over time including tax changes, inflation, the recession, and sequestration.

REMI PI+ and IMPLAN are both economic policy analysis models, and both are used by state and federal government. However, each model has attributes that may lead to different results even when analyzing the same data. These differing results can be attributed to the various differences between the two models:

- The length of time of analysis,
- The inclusion of external factors,
- The elasticity of the labor supply, and
- The multipliers.

When comparing the models, IMPLAN is a static model, meaning that it analyzes the data for a single year at a time. REMI PI+ is a dynamic model, meaning it analyzes the data over a period and that future impacts are dependent on changes in the previous years. The main strength of the REMI PI+ model being dynamic is that it allows researchers to examine policy changes with respect to inflation and price effects. This method allows for increased demand and employment constraints from the previous years to shift inflation and wage changes in later years.

In addition to these differences between REMI PI+ and IMPLAN, IMPLAN assumes a perfectly elastic labor supply. Under this assumption, IMPLAN expects that, regardless of the data being analyzed, Maryland will have the necessary labor to meet the expected demand. This assumption can be misleading in industries such as the bioscience industry, which requires highly-skilled workers. Realistically, some cross-state collaboration or hiring of out-of-state employees with the expectation of relocation may need to occur to acquire an appropriately

skilled workforce for such an industry. Under the REMI PI+ model, these constraints on the labor supply are built into the model based on current labor supply and growth estimates by sector. The REMI PI+ model then allows researchers to look at the economic migration based on job opportunities within the region to estimate the labor that would seek to relocate as well as the potential for Maryland jobs to go to other states due to a shortage in labor demand.

The multipliers used by each model also vary, which can have an impact on results. IMPLAN and REMI PI+ are each built on a set of multipliers based on historical data created for each state by the Bureau of Economic Analysis. Both models are based on the concept of input/output modeling. Within these models, an input or change to the economy is entered into the model. The model uses the multipliers to generate the potential economic impacts (jobs, output, and wages) that might result from this economic activity. The difference between the models, however, are the interaction and constraints built within each tool.

5.4 Economic and Fiscal Impacts during Investment Phase

RESI assumed that investment for infrastructure expansion and residential conversions and new residential hookups will occur during the ten-year period. RESI defined the construction of new lines and newly added households consuming natural gas as the investment phase. To estimate the potential economic and fiscal impacts associated with expansion of Maryland's current natural gas infrastructure, RESI used the information regarding current and estimated customers as determined in Sections 5.1 and 5.2. The total customers by type are reported in Figure 14.

Figure 14: Estimated Total Natural Gas Customers by Type by County, 2026

County	Residential Customers	Establishment Customers	Total Natural Gas Customers
Allegany County	18,649	1,549	20,198
Anne Arundel	121,437	8,464	129,901
Baltimore City	211,335	12,965	224,300
Baltimore County	237,645	15,312	252,957
Calvert County	6,895	588	7,483
Caroline County	2,303	12	2,315
Carroll County	22,395	2,116	24,511
Cecil County	12,378	794	13,172
Charles County	25,269	1,185	26,454
Dorchester County	2,844	14	2,858
Frederick County	42,642	3,708	46,350
Garrett County	4,542	459	5,001
Harford County	54,560	3,504	58,064
Howard County	70,435	5,053	75,488
Kent County	1,820	13	1,833
Montgomery County	244,532	14,324	258,856
Prince George's County	217,703	13,150	230,853
Queen Anne's County	0	0	0
St. Mary's County	12,231	777	13,008
Somerset County	1,908	7	1,915
Talbot County	0	0	0
Washington County	20,306	2,324	22,630
Wicomico County	7,044	51	7,095
Worcester County	11,684	42	11,726
Total	**1,350,555**	**86,410**	**1,436,965**

Sources: Maryland Natural Gas LDC, RESI

According to Figure 14, RESI estimated that there will be nearly 1.4 million natural gas customers in Maryland by 2026. Of those 1.4 million, nearly 94 percent will be residential and the remaining 6 percent will be commercial and industrial establishments in Maryland. The estimates in Figure 14 established a base of customers who will pay for conversion or new hook-up costs for natural gas in Maryland. For this analysis, RESI included the costs of hooking up to natural gas lines as part of the investment and construction phase. RESI assumed approximately $6,500 in conversion costs to households switching to natural gas, with business

costs varying depending on the size of the establishment.[37] RESI phased in total household conversions over the ten-year period for an overall conversion of close to 3.2 percent each year from the base of total customers as of 2015. Using the dollar calculation of conversion costs for each energy type and a factor for rebates and credits, RESI used these totals to measure the impacts to the state as an increase in demand for specialized services by HVAC professionals and services. RESI distributed these figures across counties to establish the overall economic and fiscal impacts associated with a change to natural gas.

In addition to the costs of conversion, RESI examined the costs of gas infrastructure expansion to allow for more residents and establishments to access natural gas. Using information from the National Pipeline Mapping Service, RESI estimated the regions that would most likely be expanded by comparing household density information overlaid with current transmission lines. RESI based costs for new pipelines by type on historical cost estimates over the last ten years for materials, labor, and right-of-way.[38] Newly constructed lines were estimated based on cost of expanding existing lines within the state; however, larger load capacity expansion based on lines crossing state lines may be needed in future infrastructure improvements if demand continues increasing past 2026. Figure 15 details the potential expansion areas, including line type and average cost per project.[39]

[37] Average costs of conversion and hookup ranged from $3,000 to $10,000 across several states and sources with boiler maintenance represented as the net between $50 for natural gas annually and $150 for scrubbing of oil burner.
[38] Christopher E. Smith, "Oil Pipelines Lead Way in Strong 2014," *Oil and Gas Journal* (September 7, 2015), accessed December 22, 2015, http://digital.ogj.com/ogjournal/20150907?pg=1#pg1.
[39] U.S. Energy Information Administration, "Natural Gas Pipeline Projects," October 2015, accessed November 12, 2015, http://www.eia.gov/naturalgas/data.cfm.

Figure 15: Potential Natural Gas Construction Costs for Line Expansions by County

County	Cost
Allegany County	$35.4 million
Anne Arundel	$28.4 million
Baltimore City	$10.1 million
Baltimore County	$12.9 million
Calvert County	$18.8 million
Caroline County	$39.8 million
Carroll County	$25.9 million
Cecil County	$18.0 million
Charles County	$15.0 million
Dorchester County	$12.4 million
Frederick County	$16.6 million
Garrett County	$0
Harford County	$10.2 million
Howard County	$9.5 million
Kent County	$18.6 million
Montgomery County	$7.1 million
Prince George's County	$8.3 million
Queen Anne's County	$0
St. Mary's County	$12.2 million
Somerset County	$2.7 million
Talbot County	$0
Washington County	$12.1 million
Wicomico County	$12.6 million
Worcester County	$0
Total	**$326.6 million**

Sources: Natural Gas LDCs, ACS, RESI

Total projects for expansion of current lines would cost roughly $326.6 million. These lines were considered at a given price per mile to reach other high population density areas. The costs above do not include conversion costs borne by households and businesses. These costs are estimated separately. It is reasonable that although a new line may not be added to a region, conversions may still occur based on the existing lines, as homes willing or able to be serviced with natural gas will be located within these areas. Therefore, the cost of construction of new lines in Figure 15 may be shown as zero, but households and businesses conversions within those counties may still occur over the ten-year period based on current infrastructure.

Given the length required to reach customers in some cases as well as the cap on potential spending, RESI estimated that the timeline for this construction may take close to ten years. These lines are considered those of first priority as they will meet customers in the most densely populated areas of counties. There may be continued expansion and construction

activities related to these lines past 2026, but for the purpose of this analysis, RESI focused on the immediate ten years after 2016 legislation is approved. In addition, it is important to note the significant investments necessary to reach certain areas of the state. For the purposes of this report, RESI assumed that these expansion efforts would move forward regardless of the costs. Considering the feasibility of these expansion efforts is outside the scope of this study.

Economic Impacts

Using the estimated potential costs of conversions based on new customers and feasible infrastructure improvements over the ten-year period, RESI estimated the impacts from 2016 through 2026. RESI used the spending and activity attributed to the construction of these pipelines as an input in the REMI PI+ model to determine the impacts of the investment phase as a result of expanding the infrastructure. Figure 16 shows these results.

Figure 16: Construction Phase Economic Impacts to Maryland, 2016–2026

Year	Jobs	Output	Wages
2016	521	$24,414,100	$19,916,600
2017	885	$47,226,000	$36,499,000
2018	973	$54,214,500	$43,331,100
2019	1,376	$75,668,400	$63,735,900
2020	2,094	$113,281,300	$100,727,100
2021	3,214	$172,653,200	$160,877,200
2022	4,955	$265,701,300	$258,335,200
2023	7,656	$411,315,900	$376,605,250
2024	11,864	$639,076,200	$575,855,275
2025	18,412	$995,308,000	$877,922,800
2026	28,548	$1,554,252,600	$1,332,527,150
Average	**7,318**	**$395,737,409**	**$349,666,598**

Sources: REMI PI+, RESI

These economic impacts include households converting to natural gas and construction of new lines. These are considered investments that both LDCs and customers made within the region. RESI assumed that all conversions and construction of pipelines may exceed ten years but only reported the first ten years. As reported in Figure 16, during this period of investment, an average of 7,318 jobs will be supported each year, and $395.7 million in output and $349.7 million in wages, on average, will be added to the economy over the ten-year period. The expansion of the natural gas lines will also have a considerable fiscal impact on Maryland, as reported in Figure 17.

Figure 17: Fiscal Impacts to Maryland, 2016–2026

Year	Property	Income	Sales	Payroll	Other	Total
2016	$322,229	$226,495	$299,132	$6,025	$197,447	$1,051,329
2017	$576,779	$405,418	$535,436	$10,785	$353,424	$1,881,842
2018	$673,696	$473,540	$625,405	$12,597	$412,810	$2,198,047
2019	$980,834	$689,427	$910,528	$18,339	$601,010	$3,200,138
2020	$1,527,753	$1,073,856	$1,418,244	$28,566	$936,137	$4,984,556
2021	$2,404,013	$1,689,779	$2,231,693	$44,950	$1,473,069	$7,843,503
2022	$3,807,788	$2,676,491	$3,534,846	$71,197	$2,333,237	$12,423,559
2023	$6,048,613	$4,251,565	$5,615,049	$113,096	$3,706,312	$19,734,634
2024	$9,638,690	$6,775,027	$8,947,789	$180,223	$5,906,146	$31,447,875
2025	$15,371,865	$10,804,871	$14,270,011	$287,421	$9,419,173	$50,153,341
2026	$24,507,806	$17,226,517	$22,751,089	$458,243	$15,017,258	$79,960,914
Average	**$5,987,279**	**$4,208,453**	**$5,558,111**	**$111,949**	**$3,668,729**	**$19,534,522**

Sources: REMI PI+, RESI

The average annual fiscal impact as a result of natural gas expansion within Maryland will be approximately $19.5 million. The largest fiscal impacts will be generated as a result of increased property tax revenues, accounting for nearly $6.0 million on average each year. The second largest fiscal impacts are sales tax revenues, which will add $5.6 million on average each year. To view this information by county, please refer to Appendix B.

5.5 Economic and Fiscal Impacts during Operation Phase

In Section 4.0, RESI estimated the potential savings associated with natural gas consumption over other forms of energy for household and establishments. RESI expanded upon the information from the Maryland Natural Gas LDCs by extrapolating these savings estimates across the forecasted schedule of conversions for residential and establishments and the newly constructed households over the next ten years. RESI estimated the feasible savings associated with those converting to natural gas over the ten-year period, growing exponentially as new conversions occur by year. Savings in this analysis are the net from the annualized cost from the investment made in Section 5.4. Overall, households would invested in a given year, but payback for the investment may take ten years. This estimate of an approximate ten-year payback is comparable to options established by Pennsylvania studies.[40]

Using the information regarding possible natural gas demand, RESI applied a conversion schedule to each group over a ten-year period beginning in 2016. Using the phased-in totals, RESI estimated the total incremental savings from 2016 through 2026 and the total realized costs incrementally distributed over time based on a five-year investment. These estimates are reported in Figure 18.

[40] Ready, "Analysis of Potential Demand for the Extension and Expansion of Natural Gas Distribution Infrastructure in Pennsylvania," 6.

Figure 18: Total Conversion Cost and Savings Estimates, 2016–2026

Customer Type	Total Ten-Year Savings	Total Cost of Investment	Total Net Ten-Year Savings
Residential	$1,047,634,112	$785,323,703	$262,310,409
Commercial/Industrial	$1,071,548,437	$96,628,626	$974,919,811

Sources: Natural Gas LDCs, RESI

As reported in Figure 18, the total net savings over the ten years for households is roughly $262.3 million, and establishments would realize $974.9 million in savings. RESI accounted for the costs reported in Figure 18 in the investment phase of this analysis. To avoid double-counting, RESI analyzed the net savings reported in the fourth column of Figure 18 for the economic and fiscal impacts reported in Figure 19 and Figure 20. RESI modeled savings as a result of reduced energy costs in the REMI PI+ model as a reduction for production costs to establishments and an increase in household disposable income. Presumably, as households save more over time because of their reduced energy costs, incremental savings will be subsequently redistributed among other household spending categories, such as new consumer goods or services. A reduction in the production costs to establishments within Maryland would potentially allow these establishments to consider expanding operations and investing in new production capital. Using the net savings to households and establishments, as reported above, RESI estimated changes to jobs, output, and wages, as reported in Figure 19.

Figure 19: Annual Economic Impacts to Maryland, 2016–2026

Year	Jobs	Output	Wages
2016	429	$50,166,000	$20,073,000
2017	589	$70,724,400	$28,956,600
2018	755	$92,491,200	$38,611,200
2019	907	$114,605,400	$48,311,400
2020	1,057	$138,210,600	$58,756,200
2021	1,226	$165,820,800	$70,914,600
2022	1,413	$197,698,800	$84,976,800
2023	1,626	$235,245,000	$101,687,400
2024	1,887	$280,892,400	$122,498,400
2025	2,222	$338,607,600	$149,517,600
2026	2,251	$358,069,200	$157,843,800
Average	**1,306**	**$185,684,673**	**$80,195,182**

Sources: REMI PI+, RESI

The savings associated with households and establishments converting to natural gas will support an average of 1,306 jobs and contribute on average $185.7 million in output and $80.2 million in wages each year from 2016 through 2026. When analyzing detailed employment

impacts, RESI noticed that the jobs created from the conversion yielded an average salary of approximately $61,417.

This activity is projected to increase jobs within the construction, retail trade, and heath care and social assistance industries. Furthermore, the population within several regions is expected to grow over this period, and the increase in lower-cost heating amenities may make some areas with a lower cost of living more attractive to low-income or fixed-income individuals. RESI projected the increase in population to peak in 2023, adding more than 5,800 new residents.

RESI then estimated the following fiscal impacts associated with net savings for conversion to natural gas from 2016 through 2026. These findings are reported in Figure 20.

Figure 20: Annual Fiscal Impacts to Maryland, 2016–2026

Year	Property	Income	Sales	Payroll	Other	Total
2018	$543,860	$382,279	$504,876	$10,169	$333,252	$1,774,436
2019	$716,344	$503,517	$664,996	$13,394	$438,943	$2,337,194
2020	$912,619	$641,479	$847,203	$17,064	$559,211	$2,977,577
2021	$1,112,559	$782,017	$1,032,811	$20,802	$681,725	$3,629,916
2022	$1,330,266	$935,043	$1,234,913	$24,873	$815,126	$4,340,220
2023	$1,590,771	$1,118,151	$1,476,744	$29,744	$974,751	$5,190,161
2024	$1,895,229	$1,332,155	$1,759,379	$35,437	$1,161,309	$6,183,508
2025	$2,261,135	$1,589,350	$2,099,057	$42,278	$1,385,519	$7,377,339
2026	$2,723,913	$1,914,636	$2,528,663	$50,931	$1,669,089	$8,887,231
2027	$3,329,324	$2,340,179	$3,090,678	$62,251	$2,040,057	$10,862,489
2028	$3,491,544	$2,454,204	$3,241,271	$65,284	$2,139,458	$11,391,761
Average	**$1,809,778**	**$1,272,092**	**$1,680,054**	**$33,839**	**$1,108,949**	**$5,904,712**

Sources: REMI PI+, RESI

The ten-year period of natural gas conversions in Maryland will contribute close to $5.9 million in average fiscal revenues each year. The largest contribution in fiscal revenues will come from increased property tax revenues, which will add an average of $1.8 million each year. Sales tax revenues and income tax revenues will also contribute a large portion—$1.7 million and $1.3 million each year on average, respectively. Expanding and converting to natural gas has an economic incentive for many households, as the increased savings will help reduce the energy burden and increase the disposable household income for those in lower median income regions of the state.

Commercial and industrial entities may find that conversion have larger upfront costs; however, they can significantly reduce their energy costs and therefore improve profits over time.

6.0 Environmental and Health Impacts from Expansion

This section briefly outlines potential environmental and health impacts from the expansion of natural gas infrastructure in the state. The core focus of this report is to measure the economic

and fiscal impacts; nevertheless, it is important to examine how environmental and health impacts could potentially influence those figures. The analysis in this section is merely a brief overview of the impacts found in existing literature. It should be noted that any costs savings or cost increases due to environmental and health impacts are not captured in the economic and fiscal impacts reported in Section 5.0.

Environmental Impacts

The increased conversion to natural gas from carbon-intensive coal-based generation has contributed to lower carbon emissions in the U.S. in recent years.[41] Carbon emissions from natural gas combustion are up to 60 percent lower per unit of electricity generated as compared to coal.[42] While critics argue whether natural gas has a greater impact on global warming because of methane leakages, a study concluded that it would take a methane leakage rate of 9.3 percent over 100 years to make natural gas worse than existing energy generating coal plants.[43] For newer, higher efficiency coal generation, the rate is 6.1 percent.[44] According to the EPA, natural gas leakage rates are around 1.5 percent during production, transmission, storage, and distribution.[45] Newer and more efficient pipelines bring those rates even lower.[46] Additionally, regions utilizing plastic and protected steel piping show lower methane emission rates than areas with older distribution systems (34 percent in the eastern U.S. versus less than 20 percent in the west).[47] These figures are encouraging for further reducing distribution leaks as older pipelines continue to be replaced and new expansions are completed with low-emission plastic.[48]

The expansion of natural gas infrastructure and household conversions should be viewed as an opportunity to reduce greenhouse emissions when compared to high-carbon options such as coal and oil.[49] The Regional Greenhouse Gas Initiative (RGGI), which Maryland joined in 2007, is intended to reduce carbon dioxide (CO_2) emissions from electricity generating plants by setting targets for emissions reductions.

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[41] Zeke Hausfather, "Bounding the climate viability of natural gas as a bridge fuel to displace coal," *Energy Policy* (2015): 286, accessed September 30, 2015, http://ac.els-cdn.com/S0301421515300239/1-s2.0-S0301421515300239-main.pdf?_tid=4183306c-6796-11e5-b676-00000aacb35f&acdnat=1443633254_8be922b699e75e85bb1037db16fd1628.

[42] Ibid.

[43] Zeke Hausfather. "Climate Impacts of Coal and Natural Gas," Berkeley Earth (2014): 3, accessed December 2, 2015 http://static.berkeleyearth.org/pdf/climate-impacts-of-coal-and-natural-gas.pdf.

[44] Ibid.

[45] Ibid.

[46] Brian K. Lamb et al., "Direct measurements show decreasing methane emissions from natural gas local distribution systems in the Unites States," *Environmental Science & Technology* (2015): 5163, accessed December 21, 2015, DOI: 10.1021/es505116p.

[47] Ibid, 5166.

[48] Ibid.

Improving the access to natural gas for Maryland households can help the state in meeting its RGGI targets. The reduction of emissions from electricity generators switching to natural gas was a significant reason for CO_2 emissions that were lower than expected during the RGGI baseline period in 2007.[50] Further investments in expanding the natural gas infrastructure could have even more positive impacts on CO_2 emissions in the state during the ten-year investment and operation timeframe as described in this study.

Health Impacts

Scientists have theorized a strong link between carbon-reduction strategies and positive health outcomes.[51] Strategies to reduce greenhouse gas can reduce indoor and outdoor air pollution and improve water quality.[52] More importantly, "many mitigation-related health impacts accrue sooner than the impacts projected from climate change."[53]

The expansion of natural gas pipelines facilitates access to direct energy for residential, industrial, and commercial consumers, which reduces truck traffic as a result. Measures that help to further limit existing greenhouse gas emissions from the transportation sector can "reduce direct emissions of criteria and toxic pollutants emitted."[54] There is added convenience from direct pipeline distribution as compared with reliance on oil or propane delivery trucks for transportation, especially during adverse weather conditions when travel is difficult.[55]

Households' adoption of natural gas also has a significant impact on greenhouse gas emissions. For instance, "Department of Energy (DOE) analyses indicates that every 10,000 U.S. homes powered with natural gas instead of coal avoids the annual emissions of 1,900 tons of NOx, 3,900 tons of SO2, and 5,200 tons of particulates."[56] These types of emissions have been linked with numerous health problems including asthma, bronchitis, lung cancer, and heart disease.[57] The ability for more than 258,327 households and 11,929 commercial and industrial establishments (which generally use more energy per capita than households) to utilize natural

[50] Maryland Department of the Environment, "Regional Greenhouse Gas Initiative and the Maryland CO2 Budget Trading Program," accessed December 21, 2015, https://www.mwcog.org/uploads/committee-documents/bV1dVl1d20120913081025.pdf.
[51] Chan, "Cutting carbon, improving health," 2.
[52] Justin V. Remais et al., "Estimating the Health Effects of Greenhouse Gas Mitigation Strategies: Addressing Parametric, Model and Valuation Challenges," *Environmental Health Perspectives* (2014): 448, accessed December 21, 2015, http://ehp.niehs.nih.gov/wp-content/uploads/122/5/ehp.1306744.pdf.
[53] Ibid, 447.
[54] American Lung Association of California, "Air Quality and Health Impacts of Greenhouse Gas Emissions and Global Warming," (August 2004): 2, accessed December 21, 2015, http://www.dnrec.delaware.gov/dwhs/Info/Regs/Documents/alac_impacts_fs.pdf.
[55] Public Service Electric and Gas Company, "Advantages of Natural Gas," accessed November 5, 2015 https://www.pseg.com/home/customer_service/gas_conversion/advantages.jsp.
[56] Union of Concerned Scientists, "Environmental Impacts of Natural Gas," accessed December 21, 2015, http://www.ucsusa.org/clean_energy/our-energy-choices/coal-and-other-fossil-fuels/environmental-impacts-of-natural-gas.html.
[57] Ibid.

gas could have significant air quality impacts and health impacts for the state in the next ten years.

7.0 Conclusion

The expansion of the natural gas infrastructure in Maryland would benefit customers of natural gas as well as provide significant positive contributions to the state's economy, climate, and health.[58] The more than 1.1 million Maryland households using natural gas to date save nearly $806 more than those using heating oil, $1,172 more than those using electricity, and $1,705 more than those using propane. Maryland commercial and industrial establishments that currently consume natural gas also save nearly $12,615 more than businesses using heating oil, $10,730 more than businesses using electricity, and $25,650 more than businesses using propane each year. If natural gas service areas in Maryland are expanded to meet the needs of more customers, RESI found that Maryland could support an average 7,318 jobs each year during the investment phase. After the initial investment phase, savings to Maryland consumers from switching to natural gas would support an average 1,306 jobs each year from 2016 through 2026.

Expansion and conversion of Maryland's natural gas infrastructure would have positive impacts on output and wages as well. During the investment phase, Maryland's output would increase by an average $395.7 million each year and $185.7 million post-conversion each year. Wages would increase from 2016 to 2026, adding an average $349.7 million each year as a result of construction and conversions and an additional $80.2 million as a result of households' and businesses' reduced energy costs. As a result of the infrastructure changes, conversions, and savings, state and local fiscal revenues would increase by an average $19.5 million for each year during investment, with an average annual increase of $5.9 million associated with the energy cost savings to households and establishments. Based on the investment of roughly $326.6 million, RESI concludes that the potential total fiscal benefit over the ten-year period would be in excess of $279.8 million.

[58] As noted on Page 14, extension of pipelines to areas that are remote from existing LDC infrastructure and that have lower population density would likely require some form of large-scale external funding.

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Appendix A—Detailed Methodology

To analyze the potential economic and fiscal impacts associated with natural gas expansion in Maryland, RESI completed a series of calculations to determine inputs to the REMI PI+ input/output model. These calculations are based on assumptions denoted within this appendix and calculations as drawn from the assumptions.

- **Section A.1** will provide the detailed assumptions and calculations associated with the current natural gas infrastructure and savings as reported in Section 4.0 of the report.
- **Section A.2** will address the underlying assumptions and methodology associated with calculating the expansion potential for the economic and fiscal impact analysis reported in Section 4.0.

A.1 Assumptions and Methodology Associated with Current Market Consumption

In Section 4.0, RESI analyzed the current market consumption of natural gas in Maryland. Within this section, RESI estimated the total customers by type, residential or establishment, and the costs/savings associated with consuming natural gas. This appendix reports the assumptions and calculations used within the estimations of Figures 6 through 10.

To estimate the potential costs and savings to households, RESI researched the natural gas consumption in Maryland for the previous year for residential units and commercial and industrial units. In Section 5.0, RESI used industry-level data that the Maryland Natural Gas LDCs provided to estimate the breakdown by establishment type. The following series of assumptions are considered within the costs/savings analysis provided in Section 4.0 regarding use, consumption, and pricing.

- Total residential consumption in Maryland as of 2014: 90,542,308 thousands of cubic feet of natural gas[59]
- Total commercial and industrial consumption in Maryland as of 2014: 89,576,547 thousand cubic feet of natural gas[60]
- Price per MMBTU of natural gas (residential): $12.21[61]
- Average price per MMBTU of natural gas (commercial and industrial): $10.43[62]
- Conversion factor of million BTU per one thousand cubic feet of natural gas: 1.028 million BTUs per thousand cubic feet of natural gas[63]

[59] U.S. Energy Information Administration, "Natural Gas Annual Respondent Query System, Maryland, 2014, All Companies Residential Consumption," accessed November 5, 2015, http://www.eia.gov/cfapps/ngqs/ngqs.cfm?f_report=RP1
[60] Ibid.
[61] U.S. Energy Information Administration, "Natural Gas Annual Prices, Maryland, Residential," accessed November 5, 2015, http://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PRS_DMcf_a.htm
[62] U.S. Energy Information Administration, "Natural Gas Annual Prices, Maryland, Commercial and Industrial," accessed November 5, 2015, http://www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PCS_DMcf_a.htm
[63] U.S. Energy Information Administration, "Energy Unit Calculators Explained," accessed November 2, 2015, http://www.eia.gov/Energyexplained/?page=about_energy_units

To estimate the potential household and establishment costs associated with consumption of natural gas, RESI first converted the units of natural gas into BTUs for comparison against other energy types. A BTU is defined as a British thermal unit, the "amount of heat needed to raise one pound of water by one degree of Fahrenheit."[64] To translate the consumption of natural gas into BTUs, RESI used the following equation:

$$Million\ BTUs\ Consumed_{it} = Amount\ of\ Natural\ Gas\ Consumed\ in\ thousand\ cubic\ feet_{it} * 1.028\ million\ BTUs\ per\ thousand\ cubic\ feet$$

Where in the previous equation:
i represents the type of entity, residential or establishment; and
t represents the time of consumption (in this case, 2014).

Using this equation, RESI estimated that Maryland residential units consumed approximately 93,077,493 million BTUs of energy in 2014. Commercial and industrial establishments consumed 92,084,690 million BTUs of energy in 2014. Both consumption totals are based solely on consumption of natural gas and no other energy consumption during that period. These totals were then multiplied by MMBTU price of natural gas consumed to estimate the total costs to residential and establishment units in Maryland. These results are reported in Figures 8 and 10 in Section 4.0.

Next, RESI estimated the difference in costs associated with consumption by examining other potential energy sources as substitutes for natural gas. RESI compared heating oil, propane, and electricity against natural gas to assess the potential costs and savings for current users. These costs do not include costs of conversion but rather assume that a choice was made for consuming natural gas at some point. Therefore, the consumer bore the cost of hook up and infrastructure at that time. This analysis examines "what if" a Maryland consumer did not consume natural gas and instead consumed a different energy source in 2014. For this analysis, RESI examined the costs differences associated with the consumption of BTUs. Therefore, all units are in MMBTUs.

A.2 Assumptions and Methodology Associated with Forecasted Customers Using Natural Gas

In Section A.1, RESI established a series of assumptions and methods of determining the current market for natural gas consumption in Maryland. This section builds from those estimates to assess two data points: construction and operation service changes.

[64] Dennis Silverman, "Energy Units and Conversions," U.C. Irvine Website, accessed November 1, 2015, http://www.physics.uci.edu/~silverma/units.html.

Under the construction phase, RESI assumed that there is some level of expansion associated with the current natural gas infrastructure. This may include simple expansions from current mains or larger mains within the region. During the construction phase, RESI assumed the following.

- Expansion of current mains will occur in the highest density of potential customer bases.
- Customers that are currently on-main may convert during this period.
- Customers may experience a slight rate increase associated with the cost of expansion.
- The timeline for mains from approval to construction is based on historical expansion data from EIA reports.

To develop a feasible construction period, RESI analyzed the current transmission line documents indicating the current locations of natural gas lines that allow for flow of natural gas within, from, and to Maryland. Figure 21 documents this information and the capacity loads per main.

Figure 21: Current Natural Gas Mains and Capacity Loads, 2014

Main Name	State To	County To	State From	County From	Capacity (mmcfd)
Columbia Trans Gas Corp	WV	Mineral	MD	Allegany	5
Columbia Trans Gas Corp	PA	Lancaster	MD	Cecil	206
Transcontinental Gas P L Co	PA	York	MD	Harford	2050
Transcontinental Gas P L Co	MD	Montgomery	VA	Fairfax	2265
Columbia Gas Trans Corp	MD	Washington	PA	Fulton	57
Columba Gas Trans Corp	MD	Montgomery	VA	Fairfax	1180
Columbia Gas Trans Corp	MD	Garrett	WV	Mineral	4
Cove Point LNF LP	MD	Charles	VA	Fairfax	2233
Cove Point LNF LP	VA	Fairfax	MD	Charles	2233
Dominion Transmission Co	MD	Washington	PA	Franklin	769
Dominion Transmission Co	MD	Montgomery	VA	Loudoun	700
Texas Eastern Trans Corp	PA	Franklin	MD	Washington	300
Washington Gas and Light Co	DC	Washington D.C.	MD	Montgomery	80
Eastern Shore Nat Gas Co	DE	New Castle	MD	Cecil	145
Texas Eastern Trans Corp	MD	Garrett	PA	Fayette	300
Eastern Shore Nat Gas Co	DE	Sussex	MD	Dorchester	22
Eastern Shore Nat Gas Co	PA	Chester	MD	Cecil	145

Sources: EIA, RESI

As noted in Figure 21, there are several existing lines running through Maryland. RESI used this information to assess where potential future types of lines may need to be constructed to meet the new household demand as described in Section 5.3.

A.3 Weighting by Size Category of Business Establishment

Using information provided by the Maryland Natural Gas LDCs on current and potential establishment customers, RESI estimated the following total customer counts as of 2016 and 2026. These commercial and industrial counts are provided in Figure 22.

Figure 22: Commercial and Industrial Natural Gas Customers by County for 2016 and 2026

County	Commercial and Industrial Customers 2016	Commercial and Industrial Customers 2026	Net Difference from 2016-2026
Allegany County	1,490	59	1,549
Anne Arundel	7,142	1,322	8,464
Baltimore City	12,719	246	12,965
Baltimore County	14,195	1,117	15,312
Calvert County	315	273	588
Caroline County	0	12	12
Carroll County	1,581	535	2,116
Cecil County	546	248	794
Charles County	801	384	1,185
Dorchester County	0	14	14
Frederick County	2,944	764	3,708
Garrett County	341	118	459
Harford County	3,050	454	3,504
Howard County	4,080	973	5,053
Kent County	0	13	13
Montgomery County	11,284	3,040	14,324
Prince George's County	11,650	1,500	13,150
Queen Anne's County	0	0	0
St. Mary's County	396	381	777
Somerset County	0	7	7
Talbot County	0	0	0
Washington County	1,947	377	2,324
Wicomico County	0	51	51
Worcester County	0	42	42
Total	**74,481**	**11,929**	**86,410**

Sources: Maryland Natural Gas LDCs, CBP, RESI

As noted in Figure 22, RESI estimated that the total number of establishment customers for natural gas will increase by 11,929 by 2026. To quantify and assess demand loads, RESI weighted the demands based on potential share by each county. To estimate the potential share, RESI examined the current share of establishments by size category. Three size categories were assigned based on the potential number of employees each establishment may have employed. The following list establishes the size categories based on employment.

- **Small** establishments are those with more than one employee but fewer than or equal to 49 employees.

- **Medium** establishments are those with 50 or more employees but fewer than or equal to 499 employees.
- **Large** establishments are those with more than 499 employees.

Using the categories above, RESI redistributed each county's universe of establishments based on County Business Pattern data, which includes both serviced and non-serviced establishments for natural gas. Figure 23 outlines this information for 2015.

Figure 23: Commercial and Industrial Natural Gas Customers by County for 2015

County	Small Establishments (<49 employees)	Medium Establishments (<499 employees)	Large Establishments (>499 employees)
Allegany County	1,533	76	4
Anne Arundel	12,896	831	23
Baltimore City	11,461	766	53
Baltimore County	18,577	1,165	40
Calvert County	1,636	50	2
Caroline County	561	22	2
Carroll County	4,094	157	4
Cecil County	1,709	68	7
Charles County	2,503	117	2
Dorchester County	687	29	1
Frederick County	5,638	307	10
Garrett County	871	33	2
Harford County	5,057	256	6
Howard County	8,252	672	22
Kent County	620	15	1
Montgomery County	25,206	1,464	69
Prince George's County	13,285	968	28
Queen Anne's County	1,310	38	0
St. Mary's County	1,818	108	2
Somerset County	353	13	0
Talbot County	1,406	60	1
Washington County	3,224	192	10
Wicomico County	2,396	131	3
Worcester County	2,059	49	1
Total	**127,152**	**7,587**	**293**

Sources: CBP, RESI

According to Figure 23, approximately 94.2 percent of establishments fall within the range of fewer than 49 employees. Using the share by size of establishments against the total establishment count, RESI applied these percentages to the total consumption of natural gas by county as forecasted by PJM. The share by size was then tabulated against the costs for natural gas costs per MMBTU versus other heating sources. The savings by each compared fuel type are reported in Figure 24.

Figure 24: Commercial and Industrial Natural Gas Savings for All Establishments Weighted by Size Category

County	Small Establishments (<49 employees)	Medium Establishments (<499 employees)	Large Establishments (>499 employees)
Heating Oil vs. Natural Gas	$55,655,321	$229,165,566	$654,756,735
Electricity vs. Natural Gas	$47,337,070	$194,914,455	$556,896,718
Propane vs. Natural Gas	$113,164,514	$465,964,609	$1,331,323,332
Average	**$72,052,302**	**$296,681,543**	**$847,658,928**

Sources: Maryland Natural Gas LDCs, CBP, RESI

As noted in Figure 24, the average savings each year using natural gas for each size category amounted to the following.

- **Small** establishments currently using natural gas save a combined average of $72.1 million each year in energy costs.
- **Medium** establishments currently using natural gas save a combined average of $296.7 million per year in energy costs.
- **Large** establishments currently using natural gas save a combined average of $847.7 million per year in energy costs.

Appendix B—Detailed Economic Impacts

B.1 Detailed Economic Impacts for Construction of Expansion by Year, County, and Type

Figure 25: Economic Impacts from Natural Gas Expansion by County, 2016

County	Jobs	Output	Wages
Allegany County	56	$2,644,862	$2,157,633
Anne Arundel	45	$2,126,469	$1,734,737
Baltimore City	16	$756,265	$616,948
Baltimore County	21	$961,306	$784,217
Calvert County	30	$1,408,389	$1,148,940
Caroline County	64	$2,975,470	$2,427,337
Carroll County	41	$1,934,056	$1,577,769
Cecil County	29	$1,344,472	$1,096,797
Charles County	24	$1,124,067	$916,994
Dorchester County	20	$925,702	$755,172
Frederick County	26	$1,239,779	$1,011,390
Garrett County	0	$0	$0
Harford County	16	$760,398	$620,319
Howard County	15	$714,113	$582,561
Kent County	30	$1,388,553	$1,132,757
Montgomery County	11	$531,105	$433,267
Prince George's County	13	$621,543	$507,044
Queen Anne's County	0	$0	$0
St. Mary's County	19	$910,144	$742,480
Somerset County	4	$198,365	$161,822
Talbot County	0	$0	$0
Washington County	19	$906,810	$739,760
Wicomico County	20	$942,232	$768,657
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 26: Economic Impacts from Natural Gas Expansion by County, 2017

County	Jobs	Output	Wages
Allegany County	96	$5,116,153	$3,954,061
Anne Arundel	77	$4,113,387	$3,179,065
Baltimore City	27	$1,462,900	$1,130,614
Baltimore County	35	$1,859,525	$1,437,149
Calvert County	51	$2,724,352	$2,105,537
Caroline County	108	$5,755,672	$4,448,318
Carroll County	70	$3,741,187	$2,891,407
Cecil County	49	$2,600,711	$2,009,981
Charles County	41	$2,174,365	$1,680,476
Dorchester County	34	$1,790,654	$1,383,921
Frederick County	45	$2,398,197	$1,853,466
Garrett County	0	$0	$0
Harford County	28	$1,470,894	$1,136,792
Howard County	26	$1,381,361	$1,067,596
Kent County	50	$2,685,980	$2,075,882
Montgomery County	19	$1,027,357	$794,001
Prince George's County	23	$1,202,296	$929,204
Queen Anne's County	0	$0	$0
St. Mary's County	33	$1,760,559	$1,360,662
Somerset County	7	$383,711	$296,555
Talbot County	0	$0	$0
Washington County	33	$1,754,110	$1,355,678
Wicomico County	34	$1,822,630	$1,408,634
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 27: Economic Impacts from Natural Gas Expansion by County, 2018

County	Jobs	Output	Wages
Allegany County	105	$5,873,241	$4,694,205
Anne Arundel	85	$4,722,086	$3,774,141
Baltimore City	30	$1,679,380	$1,342,249
Baltimore County	38	$2,134,697	$1,706,163
Calvert County	56	$3,127,501	$2,499,664
Caroline County	119	$6,607,396	$5,280,981
Carroll County	77	$4,294,808	$3,432,638
Cecil County	54	$2,985,564	$2,386,221
Charles County	45	$2,496,127	$1,995,037
Dorchester County	37	$2,055,634	$1,642,972
Frederick County	49	$2,753,082	$2,200,409
Garrett County	0	$0	$0
Harford County	30	$1,688,557	$1,349,584
Howard County	28	$1,585,775	$1,267,435
Kent County	55	$3,083,452	$2,464,458
Montgomery County	21	$1,179,385	$942,627
Prince George's County	25	$1,380,212	$1,103,138
Queen Anne's County	0	$0	$0
St. Mary's County	36	$2,021,086	$1,615,359
Somerset County	8	$440,493	$352,065
Talbot County	0	$0	$0
Washington County	36	$2,013,683	$1,609,442
Wicomico County	38	$2,092,342	$1,672,311
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 28: Economic Impacts from Natural Gas Expansion by County, 2019

County	Jobs	Output	Wages
Allegany County	149	$8,197,415	$6,904,727
Anne Arundel	120	$6,590,722	$5,551,400
Baltimore City	43	$2,343,948	$1,974,320
Baltimore County	54	$2,979,445	$2,509,603
Calvert County	79	$4,365,123	$3,676,767
Caroline County	168	$9,222,092	$7,767,818
Carroll County	109	$5,994,360	$5,049,081
Cecil County	76	$4,167,019	$3,509,903
Charles County	63	$3,483,901	$2,934,509
Dorchester County	52	$2,869,095	$2,416,654
Frederick County	70	$3,842,538	$3,236,591
Garrett County	0	$0	$0
Harford County	43	$2,356,757	$1,985,109
Howard County	40	$2,213,302	$1,864,276
Kent County	78	$4,303,643	$3,624,982
Montgomery County	30	$1,646,094	$1,386,514
Prince George's County	35	$1,926,393	$1,622,611
Queen Anne's County	0	$0	$0
St. Mary's County	51	$2,820,875	$2,376,038
Somerset County	11	$614,806	$517,855
Talbot County	0	$0	$0
Washington County	51	$2,810,542	$2,367,335
Wicomico County	53	$2,920,329	$2,459,809
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 29: Economic Impacts from Natural Gas Expansion by County, 2020

County	Jobs	Output	Wages
Allegany County	227	$12,272,148	$10,912,109
Anne Arundel	182	$9,866,807	$8,773,336
Baltimore City	65	$3,509,067	$3,120,181
Baltimore County	82	$4,460,454	$3,966,132
Calvert County	121	$6,534,919	$5,810,698
Caroline County	255	$13,806,167	$12,276,123
Carroll County	166	$8,974,008	$7,979,480
Cecil County	115	$6,238,342	$5,546,989
Charles County	96	$5,215,663	$4,637,646
Dorchester County	79	$4,295,252	$3,819,238
Frederick County	106	$5,752,570	$5,115,051
Garrett County	0	$0	$0
Harford County	65	$3,528,243	$3,137,231
Howard County	61	$3,313,480	$2,946,269
Kent County	119	$6,442,878	$5,728,857
Montgomery County	46	$2,464,327	$2,191,222
Prince George's County	53	$2,883,955	$2,564,346
Queen Anne's County	0	$0	$0
St. Mary's County	78	$4,223,063	$3,755,049
Somerset County	17	$920,411	$818,408
Talbot County	0	$0	$0
Washington County	78	$4,207,594	$3,741,295
Wicomico County	81	$4,371,953	$3,887,439
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 30: Economic Impacts from Natural Gas Expansion by County, 2021

County	Jobs	Output	Wages
Allegany County	348	$18,704,108	$17,428,374
Anne Arundel	280	$15,038,103	$14,012,413
Baltimore City	100	$5,348,206	$4,983,426
Baltimore County	127	$6,798,224	$6,334,544
Calvert County	185	$9,959,938	$9,280,609
Caroline County	392	$21,042,122	$19,606,921
Carroll County	255	$13,677,379	$12,744,498
Cecil County	177	$9,507,922	$8,859,423
Charles County	148	$7,949,246	$7,407,059
Dorchester County	122	$6,546,438	$6,099,931
Frederick County	163	$8,767,551	$8,169,550
Garrett County	0	$0	$0
Harford County	100	$5,377,431	$5,010,658
Howard County	94	$5,050,109	$4,705,661
Kent County	183	$9,819,657	$9,149,896
Montgomery County	70	$3,755,906	$3,499,730
Prince George's County	82	$4,395,465	$4,095,668
Queen Anne's County	0	$0	$0
St. Mary's County	120	$6,436,414	$5,997,411
Somerset County	26	$1,402,808	$1,307,128
Talbot County	0	$0	$0
Washington County	119	$6,412,837	$5,975,442
Wicomico County	124	$6,663,338	$6,208,858
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 31: Economic Impacts from Natural Gas Expansion by County, 2022

County	Jobs	Output	Wages
Allegany County	537	$28,784,325	$27,986,330
Anne Arundel	432	$23,142,597	$22,501,010
Baltimore City	154	$8,230,518	$8,002,341
Baltimore County	195	$10,461,995	$10,171,955
Calvert County	286	$15,327,653	$14,902,721
Caroline County	604	$32,382,366	$31,484,622
Carroll County	393	$21,048,538	$20,465,004
Cecil County	273	$14,632,032	$14,226,385
Charles County	228	$12,233,338	$11,894,190
Dorchester County	188	$10,074,514	$9,795,216
Frederick County	252	$13,492,652	$13,118,592
Garrett County	0	$0	$0
Harford County	154	$8,275,493	$8,046,070
Howard County	145	$7,771,768	$7,556,309
Kent County	282	$15,111,771	$14,692,823
Montgomery County	108	$5,780,078	$5,619,836
Prince George's County	126	$6,764,316	$6,576,788
Queen Anne's County	0	$0	$0
St. Mary's County	185	$9,905,194	$9,630,590
Somerset County	40	$2,158,824	$2,098,975
Talbot County	0	$0	$0
Washington County	184	$9,868,911	$9,595,313
Wicomico County	191	$10,254,416	$9,970,130
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 32: Economic Impacts from Natural Gas Expansion by County, 2023

County	Jobs	Output	Wages
Allegany County	829	$44,559,250	$40,798,927
Anne Arundel	667	$35,825,637	$32,802,337
Baltimore City	237	$12,741,160	$11,665,943
Baltimore County	301	$16,195,573	$14,828,841
Calvert County	442	$23,727,800	$21,725,429
Caroline County	933	$50,129,156	$45,898,793
Carroll County	606	$32,583,951	$29,834,215
Cecil County	422	$22,650,952	$20,739,455
Charles County	352	$18,937,681	$17,339,544
Dorchester County	290	$15,595,737	$14,279,624
Frederick County	389	$20,887,148	$19,124,497
Garrett County	0	$0	$0
Harford County	238	$12,810,784	$11,729,691
Howard County	224	$12,030,997	$11,015,710
Kent County	435	$23,393,606	$21,419,437
Montgomery County	167	$8,947,785	$8,192,688
Prince George's County	195	$10,471,424	$9,587,748
Queen Anne's County	0	$0	$0
St. Mary's County	285	$15,333,624	$14,039,631
Somerset County	62	$3,341,944	$3,059,920
Talbot County	0	$0	$0
Washington County	284	$15,277,457	$13,988,204
Wicomico County	295	$15,874,233	$14,534,618
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 33: Economic Impacts from Natural Gas Expansion by County, 2024

County	Jobs	Output	Wages
Allegany County	1,285	$69,233,297	$62,384,359
Anne Arundel	1,033	$55,663,571	$50,157,025
Baltimore City	368	$19,796,396	$17,838,028
Baltimore County	467	$25,163,641	$22,674,315
Calvert County	684	$36,866,731	$33,219,671
Caroline County	1,446	$77,887,459	$70,182,404
Carroll County	940	$50,626,849	$45,618,563
Cecil County	653	$35,193,593	$31,712,049
Charles County	546	$29,424,151	$26,513,353
Dorchester County	450	$24,231,654	$21,834,526
Frederick County	602	$32,453,108	$29,242,668
Garrett County	0	$0	$0
Harford County	370	$19,904,573	$17,935,503
Howard County	347	$18,692,990	$16,843,777
Kent County	675	$36,347,481	$32,751,789
Montgomery County	258	$13,902,493	$12,527,182
Prince George's County	302	$16,269,825	$14,660,324
Queen Anne's County	0	$0	$0
St. Mary's County	442	$23,824,399	$21,467,559
Somerset County	96	$5,192,497	$4,678,827
Talbot County	0	$0	$0
Washington County	441	$23,737,130	$21,388,923
Wicomico County	458	$24,664,362	$22,224,428
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 34: Economic Impacts from Natural Gas Expansion by County, 2025

County	Jobs	Output	Wages
Allegany County	1,995	$107,825,099	$95,108,361
Anne Arundel	1,604	$86,691,380	$76,467,122
Baltimore City	570	$30,831,239	$27,195,047
Baltimore County	725	$39,190,276	$34,568,231
Calvert County	1,062	$57,416,865	$50,645,202
Caroline County	2,244	$121,303,236	$106,996,906
Carroll County	1,459	$78,847,104	$69,547,989
Cecil County	1,014	$54,811,092	$48,346,750
Charles County	848	$45,825,667	$40,421,054
Dorchester County	698	$37,738,785	$33,287,926
Frederick County	935	$50,543,015	$44,582,044
Garrett County	0	$0	$0
Harford County	573	$30,999,716	$27,343,654
Howard County	539	$29,112,777	$25,679,258
Kent County	1,047	$56,608,177	$49,931,890
Montgomery County	401	$21,651,976	$19,098,373
Prince George's County	469	$25,338,898	$22,350,465
Queen Anne's County	0	$0	$0
St. Mary's County	686	$37,104,519	$32,728,465
Somerset County	150	$8,086,882	$7,133,127
Talbot County	0	$0	$0
Washington County	684	$36,968,605	$32,608,581
Wicomico County	711	$38,412,692	$33,882,354
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 35: Economic Impacts from Natural Gas Expansion by County, 2026

County	Jobs	Output	Wages
Allegany County	3,093	$168,377,467	$144,357,196
Anne Arundel	2,487	$135,375,484	$116,063,185
Baltimore City	884	$48,145,432	$41,277,136
Baltimore County	1,124	$61,198,733	$52,468,288
Calvert County	1,647	$89,661,001	$76,870,207
Caroline County	3,479	$189,424,651	$162,401,845
Carroll County	2,262	$123,126,023	$105,561,199
Cecil County	1,572	$85,591,879	$73,381,575
Charles County	1,314	$71,560,424	$61,351,808
Dorchester County	1,082	$58,932,114	$50,525,019
Frederick County	1,450	$78,926,938	$67,667,436
Garrett County	0	$0	$0
Harford County	889	$48,408,522	$41,502,694
Howard County	835	$45,461,916	$38,976,443
Kent County	1,624	$88,398,170	$75,787,528
Montgomery County	621	$33,811,282	$28,987,856
Prince George's County	727	$39,568,705	$33,923,941
Queen Anne's County	0	$0	$0
St. Mary's County	1,064	$57,941,658	$49,675,859
Somerset County	232	$12,628,310	$10,826,790
Talbot County	0	$0	$0
Washington County	1,060	$57,729,417	$49,493,896
Wicomico County	1,102	$59,984,473	$51,427,251
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

B.2 Detailed Economic Impacts after Expansion by Year, County, and Type

Figure 36: Economic Impacts from Natural Gas Expansion by County, 2016

County	Jobs	Output	Wages
Allegany County	47	$5,434,653	$2,174,576
Anne Arundel	37	$4,369,461	$1,748,359
Baltimore City	13	$1,553,971	$621,793
Baltimore County	17	$1,975,287	$790,375
Calvert County	25	$2,893,953	$1,157,962
Caroline County	52	$6,113,985	$2,446,398
Carroll County	34	$3,974,090	$1,590,159
Cecil County	24	$2,762,615	$1,105,410
Charles County	20	$2,309,728	$924,195
Dorchester County	16	$1,902,129	$761,102
Frederick County	22	$2,547,494	$1,019,333
Garrett County	0	$0	$0
Harford County	13	$1,562,463	$625,191
Howard County	13	$1,467,356	$587,136
Kent County	24	$2,853,193	$1,141,653
Montgomery County	9	$1,091,313	$436,669
Prince George's County	11	$1,277,144	$511,025
Queen Anne's County	0	$0	$0
St. Mary's County	16	$1,870,160	$748,310
Somerset County	3	$407,599	$163,093
Talbot County	0	$0	$0
Washington County	16	$1,863,310	$745,569
Wicomico County	17	$1,936,095	$774,693
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 37: Economic Impacts from Natural Gas Expansion by County, 2017

County	Jobs	Output	Wages
Allegany County	64	$7,661,815	$3,136,967
Anne Arundel	51	$6,160,099	$2,522,121
Baltimore City	18	$2,190,800	$896,976
Baltimore County	23	$2,784,775	$1,140,167
Calvert County	34	$4,079,916	$1,670,435
Caroline County	72	$8,619,541	$3,529,088
Carroll County	47	$5,602,702	$2,293,907
Cecil County	32	$3,894,756	$1,594,625
Charles County	27	$3,256,271	$1,333,211
Dorchester County	22	$2,681,635	$1,097,938
Frederick County	30	$3,591,476	$1,470,453
Garrett County	0	$0	$0
Harford County	18	$2,202,772	$901,878
Howard County	17	$2,068,690	$846,981
Kent County	34	$4,022,453	$1,646,908
Montgomery County	13	$1,538,542	$629,923
Prince George's County	15	$1,800,526	$737,187
Queen Anne's County	0	$0	$0
St. Mary's County	22	$2,636,566	$1,079,486
Somerset County	5	$574,636	$235,273
Talbot County	0	$0	$0
Washington County	22	$2,626,908	$1,075,532
Wicomico County	23	$2,729,521	$1,117,544
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 38: Economic Impacts from Natural Gas Expansion by County, 2018

County	Jobs	Output	Wages
Allegany County	82	$10,019,886	$4,182,883
Anne Arundel	66	$8,055,988	$3,363,038
Baltimore City	23	$2,865,061	$1,196,043
Baltimore County	30	$3,641,843	$1,520,317
Calvert County	44	$5,335,589	$2,227,385
Caroline County	92	$11,272,372	$4,705,743
Carroll County	60	$7,327,042	$3,058,733
Cecil County	42	$5,093,442	$2,126,299
Charles County	35	$4,258,452	$1,777,725
Dorchester County	29	$3,506,960	$1,464,009
Frederick County	38	$4,696,822	$1,960,726
Garrett County	0	$0	$0
Harford County	24	$2,880,717	$1,202,579
Howard County	22	$2,705,369	$1,129,378
Kent County	43	$5,260,440	$2,196,013
Montgomery County	16	$2,012,058	$839,950
Prince George's County	19	$2,354,673	$982,977
Queen Anne's County	0	$0	$0
St. Mary's County	28	$3,448,020	$1,439,404
Somerset County	6	$751,491	$313,716
Talbot County	0	$0	$0
Washington County	28	$3,435,390	$1,434,131
Wicomico County	29	$3,569,584	$1,490,152
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 39: Economic Impacts from Natural Gas Expansion by County, 2019

County	Jobs	Output	Wages
Allegany County	98	$12,415,593	$5,233,738
Anne Arundel	79	$9,982,136	$4,207,926
Baltimore City	28	$3,550,083	$1,496,522
Baltimore County	36	$4,512,590	$1,902,263
Calvert County	52	$6,611,303	$2,786,966
Caroline County	111	$13,967,542	$5,887,955
Carroll County	72	$9,078,902	$3,827,171
Cecil County	50	$6,311,260	$2,660,484
Charles County	42	$5,276,627	$2,224,339
Dorchester County	34	$4,345,457	$1,831,808
Frederick County	46	$5,819,809	$2,453,315
Garrett County	0	$0	$0
Harford County	28	$3,569,483	$1,504,700
Howard County	27	$3,352,210	$1,413,109
Kent County	52	$6,518,186	$2,747,713
Montgomery County	20	$2,493,131	$1,050,968
Prince George's County	23	$2,917,664	$1,229,928
Queen Anne's County	0	$0	$0
St. Mary's County	34	$4,272,424	$1,801,022
Somerset County	7	$931,169	$392,530
Talbot County	0	$0	$0
Washington County	34	$4,256,775	$1,794,425
Wicomico County	35	$4,423,055	$1,864,519
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 40: Economic Impacts from Natural Gas Expansion by County, 2020

County	Jobs	Output	Wages
Allegany County	114	$14,972,824	$6,365,259
Anne Arundel	92	$12,038,151	$5,117,668
Baltimore City	33	$4,281,292	$1,820,066
Baltimore County	42	$5,442,046	$2,313,527
Calvert County	61	$7,973,029	$3,389,500
Caroline County	129	$16,844,427	$7,160,916
Carroll County	84	$10,948,878	$4,654,596
Cecil County	58	$7,611,186	$3,235,673
Charles County	49	$6,363,450	$2,705,235
Dorchester County	40	$5,240,488	$2,227,841
Frederick County	54	$7,018,511	$2,983,715
Garrett County	0	$0	$0
Harford County	33	$4,304,687	$1,830,012
Howard County	31	$4,042,663	$1,718,620
Kent County	60	$7,860,733	$3,341,761
Montgomery County	23	$3,006,640	$1,278,185
Prince George's County	27	$3,518,614	$1,495,836
Queen Anne's County	0	$0	$0
St. Mary's County	39	$5,152,413	$2,190,398
Somerset County	9	$1,122,962	$477,394
Talbot County	0	$0	$0
Washington County	39	$5,133,540	$2,182,374
Wicomico County	41	$5,334,069	$2,267,623
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 41: Economic Impacts from Natural Gas Expansion by County, 2021

County	Jobs	Output	Wages
Allegany County	133	$17,963,931	$7,682,420
Anne Arundel	107	$14,443,000	$6,176,665
Baltimore City	38	$5,136,562	$2,196,692
Baltimore County	48	$6,529,198	$2,792,264
Calvert County	71	$9,565,793	$4,090,888
Caroline County	149	$20,209,422	$8,642,722
Carroll County	97	$13,136,124	$5,617,769
Cecil County	68	$9,131,665	$3,905,230
Charles County	56	$7,634,671	$3,265,028
Dorchester County	46	$6,287,376	$2,688,847
Frederick County	62	$8,420,593	$3,601,134
Garrett County	0	$0	$0
Harford County	38	$5,164,630	$2,208,696
Howard County	36	$4,850,261	$2,074,253
Kent County	70	$9,431,064	$4,033,270
Montgomery County	27	$3,607,273	$1,542,679
Prince George's County	31	$4,221,524	$1,805,369
Queen Anne's County	0	$0	$0
St. Mary's County	46	$6,181,706	$2,643,656
Somerset County	10	$1,347,295	$576,181
Talbot County	0	$0	$0
Washington County	46	$6,159,062	$2,633,972
Wicomico County	47	$6,399,650	$2,736,862
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 42: Economic Impacts from Natural Gas Expansion by County, 2022

County	Jobs	Output	Wages
Allegany County	153	$21,417,383	$9,205,826
Anne Arundel	123	$17,219,576	$7,401,484
Baltimore City	44	$6,124,033	$2,632,291
Baltimore County	56	$7,784,395	$3,345,964
Calvert County	81	$11,404,756	$4,902,102
Caroline County	172	$24,094,556	$10,356,554
Carroll County	112	$15,661,461	$6,731,760
Cecil County	78	$10,887,170	$4,679,628
Charles County	65	$9,102,388	$3,912,476
Dorchester County	54	$7,496,084	$3,222,039
Frederick County	72	$10,039,398	$4,315,231
Garrett County	0	$0	$0
Harford County	44	$6,157,498	$2,646,675
Howard County	41	$5,782,693	$2,485,573
Kent County	80	$11,244,126	$4,833,058
Montgomery County	31	$4,300,749	$1,848,589
Prince George's County	36	$5,033,085	$2,163,369
Queen Anne's County	0	$0	$0
St. Mary's County	53	$7,370,099	$3,167,887
Somerset County	11	$1,606,304	$690,437
Talbot County	0	$0	$0
Washington County	52	$7,343,103	$3,156,283
Wicomico County	55	$7,629,943	$3,279,575
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 43: Economic Impacts from Natural Gas Expansion by County, 2023

County	Jobs	Output	Wages
Allegany County	176	$25,484,891	$11,016,142
Anne Arundel	142	$20,489,852	$8,856,978
Baltimore City	50	$7,287,086	$3,149,928
Baltimore County	64	$9,262,778	$4,003,944
Calvert County	94	$13,570,704	$5,866,095
Caroline County	198	$28,670,502	$12,393,159
Carroll County	129	$18,635,826	$8,055,554
Cecil County	90	$12,954,819	$5,599,872
Charles County	75	$10,831,078	$4,681,860
Dorchester County	62	$8,919,712	$3,855,650
Frederick County	83	$11,946,042	$5,163,816
Garrett County	0	$0	$0
Harford County	51	$7,326,906	$3,167,141
Howard County	48	$6,880,920	$2,974,358
Kent County	92	$13,379,568	$5,783,474
Montgomery County	35	$5,117,530	$2,212,112
Prince George's County	41	$5,988,949	$2,588,793
Queen Anne's County	0	$0	$0
St. Mary's County	61	$8,769,801	$3,790,849
Somerset County	13	$1,911,367	$826,211
Talbot County	0	$0	$0
Washington County	60	$8,737,677	$3,776,963
Wicomico County	63	$9,078,992	$3,924,500
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 44: Economic Impacts from Natural Gas Expansion by County, 2024

County	Jobs	Output	Wages
Allegany County	204	$30,430,029	$13,270,668
Anne Arundel	164	$24,465,743	$10,669,617
Baltimore City	58	$8,701,086	$3,794,582
Baltimore County	74	$11,060,145	$4,823,377
Calvert County	109	$16,203,990	$7,066,631
Caroline County	230	$34,233,782	$14,929,502
Carroll County	149	$22,251,958	$9,704,176
Cecil County	104	$15,468,598	$6,745,923
Charles County	87	$12,932,762	$5,640,034
Dorchester County	72	$10,650,510	$4,644,734
Frederick County	96	$14,264,076	$6,220,626
Garrett County	0	$0	$0
Harford County	59	$8,748,633	$3,815,317
Howard County	55	$8,216,108	$3,583,080
Kent County	107	$15,975,765	$6,967,101
Montgomery County	41	$6,110,546	$2,664,836
Prince George's County	48	$7,151,057	$3,118,607
Queen Anne's County	0	$0	$0
St. Mary's County	70	$10,471,510	$4,566,671
Somerset County	15	$2,282,252	$995,300
Talbot County	0	$0	$0
Washington County	70	$10,433,153	$4,549,943
Wicomico County	73	$10,840,698	$4,727,676
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 45: Economic Impacts from Natural Gas Expansion by County, 2025

County	Jobs	Output	Wages
Allegany County	241	$36,682,512	$16,197,750
Anne Arundel	194	$29,492,740	$13,022,991
Baltimore City	69	$10,488,906	$4,631,544
Baltimore County	87	$13,332,682	$5,887,259
Calvert County	128	$19,533,438	$8,625,302
Caroline County	271	$41,267,826	$18,222,469
Carroll County	176	$26,824,087	$11,844,605
Cecil County	122	$18,646,944	$8,233,856
Charles County	102	$15,590,068	$6,884,044
Dorchester County	84	$12,838,879	$5,669,212
Frederick County	113	$17,194,928	$7,592,695
Garrett County	0	$0	$0
Harford County	69	$10,546,222	$4,656,853
Howard County	65	$9,904,278	$4,373,392
Kent County	126	$19,258,319	$8,503,819
Montgomery County	48	$7,366,085	$3,252,613
Prince George's County	57	$8,620,390	$3,806,471
Queen Anne's County	0	$0	$0
St. Mary's County	83	$12,623,100	$5,573,932
Somerset County	18	$2,751,188	$1,214,831
Talbot County	0	$0	$0
Washington County	83	$12,576,861	$5,553,514
Wicomico County	86	$13,068,145	$5,770,448
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

Figure 46: Economic Impacts from Natural Gas Expansion by County, 2026

County	Jobs	Output	Wages
Allegany County	244	$38,790,854	$17,099,755
Anne Arundel	196	$31,187,846	$13,748,203
Baltimore City	70	$11,091,760	$4,889,461
Baltimore County	89	$14,098,983	$6,215,103
Calvert County	130	$20,656,130	$9,105,620
Caroline County	274	$43,639,710	$19,237,225
Carroll County	178	$28,365,812	$12,504,196
Cecil County	124	$19,718,684	$8,692,376
Charles County	104	$16,486,113	$7,267,396
Dorchester County	85	$13,576,799	$5,984,914
Frederick County	114	$18,183,213	$8,015,510
Garrett County	0	$0	$0
Harford County	70	$11,152,370	$4,916,180
Howard County	66	$10,473,530	$4,616,934
Kent County	128	$20,365,198	$8,977,372
Montgomery County	49	$7,789,454	$3,433,741
Prince George's County	57	$9,115,851	$4,018,443
Queen Anne's County	0	$0	$0
St. Mary's County	84	$13,348,617	$5,884,328
Somerset County	18	$2,909,314	$1,282,482
Talbot County	0	$0	$0
Washington County	84	$13,299,721	$5,862,773
Wicomico County	87	$13,819,242	$6,091,788
Worcester County	0	$0	$0

Sources: REMI PI+, RESI

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