Economic Impacts of the Atlantic Sunrise Pipeline Project

Project Report

January 9, 2015

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Acknowledgement: This report is an account of work sponsored by the Williams Corporation. The study's authors acknowledge that Williams provided financial support for the analysis contained herein.

1. Introduction

1.1 Project Overview and Summary of Results

This report presents interim results of an economic-impacts analysis conducted for the Atlantic Sunrise (ASR) pipeline project under consideration by Williams. The ASR project would expand the existing Transco pipeline system to expand gas deliverability from producing areas in the Pennsylvania Marcellus Shale formation to points south along the eastern seaboard. Bi-directional flow (south-north or north-south, depending on economic conditions) would also be possible with the new pipeline construction. In Pennsylvania the ASR project would add nearly 180 miles of new greenfield pipeline (the Central Penn Line North and Central Penn Line South); 12 miles of looping pipeline (Chapman Loop and Unity Loop); new compressor stations (Compressor Stations 605 and 610); as well as three new meter stations. A map of the ASR project is shown in Figure 1.

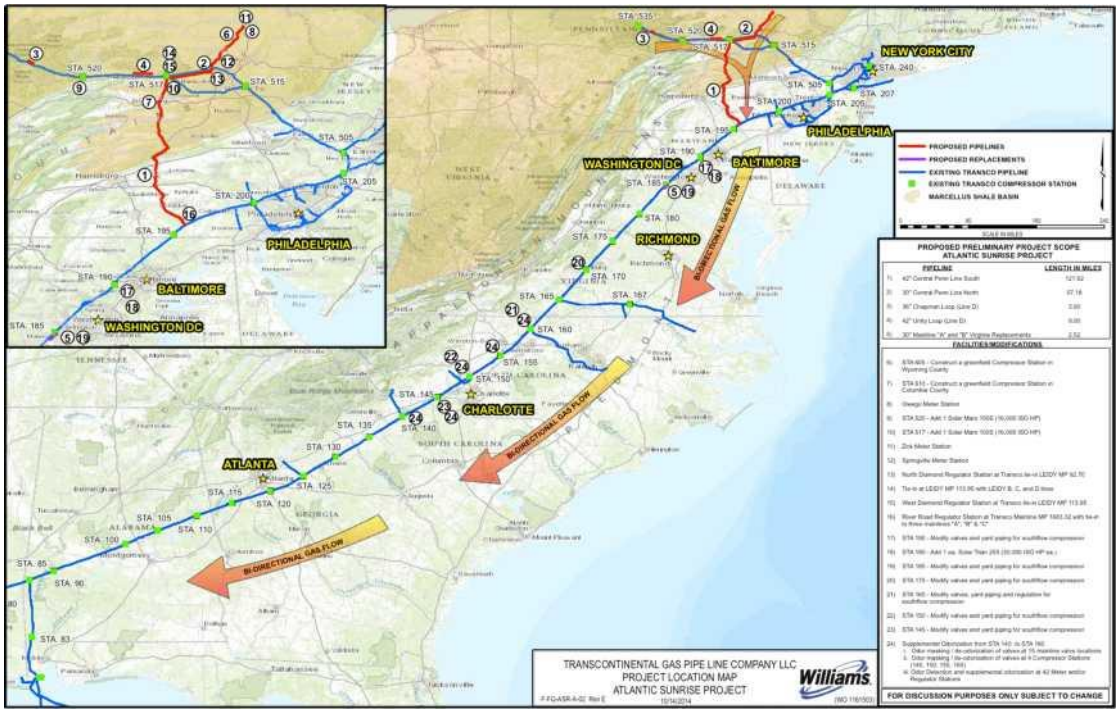

Figure 1. Map of the proposed ASR pipeline expansion. Source: http://atlanticsun.wpengine.com. New pipeline infrastructure is shown in red.

The economic impacts analysis utilizes input-output modeling and data provided by Williams to estimate the value added to regional economies within the Transco construction area that could be attributed to pipeline construction and operation activities; and the workforce impacts associated with the project's construction and operation. The current report focuses on the workforce and value-added impacts of the construction and operation phases of the project. The information contained in this report considers economic impacts related to the four pipeline facilities located

in Pennsylvania (Central Penn Line North, Central Penn Line South, Chapman Loop and Unity Loop), associated new aboveground facilities located in Pennsylvania (Compressor Station 605, Compressor Station 610, new metering and regulating stations) as well as anticipated pipeline replacement work in Virginia. It does not include the work at existing compressor stations in Pennsylvania, or related facility additions or modifications in other states.

Table 1: Overview of County- Level Economic Impacts

	Direct Construction Employment (Jobs During Construction)	Direct In-County Jobs During Construction	Total In-County Workforce Impact (FTEs)	Total Value Added Impact ($MM)	Gross Output ($MM)	Employment Multiplier (FTE/$MM Gross Output)	Labor Income ($MM)
Clinton, PA	183	46	44	$3.0	$7.1	6.20	$2.3
Columbia, PA	472	118	1,012	$85.5	$168.7	6.00	$62.4
Lancaster, PA	241	60	837	$75.5	$132.0	6.35	$54.1
Lebanon, PA	180	45	425	$29.6	$52.2	8.14	$18.6
Luzerne, PA	216	54	483	$41.2	$74.9	6.44	$27.7
Lycoming, PA	155	39	220	$18.1	$35.2	6.24	$13.6
Northumberland, PA	180	45	168	$11.9	$26.3	6.40	$8.5
Schuylkill, PA	180	45	336	$29.5	$70.7	4.75	$20.8
Susquehanna, PA	277	69	230	$18.2	$41.6	5.55	$13.3
Wyoming, PA	293	73	388	$34.6	$66.8	5.82	$23.8
Other PA Counties		1,779	3,978	$511.9	$999.8	3.98	
Pennsylvania	2,373	2,373	8,122	$859.16	$1,675.26	4.85	$245.28
Appomattox, VA			15		$1.6	9.82	$0.5
Prince William, VA			133	$10.6	$17.4	7.60	$29.2
Virginia Total			148	$11.41	$19.01	7.78	$29.72
Project Total			***8,270***	***$870.58 $1,694.28***		***4.88***	***$275.00***

Focusing on the construction phase of the project, our initial estimates of economic impacts during the construction phase are summarized in Table 1, while the industrial sectors most impacted by the ASR project (in those counties where ASR project construction is planned to occurs) are summarized in Table 2. Direct employment by Williams will involve more than 2,300 full-time positions during the construction phase (which will last between three and eleven months, depending on the construction segment) and more than $2.5 billion of direct investment. We estimate that this direct investment by Williams will help to support approximately 6,000 full-time equivalent positions in supporting and ancillary industries (so-called indirect and induced workforce impacts) and generate over $870 million of value-added. A full-time equivalent (FTE) in our analysis is defined as one person's labor for one calendar year, so the direct, indirect and induced workforce impacts have been discounted to account for the varying construction periods when expressed in FTEs. We estimate that the majority of these impacts would be enjoyed by Pennsylvania counties. These impacts reach beyond the counties where construction will actually take place, since a number of workers and firms engaged in pipeline construction in a given county will originate from outside that county. The employment multipliers that we estimate, which measure the workforce impacts per million dollars of gross economic output from firms involved (directly

or indirectly) in the ASR construction range mostly from 5 to 6.4, with one county (Lebanon, Pennsylvania) having a larger estimated multiplier of 8.14 and one county (Schuylkill, Pennsylvania) having a smaller multiplier of 4.75. These multipliers are consistent with those found for other studies of oil and gas extraction (Walker and Sonora, 2005; Baumann, et al., 2002; Snead, et al., 2002; Perryman, 2009; Considine, et al., 2011).

Table 2: Sectors with the Highest Economic Impacts Across Counties Hosting ASR Construction Activities

Sector Description	Value Added ($MM)	Gross Output ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$56.47	$170.21	261
Architectural, engineering, and related services	$17.25	$34.71	330
Real estate establishments	$17.06	$21.32	125
Imputed rental activity for owner-occupied dwellings	$14.38	$19.56	0
Retail Stores Q Building material and garden supply	$14.38	$20.52	267
Commercial and industrial machinery and equipment rental and leasing	$7.15	$12.36	45
Monetary authorities and depository credit intermediation activities	$6.07	$8.87	30
Retail Stores Q Gasoline stations	$5.80	$8.21	132
Employment and payroll	$5.78	$5.89	90
Legal services	$5.52	$7.13	53
Total	$149.85	$308.78	2,757

Economic activity generated by the construction phase of the ASR project will lead to increased tax collections. We report estimates of these tax implications at the state and federal level. The total construction-phase tax implications across all counties are summarized in Table 3 and amount to nearly $50 million in collections at the state and federal levels across all county locations hosting construction activity for the ASR project.

Operations and maintenance activities along the ASR line will require a more permanent workforce not represented in the construction-phase impacts in Table 1. Based on data provided by Williams, this permanent workforce would amount to 15 FTEs annually, split roughly evenly between two counties where compressor stations are located (Columbia and Wyoming, Pennsylvania). This permanent workforce would supplement the existing operations and maintenance workforce for other sections of the Transco system (where workforce requirements are not expected to change). We estimate that the total long-term economic impacts of the

ASR project will amount to supporting 29 FTEs per year and generating nearly $1.9 million per year in value-added, for as long as the ASR project continues to operate, as shown in Table 4.

Table 3: Summary of Estimated Tax Implications

	Total Federal Taxes	Total State Taxes
Clinton, PA	$260,599	$156,238
Columbia, PA	$7,316,500	$4,082,704
Lancaster, PA	$6,615,625	$3,673,554
Lebanon, PA	$2,269,577	$1,445,596
Luzerne, PA	$3,597,529	$2,158,610
Lycoming, PA	$1,628,171	$882,807
Northumberland, PA	$1,026,382	$627,324
Schuylkill, PA	$2,489,908	$1,535,525
Susquehanna, PA	$2,073,673	$1,095,388
Wyoming, PA	$2,099,429	$1,290,000
Pennsylvania Total	$29,377,393	$16,947,746
Appomattox, VA	$134,068	$107,473
Prince William, VA	$1,897,426	$1,002,760
Virginia Total	$2,031,494	$1,110,233
Project Total	$31,408,887	$18,057,979

Table 4. Overview of Annual County- Level Economic Impacts from Operations and Maintenance Activities

	Total Workforce Impact (FTEs, in person-years)	Total Value-Added Impact ($MM)	Gross Output ($MM)	Employment Multiplier (FTE/$MM Gross Output)
Columbia, PA	15	$1.02	$1.19	12.48
Wyoming, PA	14	$0.87	$0.77	18.06
Project Total	29	1.88	1.96	14.69

The remainder of this interim report is organized as follows. Section 2 discusses the economic input-output modeling approach and the tools used in this analysis. Section 3 presents county-level results from the economic input-output model, broken down into the construction and operations phases of the ASR project. Section 4 describes the results of some sensitivity analysis on key assumptions within the economic input-output model. Section 5 concludes the analysis to date.

2. Economic Input-Output Modeling

Capital investments for energy infrastructure development can have significant impacts on local economies where construction occurs. Infrastructure projects require materials, transportation, excavation, land negotiations and regulatory compliance activities. These activities generate additional business for other sectors of the economy. For example, leasing requires real estate and legal services. Construction crews purchase supplies and fuel, stay at hotels, and dine at local restaurants. Construction of pipelines requires steel, aggregates, and the services of engineering construction firms. Collectively, these transactions generate re-circulation of spending throughout the economy as well as benefits to the public sector through increased tax revenues. Businesses that experience larger sales volume will hire more workers, potentially increasing overall employment (and additional spending throughout the economy).

Economists have long recognized that capital investments and the development of new industries can have broader economic benefits. A large number of studies have been conducted on these types of economic impacts arising from the construction of sports stadiums, hospitals, highways, wind turbines, and other capital investments. Nearly all of these studies have been conducted using input- output (IO) models of the economy. Input-output analysis accounts for the business- to-business transactions that facilitate the recirculation of money among firms, households, and the public sector. These models provide a snapshot of the structure of the economy at a point in time and allow for the quantification of how investment dollars re-circulate.

Expenditures at all stages of production generate indirect economic impacts as the initial stimulus *(direct impacts or direct expenditures)* is spent and re-spent in other business sectors of the economy. For example, in developing rights-of-way pipeline companies employ the services of land management companies that in turn purchase goods and services from other businesses. These impacts are known as *indirect' economic' impacts.* The wages earned by these employees increase household incomes, which then stimulates spending on local goods and services. These impacts associated with household spending are called *induced impacts.* The total economic impacts are the sum of the direct, indirect, and induced spending, set off from the pipeline construction expenditures. These economic impacts are estimated by comparing gross output, value added, tax revenues, and employment in the local economy with and without the pipeline project.

Regional economic impact analysis using input-output (IO) tables and related IO models provide a means for estimating these economic impacts. Input-output analysis provides a quantitative model of the inter-industry transactions between various sectors of the economy and, in so doing, provides a means for estimating how spending in one sector affects other sectors of the economy. This study uses county-level IO tables available from Minnesota IMPLAN Group, Inc. based upon data from the Bureau of Economic Analysis in the US Department of Commerce.[I] We use these tables to estimate the economic impacts from the ASR construction phase.

[I] http://www.implan.com/index.html

The final version of our report will also identify the specific economic sectors most affected by direct expenditures on pipeline construction and operation within each county.

Our detailed results presented in Section 3 use several measures of impact, each defined as follows:

- *Employment impacts* describe the size of the workforce, in FTEs, required to support ASR construction, operations and maintenance. The units for employment impacts should be viewed as FTEs for the duration of the construction phase.
- *Labor income impacts* describe the wages paid to the supporting workforce. These can be interpreted as the wages earned by supporting workers during the construction phase of the project.
- *Output* measures the gross output (i.e., gross sales) by firms in sectors affected, directly or indirectly, by the ASR project.
- *Value Added* is perhaps a more meaningful economic measure. Value- added is calculated by netting out inter-industry transactions from gross output. Value-added thus measures the monetary gains made by workers and owners of capital (e.g. heavy equipment or steel) used to support construction, operations and maintenance of the ASR project.

In addition to the impacts measured in magnitudes, we also calculate *multipliers* associated with each impact metric. The multiplier is calculated as the sum of direct, indirect and induced impacts, all divided by the direct impact. The multiplier thus measures how a unit of direct stimulus from the pipeline project (e.g. FTEs or millions of dollars in expenditures) grows the overall economy in each county where pipeline construction is occurring. In this report we calculate multipliers for each of the four impacts noted above, and we also calculate a multiplier that measures the total workforce impacts associated with each million dollars of gross output. We refer to this as the "employment multiplier."

The IMPLAN software also reports estimates of the state and federal tax implications of economic activity, which are based on the estimated sector-specific economic activity impacts (as described above) and tax rates in effect at the time that the data was collected by IMPLAN (which would be the 2012 vintage, in the case of this study). To the extent that specific firms or sectors have gained tax exemptions at the federal, state or local level, IMPLAN does not keep track of these special exemptions. Federal tax information is reported in Section 3 according to the following categories:

- *Social Security* is the sum of all social insurance taxes.
- *Production Taxes* are the sum of excise taxes; custom taxes; and "other" production taxes as reported by IMPLAN.
- *Corporate Income Tax* is the sum of all corporate profits taxes as reported by IMPLAN.

State tax information is reported in Section 3 according to the following categories:

- *Production Taxes* are the sum of excise taxes; custom taxes; and "other" production taxes as reported by IMPLAN.
- *Corporate Income Tax* is the sum of all corporate profits taxes as reported by IMPLAN.
- *Personal Income Tax* is the state personal income tax based on rates set in Pennsylvania and Virginia.
- *Other Personal Taxes* represents the sum of all other personal or consumption taxes.

3. Modeling Approach and Economic Impact Results

3.1 Construction Phase of the ASR Project

The input data for the county-level economic impact analysis was obtained from Williams based on their internal cost estimates for the ASR project. Segment-level cost data is presented in Table 5. For construction costs, Williams was able to provide estimates of in-state expenditures and out-of-state expenditures, shown as percentages in Table 6. These expenditure proportions vary by county. In our county-level analysis we used two approaches to estimate the amount of spending on in-county goods and services. We first assumed that 25% of the in-state expenditure percentage for each county involved within-county purchases. This number was supplied to us by Williams as a rule of thumb based on their experience with similar projects. The second approach applied the in-state and out-of-state percentages reported by Williams to the relevant county-level expenditure categories. This involves an implicit assumption that any "in-state" expenditures for a given county involved workers and businesses from that county. For example, Table 3 indicates that $134 million of direct expenditures is projected to occur in Lancaster County, Pennsylvania (representing approximately 70% of the total construction expenditures in Lancaster County). Our baseline approach would assume that 25% of those $134 million in direct expenditures involved workers or firms located in Lancaster County, while the second approach assumes 100%. This sensitivity analysis is presented in more detail in Section 4.

Table 5: Segment-level ASR Expenditure Data

SEGMENTID	COUNTY	%	TOTAL ($MM)	INSTATE ($MM)	OUT4OF4STATE ($MM)
1	Lancaster, PA	29.54%	$193.5	$134.4	$59.1
	Lebanon, PA	22.04%	$144.4	$100.3	$44.1
	Schuylkill, PA	14.50%	$95.0	$66.0	$29.0
	Northumberland, PA	6.24%	$40.9	$28.4	$12.5
	Columbia, PA	27.68%	$181.3	$126.0	$55.4
	Total	100.00%	$655.1	$455.0	$200.1
2	Columbia, PA	8.54%	$27.1	$19.1	$8.0
	Luzerne, PA	38.74%	$123.1	$86.8	$36.3
	Wyoming, PA	40.69%	$129.3	$91.1	$38.1
	Susquehanna, PA	11.94%	$37.9	$26.7	$11.2
	Total	100%	$317.7	$224.0	$93.7
3	Clinton, PA	100%	$31.6	$20.4	$11.2
4	Lycoming, PA	100%	$54.9	$35.4	$19.5
5	Prince William, VA	100%	$51.8	$42.0	$9.7
6	Columbia, PA	100%	$49.8	$32.9	$17.0
7	Wyoming, PA	100%	$49.9	$33.2	$16.7
8	Lycoming, PA	100%	$13.0	$8.9	$4.1
9	Columbia, PA	100%	$8.4	$6.1	$2.3
10	Prince William, VA	100%	$10.8	$7.4	$3.4
11	Appomattox, VA	100%	$10.8	$7.4	$3.4

Table 6: In State Purchase Percentages for Construction Expenditures

	In-State	Out-of-State
Clinton, PA	64.65%	35.35%
Columbia, PA	69.02%	30.98%
Lancaster, PA	69.46%	30.54%
Lebanon, PA	69.46%	30.54%
Luzerne, PA	70.50%	29.50%
Lycoming, PA	65.14%	34.86%
Northumberland, PA	69.46%	30.54%
Schuylkill, PA	69.46%	30.54%
Susquehanna, PA	68.26%	31.74%
Wyoming, PA	70.50%	29.50%
Pennsylvania Total	68.59%	31.41%
Appomattox, VA	68.57%	31.43%
Prince William, VA	79.02%	20.98%
Virginia Total	73.79%	26.21%
Project Total	69.79%	30.21%

Table 7: IMPLAN Sector Assignments

Expenditure Category	IMPLAN Sector Assignment
Payroll	Construction, nonresidential
Consumables / Materials	Building materials
Equipment Owned and Rented	Equipment rental and leasing
Fuel/Oil/Gas	Gasoline (Retail) Several, including:
Living Expenses	Hotels / motels; food and drink; gasoline; automotive repair and maintenance
Easement/Workspace	Landholder Income[2]
Yard and Office Rentals Permits and Fees (Building, Environmental and Wetland; State and Federal)	Real estate State Local Government enterprises
Public Affairs	Advertising and related services
Engineering	Architectural, engineering and related services
Land Legal Services	Legal Services
Operations and Maintenance	Pipeline Transportation

*Note: Land rights costs are not represented within IMPLAN as an economic sector. We model land rights costs as income directly to landholders, as if these landholders were private contractors. This cost assignment does not include the services of land acquisition professionals.

Expenditure categories in the data set provided by Williams were assigned to sector categories within IMPLAN. Note that IMPLAN uses its own definitions of sector categories, and in some cases these do not line up with categorization systems such as SIC or NAICS. The sectoral assignments that we used are shown in Table 7.

The construction schedule provided by Williams indicates that construction on all segments is schedule to occur in parallel from July 2016 to May 2017, a ten-month period. Because the construction data from Williams indicates that segments will be constructed in parallel, we assume that separate crews will be used for each segment. Different elements of the ASR project, however, have different expected construction times as shown in Table 8. This has important implications for how the economic impacts should be interpreted, particularly the workforce numbers. The FTE figures in this report take units of person-years (one person for one year is thus one FTE), consistent with how IMPLAN's results are generated. Since all segments in the construction phase last longer than one year, we use fractional

years to adjust the FTE count. For example, construction on the Central Penn Line South is expected to last nine months, directly employing approximately 820 Williams employees and contractors. Since nine months is three-fourths of one year, we would record these employment impacts as three-fourths of 820 FTEs, or 615 FTEs spread across five counties in Pennsylvania.

Table 8: Pennsylvania Construction Schedule and Direct Workforce (source: Williams data)

Segment	Counties	Duration	Direct Construction Employment (Individuals Segment During Construction)
Central Penn Line South	Columbia, PA Northumberland, PA Schuylkill, PA Lebanon, PA Lancaster, PA	9 Months	810@985
Chapman Loop	Clinton, PA	3 Months	170@195
Unity Loop & Collocated CPL North	Lycoming, PA Luzerne, PA Columbia, PA	8 Months	435@492
Uncollocated CPL North	Susquehanna, PA Wyoming, PA	7 Months	290@328
Compressor Station 610	Columbia, PA	11 Months	66@88
Compressor Station 605	Wyoming, PA	11 Months	66@88

Table 9 shows a county-level breakdown of employment for each construction segment of the ASR project, assuming that equal hiring occurs in each county for multi-county segments. Table 10 shows an estimate of the number of in-county construction hires for each segment, assuming that 25% of the workforce hired for each segment involves workers and firms located within the county in which construction is taking place.

Table 9: County- Level Direct Construction Employment for Pennsylvania (source: Williams data)

	Central Penn Line South (9 mos.)	Chapman Loop (3 mos.)	Unity Loop & CPL North (8 mos.)	CPL North (7 mos.)	Meter Stations (4 mos.)	Meter Stations 4 mos.)	Compressor Station 610 (11 mos.)	Compressor Station 605 (11 mos.)	County Totals
Clinton, PA		170 . 195							170 . 195
Columbia, PA	162 . 197		145 . 164		29 . 32	29 . 32	66 . 88		431 . 513
Lancaster, PA	162 . 197				29 . 32	29 . 32			220 . 261
Lebanon,(PA	162 . 197								162 . 197
Luzerne, PA			145 . 164		29 . 32	29 . 32			203 . 228
Lycoming, PA			145 . 164						145 . 164
Northumberland, PA	162 . 197								162 . 197
Schuylkill, PA	162 . 197								162 . 197
Susquehanna, PA				145 . 164	58 . 64	58 . 64			261 . 292
Wyoming, PA				145 . 164	29 . 32	29 . 32		66 . 88	269 . 316
Pennsylvania	810 - 985	170 - 195	435 - 492	290 - 328	174 -192	174 -192	66 -88	66 - 88	2185 - 2560

Table 10: In - County Direct Construction Employment for Pennsylvania (source: Williams data)

	Central Penn Line South (9 mos.)	Chapman Loop (3 mos.)	Unity Loop & CPL North (8 mos.)	CPL North (7 mos.)	Meter Stations (4 mos.)	Meter Stations 4 mos.)	Compressor Station 610 (11 mos.)	Compressor Station 605 (11 mos.)	County Totals
Clinton, PA		43 - 49							43 - 49
Columbia, PA	41 - 49		36 - 41		7 - 8	7 - 8	17 - 22		108 - 128
Lancaster, PA	41 - 49				7 - 8	7 - 8			55 - 65
Lebanon,(PA	41 - 49								41 - 49
Luzerne, PA			36 - 41		7 - 8	7 - 8			51 - 57
Lycoming, PA			36 - 41						36 - 41
Northumberland, PA	41 - 49								41 - 49
Schuylkill, PA	41 - 49								41 - 49
Susquehanna, PA				36 - 41	15 - 16	15 - 16			65 - 73
Wyoming, PA				36 - 41	7 - 8	7 - 8		17 - 22	67 - 79
Pennsylvania	203 - 246	43 - 49	109 - 123	73 -82	44 - 48	44 - 48	17 - 22	17 - 22	546 - 640

Table 11: In - County Construction FTEs for Pennsylvania (source: Williams data)

	Central Penn Line South (9 mos.)	Chapman Loop (3 mos.)	Unity Loop & CPL North (8 mos.)	CPL North (7 mos.)	Meter Stations (4 mos.)	Meter Stations (4 mos.)	Compressor Station 610 (11 mos.)	Compressor Station 605 (11 mos.)	County Totals
Clinton, PA		11 , 12							11 , 12
Columbia, PA	30 , 37		24 , 27		2 , 3	2 , 3	15 , 20		75 , 90
Lancaster, PA	30 , 37				2 , 3	2 , 3			35 , 42
Lebanon,(PA	30 , 37								30 , 37
Luzerne, PA			24 , 27		2 , 3	2 , 3			29 , 33
Lycoming, PA			24 , 27						24 , 27
Northumberland, PA	30 , 37								30 , 37
Schuylkill, PA	30 , 37								30 , 37
Susquehanna, PA				21 , 24	5 , 5	5 , 5			31 , 35
Wyoming, PA				21 , 24	2 , 3	2 , 3		15 , 20	41 , 49
Pennsylvania	152 - 185	11 - 12	73 - 82	42 -48	15 -16	15 - 16	15-20	15-20	337 - 399

Tables 11 and 12 illustrate how the definition of an FTE used in this report may be different than the definition of a single full-time position. These differences arise because the construction period is less than one year (and, in fact, varies by segment). Consider the direct construction employment in Clinton County, Pennsylvania, for example. Based on data provided by Williams, the Chapman Loop segment of the ASR project is expected to take three months to complete and require Williams to directly (or through contractors) hire 183 people (this is the average of the figures reported for Clinton County in Table 9) for that three-month

duration. Of those 183 employees, 25% or 45 employees are expected to be Clinton County residents. Since the Champan Loop segment will take 25% of one year to construct, we would say that Williams would be directly hiring 12 FTE's (25% of 45 in-county employees) to work in Clinton County.

Table 12: Comparing Total Construction Employment; In - County Construction Employment; and In - County Construction FTEs (source Williams data; uses the average of each range from Table 9).

	Direct Construction Employment (workers during construction)	In-County Construction Employment (in- county workers during construction)	In-County FTEs (person-years)
Clinton, PA	183	46	11
Columbia, PA	472	118	82
Lancaster, PA	241	60	39
Lebanon,(PA	180	45	34
Luzerne, PA	216	54	31
Lycoming, PA	155	39	26
Northumberland, PA	180	45	34
Schuylkill, PA	180	45	34
Susquehanna, PA	277	69	33
Wyoming, PA	293	73	45
Pennsylvania Total	2,373	593	368

Once sectors were assigned, we used IMPLAN to estimate indirect and induced economic impacts from the construction phase of the ASR project on a county-by- county basis. The results are shown in Section 3.3, below.

3.2 Operational Phase of the ASR Project

The economic impacts of the Atlantic Sunrise Pipeline project do not stop at construction. Crews will be needed to operate compressor stations and perform routine maintenance on pipeline segments for as long as the pipeline is in operation. These workers will live near the compressor station locations in Columbia and Wyoming Counties in Pennsylvania, and will spend money locally on goods and services.

We have used the IMPLAN model to estimate the economic impacts of the Atlantic Sunrise pipeline operations. We have obtained the following data from Williams regarding employment and O&M expenses during the operations phase.

- 8 employees at the Columbia compressor station, 7 at the Wyoming station. The average salary for an employee at either station is assumed to be $80,000.
- $500,000 O&M costs associated with each station annually, not including labor costs.

- Property taxes associated with the land purchase for the compressor stations, assumed to be $10,500 for the Columbia station and $24,000 for the Wyoming station.

Pipeline operations were assigned to the IMPLAN sector "Transport by Pipeline." The results from the operational phase analysis for Columbia and Wyoming Counties, Pennsylvania, are shown in Section 3.3, below.

3.3 Estimated Economic Impacts

This section reports the results of our economic impact analysis for the ASR construction phase (Sec. 3.3.1) and operational phase (Sec. 3.3.2). In this section we report impact figures at the county level (for an overview of the results across counties, see Tables 1 through 4 in Sec. 1). The construction phase of the ASR project consists of a number of parallel activities with different durations, as shown in Table 8. The economic impact figures thus need to be viewed in light of the duration of the economic activity being modeled. A single FTE in Clinton County, Pennsylvania, for example, represents the equivalent of four persons being employed full-time for the duration of the project (one quarter of one year) while a single FTE in Columbia County, Pennsylvania (a longer-duration construction segment), represents the equivalent of one person being employed for one year and one person being employed for three months for longer-duration segments (e.g. 9 months for the Central Penn Line South). Value-Added and Gross Output figures represent the aggregate monetary economic impacts generated over the duration of work in that county. Tax collection estimates at the state and federal level can be viewed similarly. The construction-phase impacts can thus be viewed as the short- term economic stimulus introduced to the counties where construction is occurring.

The economic impact figures for the operational phase represent annual economic impacts (workforce, gross output, value-added) over the duration of the operation of the ASR project (which is likely to be decades). These may thus be viewed as the long-term impacts of the project.

3.3.1 Construction-Phase Workforce and Value-Added Impacts

Tables 13 through 24 provide county-level output from the IMPLAN model. Each of the tables is divided into three panels. Panel (a) in each table shows workforce impacts (in FTEs, except for direct employment impacts for Pennsylvania as noted); labor income; gross output; and value-added. Panel (b) in each table shows IMPLAN's estimate of the state and federal tax impacts associated with the construction phase. Panel (c) in each table shows the five industrial sectors with the largest economic impacts in each county. These industrial sectors are defined based on IMPLAN sector definitions. The tables are in alphabetical order of counties in Pennsylvania, followed by alphabetical order of counties in Virginia.

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	46	2	2	5
Indirect Impacts	7	0	0	1
Induced Impacts	15	1	1	1
Total Impacts	44	2	3	7
MMultiplier	2.00	1.47	1.76	1.43

Note: Direct employment impacts represent the number of in- county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 13b: State and Federal Tax Impacts for Clinton County, PA ($ Thousand)

Federal Taxes	
Social Security	$142.8
Production Taxes	$12.7
Corporate Income Tax	$20.9
Personal Income Tax	$84.1
Total Federal Taxes	$260.6

State Taxes	
Dividends	$0.1
Social Security	$3.3
Production Taxes	$115.3
Corporate Income Tax	$4.0
Personal Income Tax	$27.0
Other Personal Taxes	$6.6
Total State Taxes	$156.2

Table 13c: Top Industrial Sector Impacts for Clinton County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$0.7	$2.5	7
Retail Stores - Building material and garden supply	$0.1	$0.2	3
Imputed rental activity for owner-occupied dwellings	$0.1	$0.2	0
Commercial and industrial machinery and equipment rental and leasing	$0.1	$0.2	1
Employment and payroll	$0.1	$0.1	1

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	118	39	44	102
Indirect Impacts	155	6	10	18
Induced Impacts	485	18	31	48
Total Impacts	1012	62	85	169
MMultiplier	2. 72	1. 62	1.94	1.65

Note: Direct employment impacts represent the number of in- county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 14b: State and Federal Tax Impacts for Columbia County, PA

Federal Taxes	
Social Security	$4,085.5
Production Taxes	$325.9
Corporate Income Tax	$729.8
Personal Income Tax	$2,175.4
Total Federal Taxes	$7,316.5

State Taxes	
Dividends	$4.1
Social Security	$90.7
Production Taxes	$2,981.5
Corporate Income Tax	$139.3
Personal Income Tax	$697.6
Other Personal Taxes	$169.5
Total State Taxes	$4,082.7

Table 14c: Top Industrial Sector Impacts for Columbia County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$14.8	$44.4	47
Architectural, engineering, and related services	$3.8	$6.7	64
Imputed rental activity for owner-occupied dwellings	$3.6	$4.9	0
Retail Stores. Building material and garden supply	$3.3	$4.9	67
Real estate establishments	$2.7	$3.2	17

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	60	28	32	65
Indirect Impacts	138	7	10	16
Induced Impacts	458	20	33	51
Total Impacts	837	54	76	132
Multiplier	3.47	1.95	2.34	2.03

Note: Direct employment impacts represent the number of in- county construction hires. Indirect and induced employment impacts are given in FTEs

Table 15b: State and Federal Tax Impacts for Lancaster County, PA

Federal Taxes	
Social Security	$3,300.8
Production Taxes	$345.9
Corporate Income Tax	$687.4
Personal Income Tax	$2,281.6
Total Federal Taxes	$6,615.6

State Taxes	
Dividends	$3.9
Social Security	$32.7
Production Taxes	$2,596.4
Corporate Income Tax	$131.2
Personal Income Tax	$731.7
Other Personal Taxes	$177.8
Total State Taxes	$3,673.6

Table 15c: Top Industrial Sector Impacts for Lancaster County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$11.5	$27.9	30
Real estate establishments	$4.5	$5.6	34
Architectural, engineering, and related services	$3.8	$6.8	65
Imputed rental activity for owner-occupied dwellings	$2.9	$3.9	0
Retail Stores - Building material and garden supply	$2.4	$3.4	40

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	45	10	15	29
Indirect Impacts	55	2	3	6
Induced Impacts	159	6	11	18
Total Impacts	425	19	30	52
Multiplier	2.01	1.82	2.01	1.80

Note: Direct employment impacts represent the number of ^county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 16b: State and Federal Tax Impacts for Lebanon County, PA

Federal Taxes	
Social Security	$1,147.0
Production Taxes	$119.6
Corporate Income Tax	$261.6
Personal Income Tax	$741.4
Total Federal Taxes	$2,269.6

State Taxes	
Dividends	$1.5
Social Security	$14.8
Production Taxes	$1,083.9
Corporate Income Tax	$49.9
Personal Income Tax	$237.7
Other Personal Taxes	$57.8
Total State Taxes	$1,445.6

Table 16c: Top Industrial Sector Impacts for Lebanon County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$2.1	$7.1	22
Real estate establishments	$2.0	$2.5	16
Architectural, engineering, and related services	$1.9	$3.8	41
Retail Stores - Building material and garden supply	$1.8	$2.5	33
Imputed rental activity for owner-occupied dwellings	$1.1	$1.5	0

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	54	13	16	36
Indirect Impacts	88	4	6	10
Induced Impacts	260	11	19	29
Total Impacts	483	28	41	75
Multiplier	3.58	2.12	2.55	2.11

Note: Direct employment impacts represent the number of ^county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 17b: State and Federal Tax Impacts for Luzerne County, PA

Federal Taxes	
Social Security	$1,833.9
Production Taxes	$255.8
Corporate Income Tax	$430.7
Personal Income Tax	$1,077.2
Total Federal Taxes	$3,597.5

State Taxes	
Dividends	$2.4
Social Security	$23.6
Production Taxes	$1,621.0
Corporate Income Tax	$82.2
Personal Income Tax	$345.4
Other Personal Taxes	$83.9
Total State Taxes	$2,158.6

Table 17c: Top Industrial Sector Impacts for Luzerne County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$4.9	$14.6	14
Real estate establishments	$2.4	$2.9	18
Architectural, engineering, and related services	$1.9	$3.4	34
Imputed rental activity for owner-occupied dwellings	$1.7	$2.3	0
Retail Stores◦ Building material and garden supply	$1.2	$1.7	22

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment (FTEs)	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	39	7	8	19
Indirect Impacts	42	2	3	4
Induced Impacts	106	4	7	11
Total Impacts	220	14	18	35
Multiplier	3.03	1.82	2.18	1.81

Note: Direct employment impacts represent the number of in- county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 18b: State and Federal Tax Impacts for Lycoming County, PA

Federal Taxes	
Social Security	$882.9
Production Taxes	$73.9
Corporate Income Tax	$141.2
Personal Income Tax	$530.2
Total Federal Taxes	$1,628.2

State Taxes	
Dividends	$0.8
Social Security	$16.4
Production Taxes	$627.3
Corporate Income Tax	$26.9
Personal Income Tax	$170.0
Other Personal Taxes	$41.3
Total State Taxes	$882.8

Table 18c: Top Industrial Sector Impacts for Lycoming County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$3.1	$9.0	13
Retail Stores- Building material and garden supply	$0.8	$1.1	14
Imputed rental activity for owner-occupied dwellings	$0.7	$1.0	0
Architectural, engineering, and related services	$0.6	$1.2	12
Commercial and industrial machinery and equipment rental and leasing	$0.4	$0.7	2

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	45	6	6	17
Indirect Impacts	28	1	2	3
Induced Impacts	53	2	4	6
Total Impacts	168	9	12	26
Multiplier	1. 94	1.54	1 84	1 52

Note: Direct employment impacts represent the number of in-county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 19b: State and Federal Tax Impacts for Northumberland County, PA

Federal Taxes	
Social Security	$569.1
Production Taxes	$42.7
Corporate Income Tax	$103.6
Personal Income Tax	$311.0
Total Federal Taxes	$1,026.4

State Taxes	
Dividends	$0.6
Social Security	$10.4
Production Taxes	$472.6
Corporate Income Tax	$19.8
Personal Income Tax	$99.7
Other Personal Taxes	$24.2
Total State Taxes	$627.3

Table 19c: Top Industrial Sector Impacts for Northumberland County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$2.1	$7.7	21
Retail Stores - Building material and garden supply	$0.5	$0.7	10
Imputed rental activity for owner occupied dwellings	$0.5	$0.7	0
Real estate establishments	$0.5	$0.6	3
Architectural, engineering, and related services	$0.5	$1.2	15

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	45	12	14	45
Indirect Impacts	90	4	6	11
Induced Impacts	136	5	10	15
Total Impacts	336	21	30	71
Multiplier	3.06	1.72	2.09	1.56

Note: Direct employment impacts represent the number of ^county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 20b: State and Federal Tax Impacts for Schuylkill County, PA

Federal Taxes	
Social Security	$1,340.2
Production Taxes	$118.4
Corporate Income Tax	$274.2
Personal Income Tax	$757.1
Total Federal Taxes	$2,489.9

State Taxes	
Dividends	$1.5
Social Security	$22.8
Production Taxes	$1,157.1
Corporate Income Tax	$52.3
Personal Income Tax	$242.8
Other Personal Taxes	$59.0
Total State Taxes	$1,535.5

Table 20c: Top Industrial Sector Impacts for Schuylkill County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$5.2	$21.0	22
Real estate establishments	$1.4	$1.7	11
Retail Stores- Building material and garden supply	$1.3	$1.8	22
Imputed rental activity for owner-occupied dwellings	$1.2	$1.7	0
Legal services	$0.7	$0.8	6

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	69	9	10	28
Indirect Impacts	48	2	3	5
Induced Impacts	72	2	5	8
Total Impacts	230	13	18	42
Multiplier	2.08	1.41	1.75	1.46

Note: Direct employment impacts represent the number of ^county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 21b: State and Federal Tax Impacts for Susquehanna County, PA

Federal Taxes	
Social Security	$950.8
Production Taxes	$64.6
Corporate Income Tax	$158.4
Personal Income Tax	$471.4
Total Federal Taxes	$1,645.2

State Taxes	
Dividends	$0.9
Social Security	$17.5
Production Taxes	$632.6
Corporate Income Tax	$30.2
Personal Income Tax	$151.2
Other Personal Taxes	$36.7
Total State Taxes	$869.1

Table 21c: Top Industrial Sector Impacts for Susquehanna County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$3.7	$12.9	$20.3
Retail Stores - Building material and garden supply	$0.9	$1.2	16
Architectural, engineering, and related services	$0.8	$1.9	24
Imputed rental activity for owner~ occupied dwellings	$0.8	$1.0	0
Real estate establishments	$0.7	$1.1	5

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	73	16	20	44
Indirect Impacts	67	3	4	7
Induced Impacts	134	5	10	15
Total Impacts	388	24	35	67
Multiplier	2.07	1.51	1.74	1.55

Note: Direct employment impacts represent the number of ^county construction hires. Indirect and induced employment impacts are given in FTEs.

Table 22b: State and Federal Tax Impacts for Wyoming County, PA

Federal Taxes	
Social Security	$1,404.6
Production Taxes	$130.0
Corporate Income Tax	$346.6
Personal Income Tax	$843.1
Total Federal Taxes	$2,724.3

State Taxes	
Dividends	$1.9
Social Security	$18.8
Production Taxes	$1,251.0
Corporate Income Tax	$66.2
Personal Income Tax	$270.4
Other Personal Taxes	$65.7
Total State Taxes	$1,674.0

Table 22c: Top Industrial Sector Impacts for Wyoming County, PA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$4.6	$12.8	16
Real estate establishments	$1.4	$1.8	11
Architectural, engineering, and related services	$1.4	$2.9	31
Retail Stores◦ Building material and garden supply	$1.1	$1.6	22
Imputed rental activity for owner-occupied dwellings	$1.0	$1.3	0

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment (FTEs)	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	10	0	0	1
Indirect Impacts	1	0	0	0
Induced Impacts	4	0	0	0
Total Impacts	15	0	1	2
Multiplier	1.48	1.47	1.76	1.51

Table 23b: State and Federal Tax Impacts for Appottomax County, VA

Federal Taxes	
Social Security	$68.1
Production Taxes	$13.5
Corporate Income Tax	$19.0
Personal Income Tax	$33.5
Total Federal Taxes	$134.1

State Taxes	
Dividends	$0.1
Social Security	$1.6
Production Taxes	$92.2
Corporate Income Tax	$1.7
Personal Income Tax	$10.0
Other Personal Taxes	$2.0
Total State Taxes	$107.5

Table 23c: Top Industrial Sector Impacts for Appottomax County, VA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$0.17	$0.58	4
Retail Stores - Building material and garden supply	$0.14	$0.21	3
Architectural, engineering, and related services	$0.10	$0.27	4
Real estate establishments	$0.07	$0.09	1
Imputed rental activity for owner occupied dwellings	$0.06	$0.09	0

Table 24a: Economic Impacts Summary for Clinton County, PA

	Employment (FTEs)	Labor Income ($MM)	Value Added ($MM)	Output ($MM)
Direct Impacts	245	$14.56	$17.78	$33.99
Indirect Impacts	64	$3.41	$5.45	$8.42
Induced Impacts	221	$11.28	$19.27	$27.35
Total Impacts	530	$29.25	$42.50	$69.77
Multiplier	2.17	2.01	2.39	2.05

Table 24b: State and Federal Tax Impacts for Prince William County, VA

Federal Taxes	
Social Security	$864.5
Production Taxes	$65.1
Corporate Income Tax	$222.2
Personal Income Tax	$745.6
Total Federal Taxes	$1,897.4

State Taxes	
Dividends	$1.4
Social Security	$16.7
Production Taxes	$699.3
Corporate Income Tax	$19.6
Personal Income Tax	$222.0
Other Personal Taxes	$43.8
Total State Taxes	$1,002.8

Table 24c: Top Industrial Sector Impacts for Prince William County, VA

Description	Value Added ($MM)	Gross Ouput ($MM)	Employment (FTE)
Construction of other new nonresidential structures	$2.6	$6.3	39
Architectural, engineering, and related services	$1.6	$2.5	19
Real estate establishments	$0.8	$1.0	6
Imputed rental activity for owner-occupied dwellings	$0.7	$0.9	0
Employment and payroll (federal, military)	$0.6	$0.7	4

The detailed input-output results shown in Tables 13 through 24 suggest that, across counties, every dollar of direct expenditure on the construction of the ASR pipeline project generates between 1.8 and 2.55 dollars of overall economic activity, with substantial variation between counties. These multipliers are generally larger than those found for other oil and gas projects. It is possible that the higher multipliers in this study arise from our assumptions regarding the geographic distribution of inter-industry expenditures. While we are able to isolate estimated in-state expenditures, with our data we cannot isolate specific in-county expenditures. We have thus assumed that all in-state expenditures for a given county occur within that county - in other words, the inter-industry purchases happen between firms and workers located in that county. In Section 4, we relax this assumption to examine how sensitive the economic impacts and multipliers are to various levels of in-county inter-industry purchases.

While there is some variation among counties in the specific economic sectors that are estimated to benefit the most from ASR pipeline construction, in many counties the construction services; architectural; and real estate markets would see the largest economic impacts. The concentration of economic impacts in these top- five sectors also varies widely by county. In Clinton County, PA, for example, the workforce impact in the top five sectors is roughly one-third of the total workforce impact that we estimated for that county (ref. Tables 13a and 13c), suggesting that the economic impacts in Clinton County are more widespread throughout the county's economy. This can be contrasted with Appotomax County, VA, where the IMPLAN model estimates that 75% of the total workforce impacts are concentrated in five economic sectors.

3.3.2 Operations Phase Economic Impacts

Tables 25 and 26 summarize the annual economic impacts associated with operation of the ASR project. Because the operational workforce for the ASR project is planned to be based in two counties - Columbia and Wyoming Counties in Pennsylvania - our analysis of the economic impacts of pipeline operations is limited to those two counties.

Table 25: Annual Economic Impacts Summary for Pipeline Operation in Columbia County, PA

	Employment (FTEs)	Labor Income ($)	Value Added ($)	Output ($)
Direct Impacts	8	$ 609,843	$ 577,460	$ 500,000
Indirect Impacts	1	$ 37,901	$ 52,223	$ 103,992
Induced Impacts	6	$ 221,424	$ 386,678	$ 585,679
Total Impacts	15	$ 869,168	$ 1,016,360	$ 1,189,671
Multiplier	1.86	1.43	1.76	2.38

Table 26: Annual Economic Impacts Summary for Pipeline Operation in Wyoming County, PA

	Employment (FTEs)	Labor Income ($)	Value Added ($)	Output ($)
Direct Impacts	7	$ 530,237	$ 498,381	$ 500,000
Indirect Impacts	2	$ 81,126	$ 73,760	$ 90,750
Induced Impacts	5	$ 189,294	$ 295,041	$ 184,249
Total Impacts	14	$ 800,657	$ 867,182	$ 774,999
Multiplier	2.07	1.51	1.74	1.55

Our input-output modeling suggests that pipeline operations will support the equivalent of 15 full-time positions per year in Columbia County and 14 full-time positions per year in Wyoming County. This creates value-added to the Columbia County economy of more than $1 million per year and nearly $770,000 per year in Wyoming County. While the operations-phase impacts are, naturally, smaller than those for pipeline construction, they represent the long-term economic impacts of the ASR project, to be enjoyed over the duration of operations (which may be many decades). We do find, however, that the employment multiplier for pipeline operations, is slightly higher for pipeline operations than for pipeline construction. The average employment multiplier (defined as FTEs per million dollars of gross output) averaged around 7.4 for pipeline construction (the average is taken across all counties). We estimate employment multipliers of 12 for the Columbia County station and 11 for the Wyoming station.

4. Sensitivity Analyses

This section presents the results of two sensitivity analyses, where we relax some of the assumptions involved in the input-output models whose results were shown in Section 3. The first set of assumptions regards the geographic distribution of inter-industry purchases - the "local purchase percentage," in the parlance of input-output models. The results in Section 3 (see Table 6 and Tables 9 through 20) assumed that in-state purchases made to support pipeline construction activities in a certain county had 25% local content (i.e., workers and firms from that particular county). This is one reason that our estimated economic impacts are so widely distributed across Pennsylvania, not concentrated only in the counties where construction will take place (see Table 1, for example) - the structure of the IMPLAN model assumes that out-of-county workers and firms will spend money in their home county and other counties in line with historical patterns. Referring to Table 6, for example, the local purchase percentage for Clinton County, Pennsylvania, was set to 16% based on the proportion of in-state purchases in the data provided by Williams. In our IMPLAN modeling, we have assumed that 16% of construction expenditures for work in Clinton County involved workers and firms from Clinton County, not from other Pennsylvania counties. Labor and firms may, in reality, be more or less mobile across county lines; workers from other counties may spend

more money in counties where construction activities are taking place than historical patterns would suggest (because of the nature of the construction activity, which may involve relocation for extended periods during the construction phase). We thus relax our initial assumptions by adjusting the local purchase percentage for each county to illustrate the effects on the economic impacts and multipliers.

4.1 Sensitivity of Economic Impacts to Local Purchase Percentage

To examine how the estimated economic impacts vary with the magnitude of the local purchase percentage, we conduct different numerical experiments with the IMPLAN model. Our base-line case assumes a local purchase percentage of 25% (where the 25% refers to the percentage of total expenditures on a given pipeline section that involve workers and firms in the county where that pipeline section is located). We then illustrate a "higher local content" case where 100% of in-state expenditures in each county remain in that county. This means that all dollars spent on construction activities in some county are re-circulated within that county. Finally, we illustrate a "lower local content" case where the local purchase percentage is assumed to be 10% (i.e., 10% of the dollar spent in a particular county are re-circulated in that county). We are only able to perform this analysis for Pennsylvania counties since we do not have the relevant local purchase percentages for the Virginia counties.

Tables 27 through 29 show the results for the original local purchase percentage and the two sensitivity cases. The results suggest a proportional level of sensitivity of the economic impacts in the construction counties to this local purchase percentage. Reducing the local purchase percentage to 10% from 100%, for example, reduces the economic impacts in the construction counties by 90% (the rest of the economic stimulus is, within the IMPLAN model, assumed to be redistributed to counties outside of the construction footprint). The sensitivity analysis here accounts only for how the economic impacts are distributed across Pennsylvania counties - changing the local purchase percentage does not change the total economic impacts associated with the ASR project.

Table 27: Economic Impacts in Pennsylvania Counties Under the Base Case (25% Local Purchase Percentage Assumption)

	Total Workforce Impact (FTEs, in person-years)	Total Value-Added Impact ($MM)	Gross Output ($MM)
Clinton, PA	44	$3.0	$7.1
Columbia, PA	1,012	$85.5	$168.7
Lancaster, PA	837	$75.5	$132.0
Lebanon, PA	425	$29.6	$52.2
Luzerne, PA	483	$41.2	$74.9
Lycoming, PA	220	$18.1	$35.2
Northumberland, PA	168	$11.9	$26.3
Schuylkill, PA	336	$29.5	$70.7
Susquehanna, PA	230	$26.1	$50.1
Wyoming, PA	388	$26.1	$50.1
Pennsylvania Total	4,144	$346.56	$667.40

Table 28: Economic Impacts in Pennsylvania Counties if the Local Purchase Percentage is 100%

	Total Workforce Impact (FTEs, in person-years)	Total Value-Added Impact ($MM)	Gross Output ($MM)
Clinton, PA	111	$7.57	$17.83
Columbia, PA	2,529	$213.68	$421.64
Lancaster, PA	2,094	$188.86	$329.89
Lebanon, PA	1,063	$74.06	$130.51
Luzerne, PA	1,207	$103.06	$187.35
Lycoming, PA	549	$45.28	$88.07
Northumberland, PA	421	$29.70	$65.76
Schuylkill, PA	840	$73.86	$176.79
Susquehanna, PA	576	$65.16	$125.33
Wyoming, PA	971	$65.16	$125.33
Pennsylvania Total	10,360	$866.39	$1,668.50

Table 29: Economic Impacts in Pennsylvania Counties if the Local Purchase Percentage is 10%

	Total Workforce Impact (FTEs, in person-years)	Total Value-Added Impact ($MM)	Gross Output ($MM)
Clinton, PA	11	1	2
Columbia, PA	253	21	42
Lancaster, PA	209	19	33
Lebanon, PA	106	7	13
Luzerne, PA	121	10	19
Lycoming, PA	55	5	9
Northumberland, PA	42	3	7
Schuylkill, PA	84	7	18
Susquehanna, PA	58	7	13
Wyoming, PA	97	7	13
Pennsylvania Total	1,036	$86.64	$166.85

4.2 Sensitivity of Economic Impacts to Disposition of Easement Revenues

Based on data provided to us by Williams, the ASR project will involve approximately $75 million in direct payments to landowners for right-of-way easements. These payments represent a substantial stimulus to landowners, but how those easement dollars are re-circulated throughout the county economy depends on how landowners dispose of that income. The IMPLAN model assumes that landholders spend this income according to historical spending patterns for disposable income. While it is difficult to get precise data on spending patterns, a limited amount of survey data collected from landholders leasing surface or subsurface rights for exploration and production in the Pennsylvania Marcellus suggests that these landholders are departing from historical spending patterns when they receive lease and bonus payments. In particular, savings rates among landholders in the Pennsylvania Marcellus appear to be substantially larger than historical data would suggest. To examine how sensitive the economic impacts of the ASR project are to the disposition of pipeline easement payments, we re-run our IMPLAN models assuming that all easement payments are zero, i.e., we remove the $75 million in direct landowner payments from the economic impact model. This is functionally equivalent to an easement-payment savings rate of 100%, since these payments are never re-circulated into the county-level economy. After estimating the indirect and induced economic impacts (and associated multipliers), the $75 million in easement payments are added back in to the direct value-added.

Table 30 shows a summary of the economic impacts for the construction counties if easement payments are not re-circulated into the economy in each county where payments are made. Here we use our base-case local purchase percentage of 25%. The reductions in economic impacts in Table 30, as compared with Table 1, vary by county from approximately 5% to 10%. Aggregated across Pennsylvania counties, we estimate that if easement payments are not re-circulated within the county economy (i.e., if payment savings rates are 100%), then the impacts on FTEs, value added and gross output during the construction phase will be reduced by approximately 7%. This is not to discount the importance of easement payments in increasing the wealth of landholders, only to suggest that the overall economic impacts of the ASR project are relatively insensitive to the disposition of these payments (as compared to the sensitivity of the disposition of construction payments other than easement payment dollars). Our analysis suggests that the proportion of local workers and firms involved in construction activities in each county is a more important driver of economic impacts than the disposition of landholder easement revenues.

Table 30: Construction - Phase Economic Impacts with a 100% Savings Rate for Easement Revenues

	Total Workforce Impact (FTEs, in person-years)	Total Value-Added Impact ($MM)	Gross Output ($MM)
Clinton, PA	43	3	7
Columbia, PA	952	80	159
Lancaster, PA	784	71	124
Lebanon, PA	386	27	47
Luzerne, PA	440	38	68
Lycoming, PA	213	18	34
Northumberland, PA	159	11	25
Schuylkill, PA	313	28	66
Susquehanna, PA	221	25	48
Wyoming, PA	353	24	46
Pennsylvania Total	3,864	$323.58	$623.44

5. Conclusions

This report has presented the results of an economic impact modeling exercise related to the construction and operations phases of the Atlantic Sunrise (ASR) Pipeline. Using IMPLAN, a commercial piece of software to perform input-output economic analysis, we have estimated impacts on workforce demands; economic output; and value-added to each of the twelve counties in Pennsylvania and Virginia where construction is expected to occur.

Construction estimate data from Williams suggests that the ASR project will involve more than 2,300 construction employees hired directly by Williams (for various time horizons based on construction times for different segments). Based on the estimates provided by the input-output model, under the base case 25% local purchase percentage assumptions the ASR project will help to support more than 8,000 FTEs total (including direct hires) in a variety of industries over its ten-month construction period, and will generate more than $870 million in value-added economic output. Under the base-case set of assumptions where the local purchase percentage in each county amounts to 25% of the in-state dollars planned to be spent in that county, somewhat more than half of the economic impacts associated with the ASR project will flow to counties outside of the ASR project footprint. The proportion of these economic benefits that accrue to counties where construction activities are planed to take place is proportional to this local purchase percentage - the more dollars that are re-circulated in the economies of the construction counties (through hiring of in-county labor and high levels of in-county spending by out-of-county workers) the larger the share of economic impacts will be enjoyed within the construction counties. Over the long run, our analysis suggests that the ASR project would support 26 FTEs and generate nearly $2 million in value added annually for those counties (Columbia and Wyoming) that would support a permanent workforce.

6. References

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