



Economic Impact and Re-Employment Assessment of PES Philadelphia Refining Complex

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Executive Summary

The Philadelphia Refining Complex consists of two refineries, Point Breeze and Girard Point, totaling more than 335,000 barrels of crude oil processing capacity and producing more than 110 million barrels of refined products annually. In the event of a plant closure, the economic impact on the region would be significant.

This report's key conclusions are:

- In the event of a plant closure, 1,100 workers would be laid off directly, and an additional 500 full time equivalent contractors would also cease operations.
- Of these 1,100 direct jobs, approximately half are categorized to have “difficult” reemployment prospects within the state of Pennsylvania due to the specialized nature of their occupation.
- The Refinery Complex pays wages significantly above average in the local economy. Specifically, the complex pays its workers \$120,000 on average, including overtime, bonus pay, and certain benefits.
- Employment at the Philadelphia Refinery Complex is highly concentrated in occupations that are highly skilled, but do not require a college education. Thus the refinery provides significant employment opportunities to local workers without significant educational or experience requirements. More than half of the workers directly employed by the refining complex are union employees.
- Every 100 jobs lost at the PES facility will lead to the loss of almost 600 jobs in the Philadelphia Metropolitan Statistical Area, more than 1,300 jobs in Pennsylvania, more than 1,400 jobs in the regional economy, and almost 2,700 jobs in the United States.
- In the event the refining complex were to cease operations completely, the economic impacts on the Commonwealth of Pennsylvania would be significant. We estimate that in the first year after operations end the economy would contract by more than 10,000 jobs, more than \$1 billion in labor income, \$2.4 billion in value added, \$6.4 billion in output and \$175 million in state and local tax revenues would be lost.

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1. Introduction

More than 150 years ago the oil and gas industry was born in Titusville Pennsylvania when Colonia Edwin Drake drilled the world's first successful oil well. In 1870, shortly after the industry's advent, the Philadelphia Refining Complex began its operations originally as the Atlantic Refining Company. Today, the Philadelphia Refining Complex consists of two refineries, Point Breeze and Girard Point, totaling more than 335,000 barrels of crude oil processing capacity and producing more than 110 million barrels of refined products annually.¹ The refining industry in general, and the Philadelphia Refining Complex specifically, has been a regional economic driver for over a century, providing well-paying and stable careers for thousands of local workers.

The Acadian Consulting Group ("ACG"), an energy research and consulting firm headquartered in Baton Rouge, Louisiana, was retained to prepare this report on behalf of Philadelphia Energy Solutions ("PES") in order to identify and explain the local and regional economic importance of the Philadelphia Refining Complex as well as estimate any potential economic dislocations that could arise if the refinery complex were forced to discontinue operations.

Four economic areas of increasing geographic scope are used in this analysis. The first area is relatively local and limited to the Philadelphia Metropolitan Statistical Area ("MSA")—hereafter simply referred to as the "Philadelphia MSA"—as defined by the U.S. Bureau of Labor Statistics ("BLS"). The second area includes the entire Commonwealth of Pennsylvania. The third, and larger Central Atlantic region includes Delaware, the District of Columbia, Maryland, Pennsylvania, New Jersey, and New York.² The fourth, and largest, is the entire U.S. economy.

The purpose of this report is to assess the economic contribution of the PES Philadelphia Refining Complex to the local, state, regional, and U.S economies. We will show that the refining sector in general, and the PES Refining Complex specifically, provides well-paying jobs for workers with relatively little work and educational experience. In other words—not only does this industry and this facility provide high paying jobs, but these jobs are accessible to a broad range of workers.

¹ Source: <http://pes-companies.com/refining-complex/>

² This region is consistent with the Petroleum Administration for Defense District (PADD) 1B.

A number of data sources will be used throughout the report. These data sources come from both publicly available data sets as well as information provided by PES on this specific facility. These different sources will corroborate one another and support the same overall conclusion. First, data from the U.S. Census Bureau's Quarterly Workforce Indicators will be used to show historical trends of employment and earnings in the refining sector.

Next, we analyze data provided by PES showing the number of current employees and the average wage of these employees by occupation. We then compare this PES provided data to data compiled from the U.S. Bureau of Labor Statistics and Pennsylvania's Center for Workforce Information & Analysis that also provides earnings information by occupation. Comparing the company provided information to both sector level employment and earnings data, and occupational level earnings at different levels of geographical aggregation, two conclusions are reached. First, both the PES refinery and the refining industry in general pay significantly above average wages compared to the region, and pay wages on par with these occupations for which they hire. Second, this specific refinery makes up approximately one third of the refining employment within the Philadelphia MSA, and about 8.5 percent of the refining employment in the larger regional economy.³ This illustrates the economic importance of this specific facility.

Next, utilizing data and methods employed by the Pennsylvania's Center for Workforce Information & Analysis, we assess the plausible re-employment of the workers at the PES Refinery in the event of a closure. This is done by comparing the number of jobs by occupation that would be lost relative to the job openings at three different levels of geographical aggregation: Philadelphia County Workforce Development Area, the Philadelphia Metropolitan Division, and the state of Pennsylvania. This analysis reveals that over half of the almost 1,100 direct jobs employed at the PES Refinery have "difficult" re-employment prospects, and another 21 percent have "fair to difficult" re-employment prospects. Unfortunately, only 12 percent of these workers are classified to have "good" job prospects. Thus, in the event of a plant closure, some of these employees might be able to find a comparable job within

³ Which, as previously mentioned, includes the District of Columbia, Delaware, Maryland, Pennsylvania, New Jersey, and New York.

their occupation at a similar wage, but many of these workers would either have to leave the Philadelphia and/or Pennsylvania region or take jobs in a different occupation and/or a different industry and therefore have significantly lower earnings.

Finally, utilizing publicly available labor market data alongside an economic input/output model, *IMPLAN*, we estimate the economic losses associated with the plant's closure. Within the Philadelphia MSA, for every one-hundred job-years lost, the economy is estimated to lose 585 jobs, \$60 million in local labor income, and \$11.8 million in state and local tax revenues. The aggregate output and value added of the MSA would decrease by \$627 million and \$189 million, respectively. The effects on the Pennsylvania economy as a whole are larger. For every one hundred job-years lost, the economy is estimated to lose more than 1,300 jobs, more than \$128 million in local labor income and over \$21 million in state and local tax revenues. These economic multipliers increase as the geographic scope expands even larger to the Central Atlantic Region and the aggregate U.S. economy. In addition, results of this economic model show that negative economic consequences of a plant closure are not just restricted to the refining and related industries along the oil and gas industry's value chain; this closure would impact many other seemingly unrelated industries in the economy including wholesale trade, truck transportation, hospitals, restaurants, real estate, retail outlets, among others.

In the event that the entire refining complex were to be shut down, there would be serious negative economic consequences, and we present three sets of estimates for this event; a high estimate, baseline estimate, and low estimate. These three estimates provide a range of reasonable negative economic impacts. Specifically, our baseline estimate suggests that if the entire plant were to close, in the year of closure, the Pennsylvania economy would lose more than 10,000 jobs, over \$1 billion in labor income, \$6.4 billion in output, and \$175 million in state and local taxes. In sum, long term effects would be significantly larger.

The PES Philadelphia Refinery Complex is an important component of the local Philadelphia economy, the state of Pennsylvania, the Central Atlantic region, and the United States as a whole. A plant closure would indeed induce serious and significant economic harm on the region. While the exact magnitude of such a large closure and

the dynamics in the short-term and long-term are difficult to quantify precisely, we do know that the closure of this plant would be detrimental both directly to the workers employed at this facility, and also to the economy at large.

2. Contribution of Refining and Petrochemical Industry to the Regional Economy

Figure 1 and Table 1 provide detailed historic information on employment and average earnings for three economic regions associated with this analysis.⁴ The data reveals several notable trends.

The first trend is that refining sector wages are significantly higher than average in all four geographical regions analyzed. Refining sector wages in the Philadelphia MSA average over \$10,500 in monthly earnings, or over \$127,000 on an annualized salary basis, an amount that is more than twice the average annual earnings in the MSA. These higher-than-average wage trends are also seen at the state, regional economy, and national levels as well.

The second trend shows that refining employment is relatively concentrated in a local area. Refining sector employment averaged around 12,900 employees across the Central Atlantic region, 6,700 employees at the state level, and 3,300 employees locally. This is important for two reasons. First, it shows that a significant share of the overall refining employment in the region is highly concentrated in the local Philadelphia MSA (about 30 percent of the region and half of the state). Secondly, the Philadelphia Refining Complex itself makes up about 1,100 of these 3,300 local refinery employees. Thus, as will be discussed later, any negative actions that could result in a discontinuation of refinery operations could have a significantly negative local economic impact.

⁴ Source: U.S. Census Bureau. Quarterly Workforce Indicators. Per QWI, earnings is defined as full quarter employment (stable) average monthly earnings. Employment is defined as beginning of quarter employment counts. Throughout the report, sector 324 (petroleum and coal products manufacturing), is referred to as the “refining sector.” All statistics cited are for the most recent year of full data—2015.

Table 1. Economic Contribution of Refining Industry, 2015

Region	Refining Employment (jobs)	Average Monthly Earnings	
		Refining ----- (\$)	Economy- Wide
Philadelphia MSA	3,368	\$ 10,652	\$ 4,896
Pennsylvania State	6,737	7,842	4,274
Four-State Region	12,868	7,797	5,182

Note: Based on 2015 numbers, which is the most recent full year of data available.
 Source: U.S. Census Bureau. Quarterly Workforce Indicators.

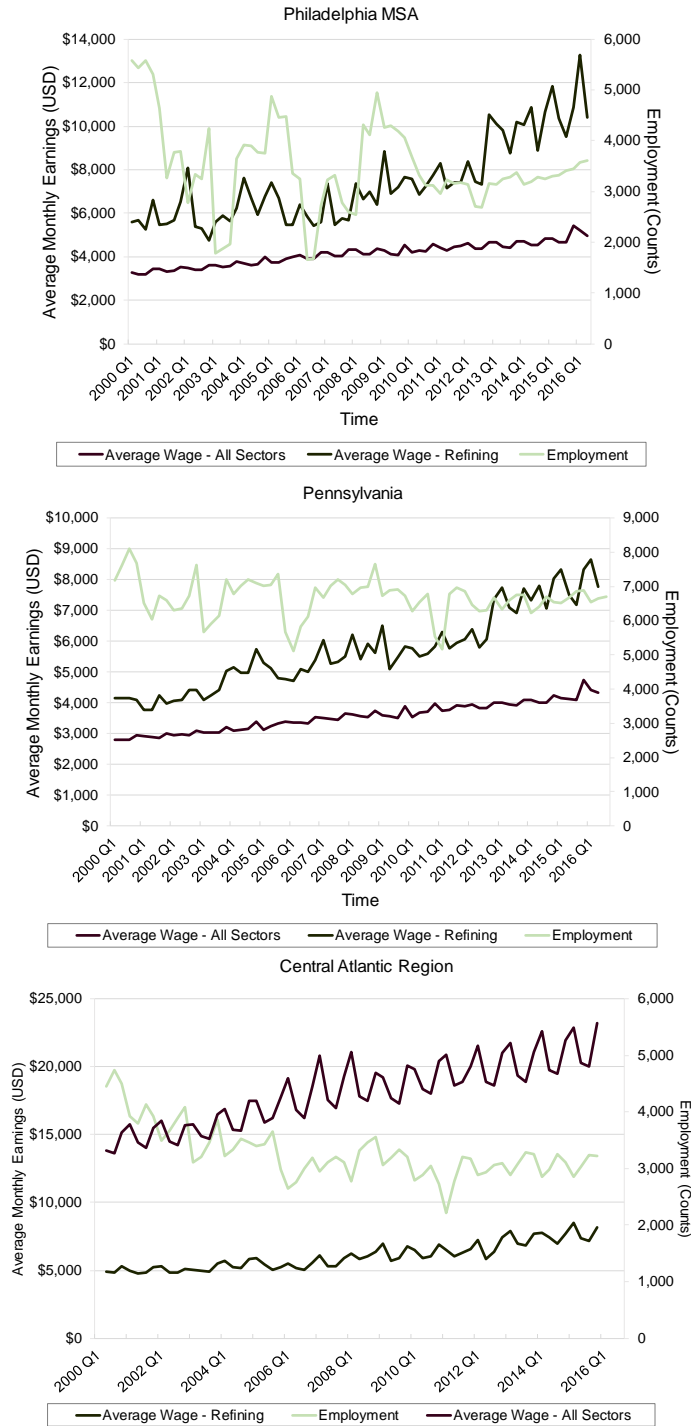


Figure 1. Refining Sector Economic Contribution by Economic Region
 Source: U.S. Census Bureau. Quarterly Workforce Indicators

3. List of Potential Layoffs

The Philadelphia Refining Complex employs a diverse range of professions, occupations, and trade craft workers. Table 2 outlines this employment diversity from internal data provided by PES standardized by the occupational codes defined by BLS in the Standard Occupational Classification (“SOC”) system.⁵ The break-down of this employment information by occupational code can provide a better understanding of how changes in the refinery complex’s operations can ripple through the local, state and regional economies.

For instance, as of the date of this report, PES employs 17 accountants and 27 boiler room operators at the refinery complex. In the event of a plant closure, an accountant, an occupation that can tend to have a more generalized skill set, may be able to find a comparable job in another industry, but a boiler room operator, with a much more specialized set of job skills, may have a more difficult time finding alternative employment. Therefore, in order to assess the likely economic implications of a plant closure, both the facilities’ relative share of the local sector and the occupations of the workers at the facilities need to be considered.

The two most common occupations employed at the refinery complex are “Operators, Chemical Process Equipment” and “Chemical Plant and System Operators” with 200 and 128 employees, respectively. These two occupations account for about 30 percent of the almost 1,100 total refinery complex employment indicating that many of the refinery complex’s workers are in occupations that are industry specific. As a result, employees in these occupations could have difficulty finding alternative employment if the refinery complex’s operations were to suddenly be curtailed. The extent of this difficulty will be assessed in a subsequent section.

The Philadelphia Refinery Complex accounts for about one-third of the 3,300 refining jobs in the local MSA and almost 9 percent of the approximately 12,900 regional refining employment making the Philadelphia Refining Complex the largest east coast refinery employer. More than half of these 1,100 workers employed at the refining complex are union employees.⁶

⁵ Bureau of Labor Statistics. Standard Occupational Classification. <<https://www.bls.gov/soc/>>

⁶ According to PES, in 2016 approximately 56 percent of workers hired were union employees.

The Philadelphia Refinery Complex, like any large refinery, also employs thousands through its contractor work supporting daily operations and maintenance activities as well as various periodic capital upgrades, environmental, and refurbishing projects. Specifically, the facility currently does business with over 1,700 individual contractors and employs approximately 500 full time equivalent contractors at any given time with an average wage rate of \$79 per hour—or an annualized rate of approximately \$164,000 per year.⁷ In addition, approximately every three years, the refining complex completes a major turnaround and doubles this number of contractors to approximately 1,000 full time equivalent workers.⁸ These additional contractors are not included in Table 2, which only shows workers directly employed by PES.

⁷ Based on information provided by PES.

⁸ *Ibid.*

Table 2. Potential Layoffs – Direct Plant Employees

SOC Code	SOC Title	Layoffs	SOC Code	SOC Title	Layoffs
13-2011	Accountants	17	11-3121	Directors, Labor Relations	2
43-3031	Accounting Clerks	1	11-3051	Directors, Manufacturing	30
43-6014	Administrative Assistants, Except Legal, Medical, Exec.	5	11-2031	Directors, Public Affairs	1
43-6011	Administrative Assistants, Executive	3	11-2022	Directors, Sales	1
43-9061	Administrative Clerks	8	17-2071	Electrical Engineers	4
43-1011	Administrative Support Workers, First-Line Supervisors	1	47-2111	Electricians	34
15-1141	Administrators, Database	1	29-2041	Emergency Medical Technicians and Paramedics	60
11-2021	Administrators, Marketing	1	17-2081	Engineers, Environmental	7
23-2011	Aides, Legal	1	17-2141	Engineers, Mechanical	66
15-1121	Analysts, Applications	2	15-1133	Engineers, Software Systems	12
13-2031	Analysts, Budget	2	11-3031	Financial Managers	9
13-2051	Analysts, Corporate Financial	8	47-1011	First-Line Supervisors of Construction Trades/Extraction Workers	10
19-3011	Analysts, Economic Research	1	49-1011	First-Line Supervisors of Mechanics	8
13-1141	Analysts, Job	1	53-7051	Forklift Operators	4
15-1132	Applications, Software Developers	2	11-1021	General and Operations Managers	18
43-3061	Assistants, Procurement	6	43-4161	Human Resources Assistants, Except Payroll and Timekeeping	1
43-5111	Attendants, Scale	1	51-9061	Inspectors	14
23-1011	Attorneys	2	51-8031	Liquid Waste Treatment Plant Operators	20
11-3111	Benefits Managers	1	49-9041	Machinery Maintenance Workers	39
51-8021	Boiler Room Operators	27	49-9043	Maintenance Workers, Machinery	65
17-2041	Chemical Engineers	17	11-9021	Managers, Construction	6
19-4031	Chemical Laboratory Technicians	41	11-9041	Managers, Engineering	3
51-8091	Chemical Plant and System Operators	128	11-9111	Managers, Medical Services	2
19-2031	Chemists	3	11-3131	Managers, Training	5
11-1011	Chief Executives	9	17-2121	Marine Engineers	4
17-2072	Circuit Design Engineers	10	29-1141	Nurses, Registered	3
17-2051	Civil Engineers	1	29-9011	Occupational Health and Safety Specialists	6
43-3051	Clerks, Payroll	1	51-9011	Operators, Chemical Process Equipment	200
49-2094	Commercial Equipment Electrical/Electronics Repairers	35	33-9099	Other Protective Service Workers	5
43-2099	Communications Equipment Operators	4	27-3031	Public Relations Specialists	1
13-1041	Compliance Officers	4	53-7121	Rail Car Loaders	33
11-3021	Computer and Information Systems Managers	3	43-4171	Receptionists	1
15-1151	Computer User Support Specialists	2	43-5061	Schedulers, Production	15
29-9012	Construction Health and Safety Technicians	6	13-1151	Specialists, Training	4
13-1051	Construction Job Cost Estimators	16	53-1021	Supervisors, Warehouse	1
11-3061	Contracting Managers	2	13-2099	Traders, Foreign Exchange	6
11-9161	Coordinators, Emergency Preparedness	1	51-4121	Welders	21
43-4051	Customer Service Representatives	1			
				Grand Total	1,096

4. Average Wages for SOC Occupations within PES

Petroleum refining is a very capital intensive industry. This means that there is often relatively more capital employed in the development and operation of a refinery than labor. While refineries, as an industry, may hire fewer employees relative to other industries, like automotive manufacturing, the wages paid by the refinery sector are typically considerably higher than other types of manufacturing activities.⁹

Table 3 provides average hourly wage and annual salary information by occupational category for the refinery complex's employees as well as the number of employees in each category by union participation.¹⁰ As can be seen PES pays higher wages across all occupational categories for which it employs workers.

Table 3. Average Wages by Occupation at PES and in Labor Market Area

SOC Code	SOC Title	PES				MSA	
		Union Employees	Nonunion Employees	Average Hourly Rate	Average Annual Salary	Average Hourly Rate	Average Annual Salary
11	Management Occupations	-	95	\$ 111.45	\$ 231,822	\$ 66.12	\$ 137,527
13	Business & Financial Operations Occupations	-	58	56.94	118,426	37.76	78,539
15	Computer & Mathematical Occupations	-	26	57.22	119,013	42.85	89,117
17	Architecture & Engineering Occupations	-	99	54.67	113,714	41.51	86,331
19	Life, Physical & Social Science Occupations	41	4	53.20	110,656	36.29	75,491
23	Legal Occupations	-	3	119.31	248,175	52.71	109,630
29	Healthcare Practitioners & Technical Occupations	10	17	59.08	122,888	39.13	81,380
33	Protective Service Occupations	-	5	36.62	76,170	21.87	45,488
43	Office & Administrative Support Occupations	1	99	43.86	91,221	18.90	39,317
47	Construction & Extraction Occupations	34	9	53.22	110,698	27.38	56,956
49	Installation, Maintenance & Repair Occupations	139	8	50.29	104,595	24.24	50,417
51	Production Occupations	396	14	54.84	114,069	19.66	40,883
53	Transportation & Material Moving Occupations	37	1	\$ 28.09	\$ 58,429	\$ 17.40	\$ 36,196

⁹ For example, according to QWI, the average wage rate paid in all manufacturing sectors in the state of Pennsylvania is \$4,274 per month, compared to \$7,842 in the refining sector, specifically, as shown in Table 1.

¹⁰ The data used to develop this table was provided directly by PES from its internal payroll information.

Next, Table 4 shows that refinery complex employees earn significantly more than the average worker in the local economy, not just relative to employees in their respective occupations. In fact, comparing these numbers to Table 1 above shows that the vast majority of workers across the income spectrum earn significantly more than average wages in the MSA, State of Pennsylvania, and Four-State Region. Workers in the 25th percentile of the earnings distribution make approximately \$103,982, while workers in the 75th percentile make approximately \$130,845 per year. The median and average earnings of PES workers are approximately \$107,198 and \$120,670 per year, respectively.¹¹

Table 4. Wage Summary Statistics

PES Salary Statistics		
1st Quartile	\$	103,982
Median		107,198
3rd Quartile		130,845
Average Salary	\$	120,670

¹¹ These numbers include bonuses, overtime, and the value of benefits the employee receives.

5. Re-Employment Assessment

The prior sections of this report, and its component charts and tables, underscore the importance of the Philadelphia Refinery Complex to the local, state and regional economy. The refinery complex is also an important, if not anchor, component of the east coast refinery industry. Thus, any action that would result in a curtailment or cessation of refinery activities at the complex would have important and disruptive economic impacts.

Perhaps the most immediate, and most important negative economic impact would be the employment dislocations that would arise from a refinery shut down. While it is true that many employees could find alternative employment in the event of a refinery shut down (although likely at a lower wage), there are other employees, engaged in more refinery-specific and specialized occupations and crafts that could face more difficulties in finding alternative employment over an extended period of time and/or find employment in another sector paying significantly lower wages. This section of the report estimates, on a per occupation basis, the difficulty some employees may have in finding alternative employment in the event of a refinery complex shut down.

The analysis characterizes potential re-employment opportunities, by occupation, in four different categories that include “good” re-employment opportunities, “fair” re-employment opportunities, “fair-to-difficult” re-employment opportunities, and “difficult” re-employment opportunities. Job opening/availability data used to make this re-employment determination is taken from the Pennsylvania Center for Workforce Information & Analysis Occupational Employment Projections.¹² The employment opportunity projections data utilized for this analysis spans a period from 2014 to 2024 and focuses on three geographically-expanding levels that include (1) the Philadelphia County Workforce Development Area (“WDA”), (2) Philadelphia Metropolitan Division,¹³ and (3) the entire Commonwealth of Pennsylvania.

¹² Pennsylvania Center for Workforce Information & Analysis Occupational Employment Projections are provided as annual average estimates in future years. These annual estimates are then divided by four to provide quarterly job opening estimates.

¹³ WDA is as defined by the Pennsylvania Department of Labor and Industry to include Philadelphia County.

For purposes of this analysis, a “good” re-employment opportunity is defined as a situation in which the projected occupational-specific job openings reported during the quarter under investigation in the WDA is greater than the occupational-specific layoffs that are estimated to arise from a refinery complex shut-down.

A “fair” re-employment opportunity is defined as a situation in which the projected occupational-specific job openings reported during the quarter under investigation in the Philadelphia Metropolitan Division is greater than the occupational-specific layoffs that are estimated to arise from a refinery complex shut-down.

A “fair-to-difficult” re-employment opportunity is defined as a situation in which the projected occupational-specific job openings reported during the quarter under investigation in the entire state is greater than the occupational-specific layoffs that are estimated to arise from a refinery complex shut-down.

Lastly, a “difficult” re-employment opportunity is defined as an employment situation that is not inclusive of, or cannot be categorized into the other prior-three re-employment designations on a per occupational basis.

A shut down of the Philadelphia Refinery Complex is estimated to result in 1,096 layoffs. About half of those laid-off positions (533 employees) are estimated to face “difficult” re-employment opportunities. This result is not surprising considering that many of the refinery complex’s occupations are specific to refinery operations. Further, another 230 employees (21 percent of total) are estimated to face “fair-to-difficult” re-employment opportunities. Thus, almost 70 percent of the refinery complex’s employment would likely face “difficult” to “fair-to-difficult” re-employment opportunities if the refinery were to cease operations. The balance of the employees are estimated to face “fair” (18 percent) to “good” (12 percent) re-employment opportunities if the refinery complex were to cease operations. The majority of workers facing difficult re-employment prospects are union members.

Table 5. Re-Employment Prospects

SOC Code	SOC Title	Company Layoffs	3-Month Openings		
			WDA	Metro Division	PA
Good Re-Employment Prospects					
13-2011	Accountants	17	68	220	542
43-3031	Accounting Clerks	1	16	55	175
43-6014	Administrative Assistants, Except Legal, Medical, Exec.	5	33	112	333
43-6011	Administrative Assistants, Executive	3	10	26	65
43-9061	Administrative Clerks	8	107	256	768
43-1011	Administrative Support Workers, First-Line Supervisors	1	40	102	283
15-1141	Administrators, Database	1	5	18	44
11-2021	Administrators, Marketing	1	7	20	45
23-2011	Aides, Legal	1	24	38	77
15-1121	Analysts, Applications	2	23	96	203
13-2031	Analysts, Budget	2	4	7	17
13-2051	Analysts, Corporate Financial	8	16	46	86
19-3011	Analysts, Economic Research	1	2	2	6
13-1141	Analysts, Job	1	5	10	27
15-1132	Applications, Software Developers	2	15	46	133
43-5111	Attendants, Scale	1	2	6	22
23-1011	Attorneys	2	49	82	158
11-3111	Benefits Managers	1	1	3	7
19-2031	Chemists	3	3	24	42
17-2051	Civil Engineers	1	13	42	128
43-3051	Clerks, Payroll	1	5	18	53
13-1041	Compliance Officers	4	9	20	50
11-3021	Computer and Information Systems Managers	3	10	37	81
15-1151	Computer User Support Specialists	2	15	64	158
11-3061	Contracting Managers	2	2	5	14
43-4051	Customer Service Representatives	1	80	277	826
11-3121	Directors, Labor Relations	2	5	15	35
11-2031	Directors, Public Affairs	1	5	8	19
11-2022	Directors, Sales	1	8	29	71
11-3031	Financial Managers	9	18	52	114
49-1011	First-Line Supervisors of Mechanics	8	9	32	109
53-7051	Forklift Operators	4	7	29	220
11-1021	General and Operations Managers	18	50	182	499
43-4161	Human Resources Assistants, Except Payroll/Timekeeping	1	3	7	19
11-9041	Managers, Engineering	3	5	17	48
11-9111	Managers, Medical Services	2	18	50	143
29-1141	Nurses, Registered	3	199	434	1,222
27-3031	Public Relations Specialists	1	9	21	47
43-4171	Receptionists	1	41	137	343
13-1151	Specialists, Training	4	11	34	85
Total		133	952	2,679	7,317

Table 5 (continued). Re-Employment Prospects

SOC Code	SOC Title	Company Layoffs	3-Month Openings		
			WDA	Metro Division	PA
Fair Re-Employment Prospects					
43-3061	Assistants, Procurement	6	3	6	21
11-1011	Chief Executives	9	N/A	23	63
13-1051	Construction Job Cost Estimators	16	6	29	97
11-9161	Coordinators, Emergency Preparedness	1	N/A	1	2
17-2071	Electrical Engineers	4	3	14	43
47-2111	Electricians	34	10	57	171
17-2081	Engineers, Environmental	7	2	11	33
15-1133	Engineers, Software Systems	12	7	45	128
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	10	6	26	98
51-9061	Inspectors	14	7	34	140
49-9041	Machinery Maintenance Workers	39	11	44	189
11-9021	Managers, Construction	6	3	14	45
43-5061	Schedulers, Production	15	10	36	111
13-2099	Traders, Foreign Exchange	6	4	7	14
51-4121	Welders	21	7	27	163
Total		200	79	374	1,318
Fair-to-Difficult Re-Employment Prospects					
51-8021	Boiler Room Operators	27	3	4	27
17-2072	Circuit Design Engineers	10	3	8	22
11-3051	Directors, Manufacturing	30	3	12	50
29-2041	Emergency Medical Technicians and Paramedics	60	11	23	105
17-2141	Engineers, Mechanical	66	9	36	102
51-8031	Liquid Waste Treatment Plant Operators	20	N/A	11	41
11-3131	Managers, Training	5	2	4	9
29-9011	Occupational Health and Safety Specialists	6	2	5	15
33-9099	Other Protective Service Workers	5	3	3	11
53-1021	Supervisors, Warehouse	1	N/A	N/A	64
Total		230	36	106	446
Difficult Re-Employment Prospects					
17-2041	Chemical Engineers	17	1	7	14
19-4031	Chemical Laboratory Technicians	41	4	17	37
51-8091	Chemical Plant and System Operators	128	N/A	5	14
49-2094	Commercial Equipment Electrical and Electronics Repairers	35	2	5	18
43-2099	Communications Equipment Operators	4	N/A	N/A	1
29-9012	Construction Health and Safety Technicians	6	1	N/A	4
49-9043	Maintenance Workers, Machinery	65	5	7	32
17-2121	Marine Engineers	4	N/A	N/A	N/A
51-9011	Operators, Chemical Process Equipment	200	3	17	37
53-7121	Rail Car Loaders	33	1	1	5
Total		533	17	59	162

6. Education, Work Experience and Industry Data for Dominant Philadelphia Refining Complex Occupations

Different occupations have significantly different educational and prior experience requirements that can often tend to be correlated with their compensation (salary). For instance, chemical engineers are paid an attractive salary relative to other occupations, but require a considerable level of education and certifications in order to be successfully employed in the petroleum refining industry. There are some instances, which are very rare in today's manufacturing sector, where certain occupations do not require a college education, and yet are paid relatively high salaries given the considerable on-the-job and other training. Employment at the Philadelphia Refinery Complex is primarily concentrated in occupations that are highly skilled, but do not require a college education. Therefore, in Figures 2 and 3, we examine the educational and experience level of workers in the two most common occupational codes at the PES complex (from Table 2). As previously discussed, the two most common occupations employed at the refinery complex are "Operators, Chemical Process Equipment" and "Chemical Plant and System Operators" with 200 and 128 employees, respectively, and these two occupations account for about 30 percent of the almost 1,100 total refinery complex employment.

Figure 2 utilizes data from the U.S. Bureau of Labor Statistics that tracks the education level of workers by occupation. This data comes from the American Community Survey Public Use Microdata by way of the BLS Employment Projections program, and includes all workers age 25 and older in the United States for years 2014 and 2015. As illustrated in Figure 2, over 40 percent of the workers in the Chemical Process Equipment Operator occupation have a high school diploma or less, and less than five percent have more than a bachelor's degree. A similar outcome arises for Chemical Plant and System Operators.

Next, Figure 3 utilizes data from the O*NET Resource Center's Education, Training, and Experience data collected by questionnaires distributed to job incumbents.¹⁴ Figure 3 illustrates that in both of these occupations, between 15 and 20

¹⁴ The data for these occupations was last updated by O*NET in 2015.

percent of workers have no prior experience within the respective occupation, while over 85 percent have less than six years of experience. Thus, these occupations generally, and the Philadelphia Refining Complex specifically, provide well-paying jobs for workers without significant education and work requirement.

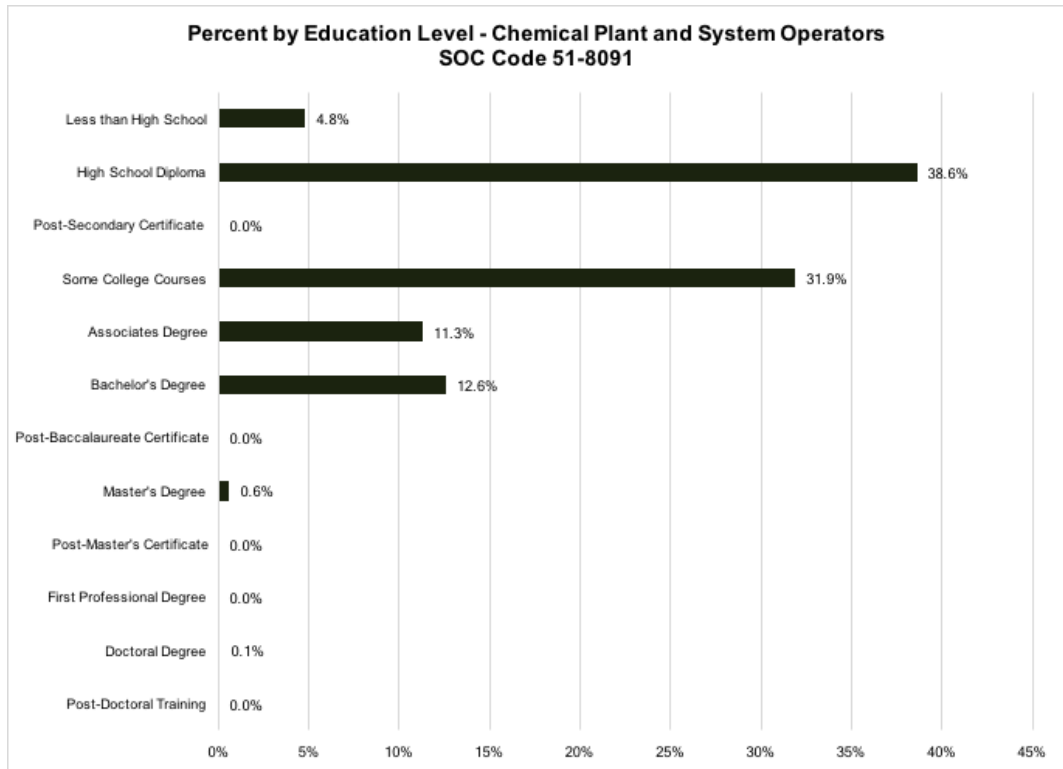
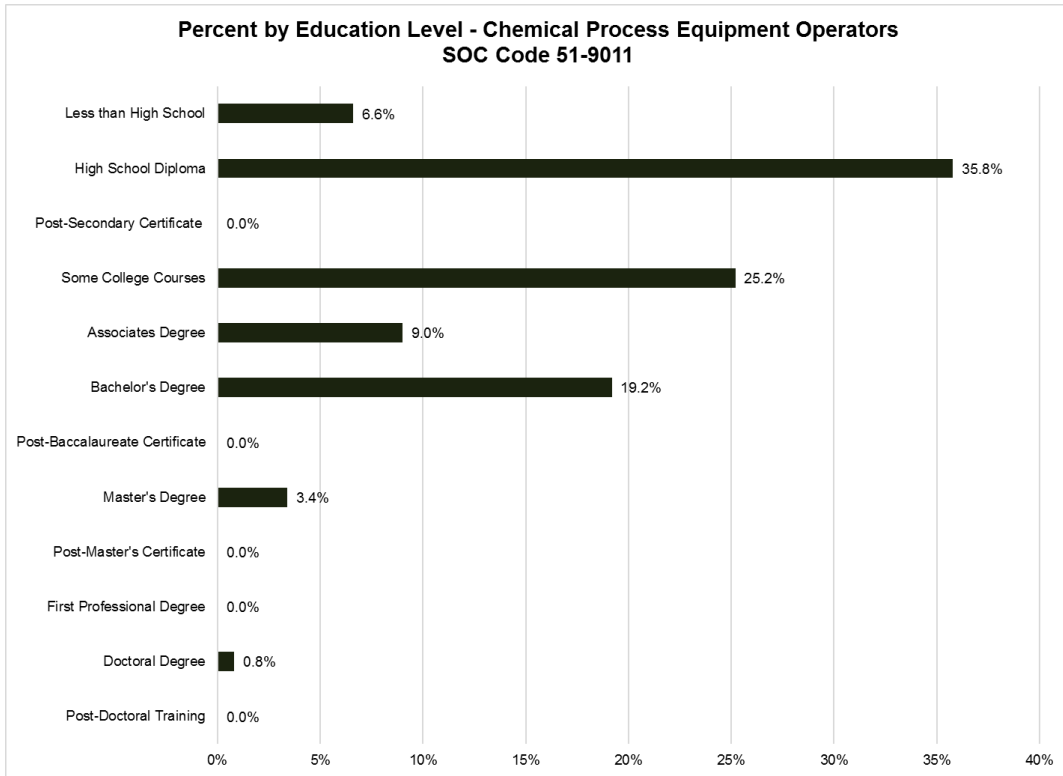


Figure 2. Education Level for Two Largest Occupations within Philadelphia Refining Complex

Source: U.S. Bureau of Labor Statistics

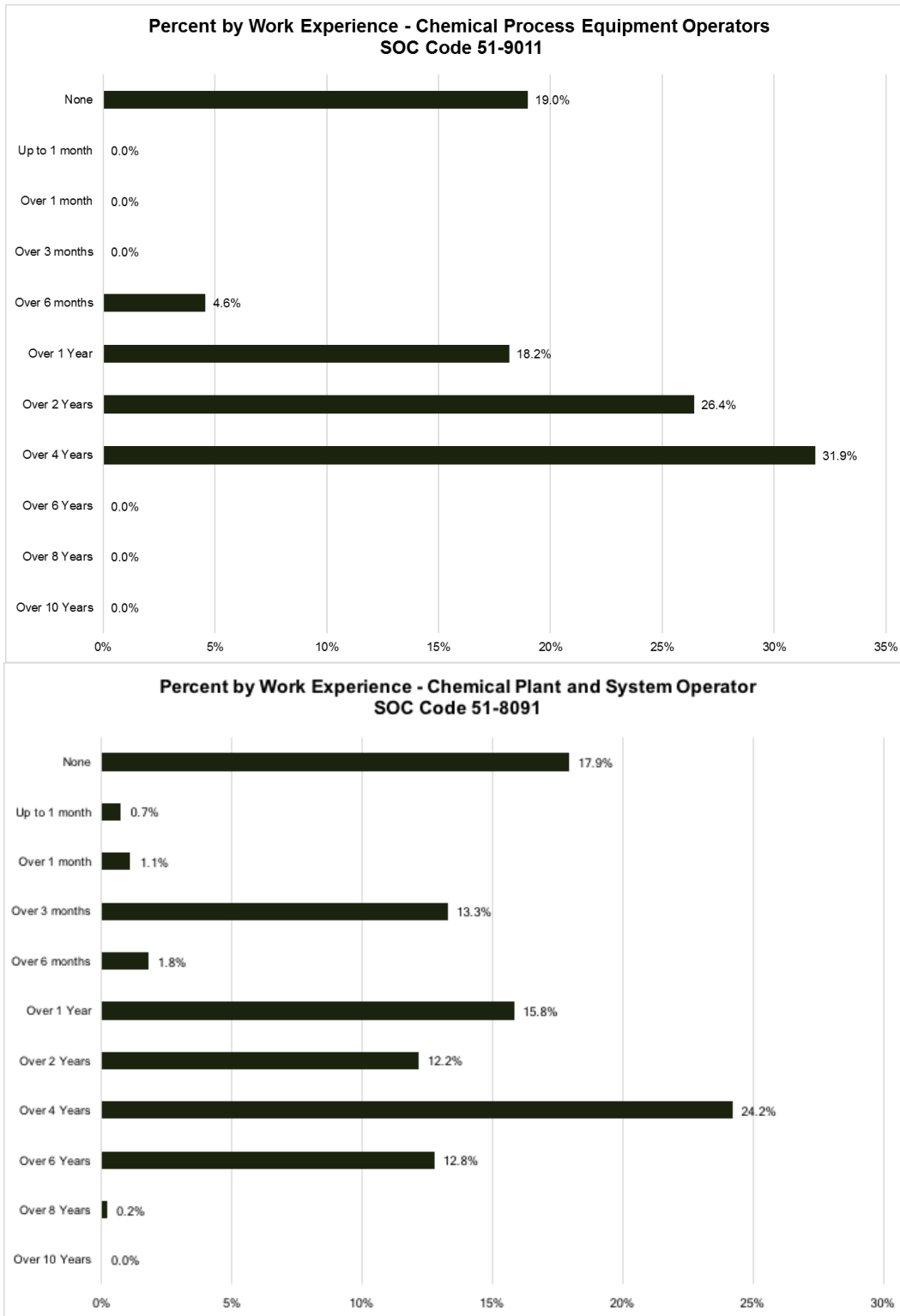


Figure 3. Work Experience for Two Largest Occupations within Philadelphia Refining Complex
Source: O*Net

7. Economic Impact of PES Philadelphia Refinery Complex Closing

In this final section, we show the estimated economic impact in the event the refining complex were to close. We proceed in two ways. First, we show the estimated economic impact to four expanding geographic regions associated with 100 jobs lost for a one-year period.

Table 6 shows the estimated economic impact for each 100 employees at the Philadelphia Refining Complex that are estimated to be without employment for a one-year period. In other words, this shows the estimated economic impact for each 100 job-years of employment lost. Results are as follows:

- The Philadelphia MSA will lose 585 jobs, almost \$60 million in labor income, over \$627 million in output, and almost \$12 million in state and local taxes.
- The state of Pennsylvania will lose 1,333 jobs, over \$128 million in labor income, over \$797 million in output, and over \$21 million in state and local taxes.
- The Central Atlantic region will lose 1,483 jobs, over \$140 million in labor income, over \$826 million in output, and over \$23 million in state and local taxes.
- The U.S. economy in aggregate will lose 2,669 jobs, over \$227 million in labor income, over \$1 billion in economic output, and over \$45 million in state and local taxes.

Put more simply, each job at the refinery complex supports more than five jobs in the Philadelphia MSA region, 13 jobs in the state of Pennsylvania, 14 jobs in the Central Atlantic region, and 26 jobs in the United States.

These negative economic consequences of a plant closure are not just restricted to the refining and related industries along the oil and gas industry's value chain; this closure would impact many other seemingly unrelated industries in the economy including wholesale trade, truck transportation, hospitals, restaurants, real estate, retail outlets, among others. The industries most impacted are presented in the Appendix.

Table 6. Economic Impacts for Every 100 Jobs Lost

Impact Type	Employment (jobs)	Labor		Value		State & Local	
		Income		Added		Output	Local Tax
		----- (\$) -----					
Philadelphia MSA							
Direct	(100)	\$ (25,310,073)	\$ (134,797,192)	\$ (533,006,786)	\$ (6,173,940)		
Indirect	(226)	(19,755,542)	(28,932,688)	(53,529,405)	(3,318,871)		
Induced	(259)	(14,567,642)	(25,184,491)	(40,561,125)	(2,320,831)		
Total	(585)	\$ (59,633,257)	\$ (188,914,372)	\$ (627,097,316)	\$ (11,813,643)		
Pennsylvania							
Direct	(100)	\$ (25,310,120)	\$ (134,797,371)	\$ (533,006,786)	\$ (5,921,132)		
Indirect	(623)	(72,469,624)	(119,409,756)	(176,574,765)	(10,959,901)		
Induced	(610)	(30,660,928)	(51,491,636)	(88,139,730)	(4,905,753)		
Total	(1,333)	\$ (128,440,673)	\$ (305,698,763)	\$ (797,721,281)	\$ (21,786,785)		
Central Atlantic Region							
Direct	(100)	\$ (25,310,120)	\$ (134,797,371)	\$ (533,006,786)	\$ (5,921,132)		
Indirect	(698)	(79,065,112)	(123,986,520)	(191,289,774)	(11,744,745)		
Induced	(686)	(35,893,711)	(60,459,233)	(102,583,489)	(5,785,539)		
Total	(1,483)	\$ (140,268,944)	\$ (319,243,123)	\$ (826,880,049)	\$ (23,451,413)		
United States							
Direct	(100)	\$ (25,310,121)	\$ (134,797,348)	\$ (533,006,786)	\$ (5,437,289)		
Indirect	(1,156)	(129,531,103)	(191,449,717)	(317,541,169)	(27,921,548)		
Induced	(1,413)	(72,891,494)	(127,257,132)	(233,287,633)	(11,985,846)		
Total	(2,669)	\$ (227,732,718)	\$ (453,504,197)	\$ (1,083,835,588)	\$ (45,344,679)		

Next, we present three estimates of the negative economic effects if the plant were to close in its entirety. The economic effect of such a large closure on a state's economy can be influenced by a multitude of factors including, but not limited to: the current economic health of the state's economy, the availability of alternative employment in the same or similar industry, the availability of alternative employment within one's specific occupation (potentially in another industry), and the availability of alternative employment in other parts of the country. While it is not possible to know the specifics of each employee's re-employment prospects, we proceed by estimating a range of potential economic impacts. Specifically, we consider three estimates: a high estimate, baseline estimate, and low estimate.

7.1 High Estimate

First, we present a high estimate. For purposes of this estimate, all workers laid off at the refining complex either go unemployed for an entire year or leave the local labor market altogether (likely for employment opportunities in other parts of the country). As shown in Table 7, the Pennsylvania economy would contract by 14,610 jobs, more than \$1.4 billion in labor income, \$3.4 billion in value added, and over \$8.7 billion in economic output. The state and local governments would lose more than \$238 million dollars in tax revenues. This is likely a high estimate of the negative economic impacts, because many of these workers will likely find other employment in the Pennsylvania economy within the first year of being unemployed. Therefore, two additional scenarios will be considered to take this into account.

Table 7. High Estimate: Economic Losses of Closure

Impact Type	Employment (jobs)	Labor Income	Value Added (\$)	Output	State & Local Local Tax
Maximum Aggregate Economic Impacts - State of Pennsylvania					
Direct	(1,096)	\$ (277,398,915)	\$ (1,477,379,186)	\$ (5,841,754,375)	\$ (64,895,607)
Indirect	(6,832)	(794,267,079)	(1,308,730,926)	(1,935,259,424)	(120,120,515)
Induced	(6,682)	(336,043,771)	(564,348,331)	(966,011,441)	(53,767,053)
Total	(14,610)	\$ (1,407,709,776)	\$ (3,350,458,442)	\$ (8,743,025,240)	\$ (238,783,164)

7.2 Baseline Estimate

Second, we present what we believe is the most reasonable “baseline” estimate of the negative economic impacts for the state that take into account both specific information on the Refining Complex’s employees alongside local employment data. Specifically, for the baseline estimate, we utilize the economic multipliers shown in Table 7 alongside re-employment prospects in Section 5. This will give a more conservative, and likely more realistic, estimate of the economic consequences of a plant closure on the state of Pennsylvania relative to the high estimate because it takes into account the fact that many workers will find employment within a year of being laid off. Specifically, for each employee laid off in the event of plant closure with a “good” re-employment prospect, this analysis assumes that the person would take one quarter (3-months) to find an alternative job, and would find a job at the same wage rate. For workers with “fair” and “fair-to-difficult” job prospects, we assume that these workers find another comparable job with a similar wage rate in two quarters (6-months) and three quarters (9 months) respectively. For workers with “difficult” job prospects, we assume that these workers either go unemployed for an entire year or leave the Pennsylvania economy for other employment.

Table 8 presents these results. Under this scenario, the Pennsylvania economy would contract by 10,757 jobs, more than \$1.0 billion in labor income, \$2.5 billion in value added, and over \$6.4 billion in economic output. The state and local governments would lose more than \$175.8 million dollars in tax revenues.

Table 8. Baseline Estimate: Economic Losses of Closure

Impact Type	Employment (jobs)	Labor Income	Value Added (\$)	Output	State & Local Local Tax
Estimated Aggregate Economic Impacts - State of Pennsylvania					
Direct	(807)	\$ (204,253,938)	\$ (1,087,821,543)	\$ (4,301,391,490)	\$ (47,783,832)
Indirect	(5,031)	(584,833,500)	(963,642,719)	(1,424,967,208)	(88,446,951)
Induced	(4,920)	(247,435,226)	(415,540,085)	(711,292,041)	(39,589,673)
Total	(10,757)	\$ (1,036,522,672)	\$ (2,467,004,347)	\$ (6,437,650,739)	\$ (175,820,447)

7.3 Low Estimate

Third, we will present a low estimate of the negative economic consequences to the state. For this low estimate, we will utilize the economic multipliers shown in Table 7 alongside unemployment duration statistics from the U.S. Bureau of Labor Statistics. Averaging the unemployment durations over the last five years for the United States, we find that after being laid off from a job, 26 percent of workers find another job within 5 weeks, 26 percent between 5 and 14 weeks, 15 percent between 15 and 26 weeks, and 33 percent are unemployed for more than 26 weeks.¹⁵

These results are presented in Table 9. Under this low estimate, the Pennsylvania economy would contract by 5,399 jobs, more than \$520 million in labor income, over \$1.2 billion in value added, and over \$3.2 billion in economic output. The state and local governments would lose more than \$88.2 million dollars in tax revenues.

This estimate is low for three reasons. First, it assumes that all workers upon re-employment will earn the same amount as their prior job in the high paying refining sector. In reality, it is likely that many of these employees will find alternative employment at a lower wage rate. Second, this analysis assumes that all of these workers find re-employment within Pennsylvania. In reality, while some of these workers will obtain work locally, others will move outside of the state for work therefore leaving the local economy. Third, these labor market statistics are averages over the entire United States for all occupations and sectors. In the event the PES Refining Complex were to close, there would be 1,100 direct workers and approximately 500 full time equivalent contractors from the same sector of the economy all seeking re-employment simultaneously. Thus, this would likely decrease their employment prospects within the region. Therefore, this low estimate can be considered a “best case scenario” for the Pennsylvania economy in the event that the refining complex were to close.

¹⁵ We take the mid-point of these employment durations for purposes of calculations. For the category of more than 26 weeks, we cap this category as 27 to 52 weeks.

Table 9. Low Estimate: Economic Losses of Closure

Impact Type	Employment (jobs)	Labor Income	Value Added	Output	State & Local Local Tax
		----- (\$) -----			
Estimate Based on BLS Unemployment Statistics - State of Pennsylvania					
Direct	(405)	\$ (102,518,459)	\$ (545,995,783)	\$ (2,158,940,160)	\$ (23,983,503)
Indirect	(2,525)	(293,537,692)	(483,668,359)	(715,214,818)	(44,393,000)
Induced	(2,470)	(124,191,869)	(208,566,502)	(357,009,344)	(19,870,717)
Total	(5,399)	\$ (520,248,024)	\$ (1,238,230,645)	\$ (3,231,164,321)	\$ (88,247,216)

Results in all three of these scenarios only include negative economic consequences in the first year after the refining complex ceases operations. While yearly effects in the long run will likely be smaller than the initial negative effect, the sum of long-term economic effects will persist and be significantly larger than the short-term effects shown here. While the exact magnitude of such a large closure and the dynamics in the short-term and long-term are difficult to quantify precisely, we can say with a high level of confidence that the closure of this plant would cause serious economic harm both directly to the workers employed at this facility and also to the economy at large.

8. Conclusions

In this report, we assess potential economic implications in the event that the PES Philadelphia Refining Complex were to discontinue operations. Utilizing data provided by PES on their specific operations alongside publicly available labor market data, a consistent picture is painted. The PES Facility is a significant economic driver to the Philadelphia MSA, the state of Pennsylvania, and the broader regional economy (including DE, MD, NJ, PA, NY, and Washington DC).

We show that the PES Refinery provides high paying jobs in specialized occupations. These jobs are unique in that they not only provide a significant opportunity for workers to earn well above average earnings, but also workers do not need advanced degrees or years of prior work experience to enter this field. In the event of a plant closure, more than half of these workers would have difficult job prospects within their current occupation due to the availability of other similar jobs within the local economy. Many of these workers would likely either take other jobs in other industries, at likely lower wages, or leave the local labor market altogether.

In the event of a plant closure, there would be significant economic impacts, not only for workers at the refining complex, but also for the local economy more broadly. Within the Philadelphia MSA, for every one hundred job-years lost, the economy is estimated to lose 585 jobs, more than \$59 million in local labor income, and \$11.8 million in state and local tax revenues. The aggregate output and value added of the MSA would decrease by \$627 million and \$189 million respectively. The effects on the Pennsylvania economy as a whole are larger. For every one hundred job-years lost, the economy is estimated to lose more than 1,300 jobs, more than \$128 million in local labor income and almost \$22 million in state and local tax revenues.

In the event that the complex were to cease operations completely, the economic impacts to Pennsylvania would be significant. Our baseline estimate suggests that in the first year after operations end the economy would contract by almost 11,000 jobs, more than \$1 billion in labor income, \$2.4 billion in value added, \$6.4 billion in output and \$175 million in state and local tax revenues would be lost. In the long-term, the sum of these negative economic consequences would be even greater.

The PES Philadelphia Refinery Complex is an important component of the local Philadelphia economy, the state of Pennsylvania, and the larger regional economy. A plant closure would indeed induce serious economic harm on the region. While the exact magnitude of such a large closure and the dynamics in the short-term and long-term are difficult to quantify precisely, we can say with a high level of confidence that the closure of this plant would cause significant economic harm both directly to the workers employed at this facility, and also to the economy at large.

Appendix

Table A1. Detailed Results: Employment, Philadelphia MSA

Industry	Direct	Indirect	Induced	Total
Petroleum refineries	(100)	(1)	(0)	(101)
Wholesale trade	-	(36)	(6)	(43)
Extraction of natural gas and crude petroleum	-	(42)	-	(42)
Maintenance and repair construction of nonresidential structures	-	(35)	(1)	(36)
Truck transportation	-	(16)	(2)	(17)
Hospitals	-	-	(15)	(15)
Full-service restaurants	-	(2)	(12)	(14)
Real estate	-	(3)	(10)	(13)
Limited-service restaurants	-	(2)	(10)	(11)
Services to buildings	-	(5)	(4)	(9)
Retail - Food and beverage stores	-	(0)	(9)	(9)
Management of companies and enterprises	-	(7)	(2)	(9)
Offices of physicians	-	-	(8)	(8)
Pipeline transportation	-	(8)	-	(8)
All other food and drinking places	-	(1)	(7)	(8)
Employment services	-	(4)	(4)	(8)
Retail - General merchandise stores	-	(0)	(7)	(7)
Individual and family services	-	-	(7)	(7)
Other financial investment activities	-	(1)	(6)	(7)
Personal care services	-	-	(6)	(6)
Automotive repair and maintenance, except car washes	-	(1)	(4)	(5)
Home health care services	-	-	(5)	(5)
Junior colleges, colleges, universities, and professional schools	-	(0)	(5)	(5)
Retail - Clothing and clothing accessories stores	-	(1)	(4)	(5)
Nursing and community care facilities	-	-	(5)	(5)
Religious organizations	-	-	(5)	(5)
Child day care services	-	-	(5)	(5)
Retail - Miscellaneous store retailers	-	(1)	(4)	(5)
Accounting, tax preparation, bookkeeping, and payroll services	-	(3)	(2)	(5)
Other personal services	-	(0)	(4)	(5)
Other	-	(56)	(101)	(158)
Total	(100)	(226)	(259)	(585)

Table A1 (continued). Detailed Results: Labor Income, Philadelphia MSA

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Petroleum refineries	\$(25,310,073)	\$ (295,718)	\$ (18,959)	\$(25,624,750)
Wholesale trade	-	(3,971,681)	(710,645)	(4,682,326)
Maintenance and repair construction of nonresidential structures	-	(2,593,732)	(99,655)	(2,693,387)
Extraction of natural gas liquids	-	(2,234,899)	(2,121)	(2,237,020)
Extraction of natural gas and crude petroleum	-	(2,023,838)	(1,921)	(2,025,759)
Management of companies and enterprises	-	(1,110,769)	(283,985)	(1,394,754)
Hospitals	-	-	(1,292,416)	(1,292,416)
Truck transportation	-	(1,056,673)	(109,968)	(1,166,641)
Pipeline transportation	-	(1,091,873)	(3,007)	(1,094,880)
Offices of physicians	-	-	(888,559)	(888,559)
Radio and television broadcasting	-	(289,735)	(264,442)	(554,177)
Other financial investment activities	-	(57,034)	(390,258)	(447,293)
Legal services	-	(147,999)	(252,505)	(400,504)
Real estate	-	(93,700)	(303,272)	(396,971)
Junior colleges, colleges, universities, and professional schools	-	(4,364)	(390,354)	(394,717)
Accounting, tax preparation, bookkeeping, and payroll services	-	(227,315)	(152,543)	(379,858)
Management consulting services	-	(209,941)	(164,504)	(374,445)
Nondepository credit intermediation and related activities	-	(145,117)	(225,193)	(370,310)
Monetary authorities and depository credit intermediation	-	(100,547)	(249,067)	(349,614)
Employment services	-	(173,134)	(174,249)	(347,383)
Insurance carriers	-	(66,466)	(273,278)	(339,744)
Full-service restaurants	-	(46,708)	(290,073)	(336,781)
Architectural, engineering, and related services	-	(234,217)	(97,235)	(331,451)
Automotive repair and maintenance, except car washes	-	(78,014)	(230,329)	(308,343)
Retail - Food and beverage stores	-	(2,287)	(290,922)	(293,208)
Services to buildings	-	(168,527)	(123,341)	(291,868)
Religious organizations	-	-	(287,408)	(287,408)
Home health care services	-	-	(272,682)	(272,682)
Postal service	-	(189,870)	(71,669)	(261,538)
Limited-service restaurants	-	(34,683)	(211,852)	(246,534)
Other	-	(3,106,698)	(6,441,231)	(9,547,928)
Total	\$(25,310,073)	\$(19,755,542)	\$(14,567,642)	\$(59,633,257)

Table A1 (continued). Detailed Results: Value Added, Philadelphia MSA

Industry	Direct	Indirect	Induced	Total
	(\$)			
Petroleum refineries	\$ (134,797,192)	\$ (1,574,946)	\$ (100,971)	\$ (136,473,109)
Wholesale trade	-	(7,045,530)	(1,260,643)	(8,306,173)
Maintenance and repair construction of nonresidential structures	-	(3,253,781)	(125,015)	(3,378,796)
Owner-occupied dwellings	-	-	(3,161,646)	(3,161,646)
Real estate	-	(671,563)	(2,173,608)	(2,845,171)
Extraction of natural gas liquids	-	(2,762,861)	(2,622)	(2,765,483)
Extraction of natural gas and crude petroleum	-	(2,249,472)	(2,135)	(2,251,607)
Management of companies and enterprises	-	(1,352,674)	(345,832)	(1,698,506)
Hospitals	-	-	(1,439,414)	(1,439,414)
Truck transportation	-	(1,212,137)	(126,147)	(1,338,284)
Pipeline transportation	-	(1,044,962)	(2,878)	(1,047,840)
Insurance carriers	-	(200,802)	(825,612)	(1,026,414)
Monetary authorities and depository credit intermediation	-	(291,124)	(721,152)	(1,012,276)
Offices of physicians	-	-	(849,293)	(849,293)
Electric power transmission and distribution	-	(394,165)	(289,531)	(683,696)
Legal services	-	(243,959)	(416,227)	(660,186)
Limited-service restaurants	-	(84,433)	(515,742)	(600,175)
Wired telecommunications carriers	-	(145,659)	(409,090)	(554,748)
Radio and television broadcasting	-	(287,782)	(262,660)	(550,441)
Other financial investment activities	-	(68,421)	(468,168)	(536,588)
Employment services	-	(244,662)	(246,237)	(490,900)
Retail - Nonstore retailers	-	(46,148)	(440,047)	(486,195)
Accounting, tax preparation, bookkeeping, and payroll services	-	(270,010)	(181,194)	(451,204)
Junior colleges, colleges, universities, and professional schools	-	(4,874)	(436,024)	(440,898)
Nondepository credit intermediation and related activities	-	(161,811)	(251,100)	(412,911)
Retail - Food and beverage stores	-	(3,091)	(393,185)	(396,276)
Insurance agencies, brokerages, and related activities	-	(88,741)	(287,173)	(375,914)
Full-service restaurants	-	(51,549)	(320,137)	(371,686)
Management consulting services	-	(203,619)	(159,551)	(363,170)
Electric power generation - Nuclear	-	(208,959)	(153,489)	(362,447)
Other	-	(4,764,954)	(8,817,966)	(13,582,929)
Total	\$ (134,797,192)	\$ (28,932,688)	\$ (25,184,491)	\$ (188,914,372)

Table A1 (continued). Detailed Results: Output, Philadelphia MSA

Industry	Direct	Indirect	Induced	Total
	(\$)			
Petroleum refineries	\$ (533,006,786)	\$ (6,227,556)	\$ (399,251)	\$ (539,633,594)
Wholesale trade	-	(10,346,738)	(1,851,322)	(12,198,060)
Maintenance and repair construction of nonresidential structures	-	(6,308,105)	(242,366)	(6,550,471)
Extraction of natural gas and crude petroleum	-	(5,038,333)	(4,782)	(5,043,115)
Owner-occupied dwellings	-	-	(4,723,692)	(4,723,692)
Extraction of natural gas liquids	-	(4,150,240)	(3,939)	(4,154,179)
Real estate	-	(832,756)	(2,695,332)	(3,528,088)
Truck transportation	-	(2,771,011)	(288,379)	(3,059,389)
Pipeline transportation	-	(2,740,073)	(7,546)	(2,747,619)
Management of companies and enterprises	-	(1,976,952)	(505,438)	(2,482,390)
Hospitals	-	-	(2,407,276)	(2,407,276)
Insurance carriers	-	(318,129)	(1,308,015)	(1,626,144)
Electric power transmission and distribution	-	(923,112)	(678,065)	(1,601,178)
Monetary authorities and depository credit intermediation	-	(377,658)	(935,509)	(1,313,167)
Other financial investment activities	-	(161,389)	(1,104,305)	(1,265,694)
Offices of physicians	-	-	(1,227,899)	(1,227,899)
Limited-service restaurants	-	(140,277)	(856,853)	(997,130)
Religious organizations	-	-	(863,992)	(863,992)
Wired telecommunications carriers	-	(225,811)	(634,200)	(860,010)
Legal services	-	(316,423)	(539,860)	(856,284)
Nondepository credit intermediation and related activities	-	(271,709)	(421,640)	(693,350)
Retail - Nonstore retailers	-	(65,358)	(623,220)	(688,578)
Full-service restaurants	-	(94,942)	(589,622)	(684,564)
Junior colleges, colleges, universities, and professional schools	-	(7,409)	(662,798)	(670,207)
Insurance agencies, brokerages, and related activities	-	(157,842)	(510,792)	(668,634)
Wireless telecommunications carriers (except satellite)	-	(155,243)	(460,148)	(615,392)
Employment services	-	(303,644)	(305,598)	(609,242)
Radio and television broadcasting	-	(308,892)	(281,927)	(590,818)
Retail - Food and beverage stores	-	(4,582)	(582,901)	(587,483)
Architectural, engineering, and related services	-	(402,553)	(167,119)	(569,671)
Other	-	(8,902,658)	(14,677,346)	(23,580,004)
Total	\$ (533,006,786)	\$ (53,529,405)	\$ (40,561,125)	\$ (627,097,316)

Table A2. Detailed Results: Employment, Pennsylvania

Industry	Direct	Indirect	Induced	Total
Extraction of natural gas and crude petroleum	-	(316)	(1)	(317)
Petroleum refineries	(100)	(1)	(0)	(101)
Wholesale trade	-	(38)	(15)	(53)
Maintenance and repair construction of nonresidential structures	-	(46)	(4)	(49)
Support activities for oil and gas operations	-	(46)	(0)	(46)
Hospitals	-	-	(34)	(34)
Full-service restaurants	-	(3)	(29)	(32)
Limited-service restaurants	-	(3)	(24)	(27)
Truck transportation	-	(22)	(5)	(27)
Real estate	-	(4)	(21)	(24)
Extraction of natural gas liquids	-	(21)	-	(22)
Retail - Food and beverage stores	-	(0)	(21)	(21)
Offices of physicians	-	-	(19)	(19)
Retail - General merchandise stores	-	(0)	(18)	(18)
All other food and drinking places	-	(1)	(16)	(17)
Management of companies and enterprises	-	(13)	(4)	(17)
Individual and family services	-	-	(16)	(16)
Employment services	-	(6)	(9)	(15)
Other financial investment activities	-	(2)	(12)	(14)
Services to buildings	-	(6)	(8)	(14)
Pipeline transportation	-	(12)	(0)	(12)
Religious organizations	-	-	(12)	(12)
Retail - Nonstore retailers	-	(1)	(12)	(12)
Nursing and community care facilities	-	-	(12)	(12)
Junior colleges, colleges, universities, and professional schools	-	(0)	(12)	(12)
Automotive repair and maintenance, except car washes	-	(2)	(10)	(12)
Personal care services	-	-	(11)	(11)
Monetary authorities and depository credit intermediation	-	(2)	(9)	(11)
Retail - Miscellaneous store retailers	-	(2)	(10)	(11)
Home health care services	-	-	(11)	(11)
Other	-	(77)	(253)	(332)
Total	(100)	(623)	(610)	(1,333)

Table A2 (continued). Detailed Results: Labor Income, Pennsylvania

Industry	Direct	Indirect	Induced	Total
	(\$)			
Extraction of natural gas and crude petroleum	\$ -	\$ (41,974,543)	\$ (76,867)	\$ (42,051,409)
Petroleum refineries	(25,310,120)	(163,339)	(22,811)	(25,496,270)
Pipeline transportation	-	(6,040,201)	(40,758)	(6,080,960)
Wholesale trade	-	(3,481,707)	(1,375,012)	(4,856,719)
Support activities for oil and gas operations	-	(4,159,354)	(13,440)	(4,172,794)
Extraction of natural gas liquids	-	(3,737,495)	(6,844)	(3,744,339)
Maintenance and repair construction of nonresidential structures	-	(2,779,238)	(213,558)	(2,992,797)
Hospitals	-	-	(2,713,853)	(2,713,853)
Management of companies and enterprises	-	(1,851,893)	(641,382)	(2,493,275)
Offices of physicians	-	-	(2,064,237)	(2,064,237)
Truck transportation	-	(1,421,609)	(338,579)	(1,760,189)
Monetary authorities and depository credit intermediation	-	(190,828)	(692,422)	(883,250)
Insurance carriers	-	(116,615)	(733,870)	(850,485)
Junior colleges, colleges, universities, and professional schools	-	(4,811)	(789,958)	(794,769)
Other financial investment activities	-	(124,743)	(669,905)	(794,648)
Radio and television broadcasting	-	(266,380)	(438,969)	(705,349)
Full-service restaurants	-	(56,416)	(632,294)	(688,710)
Architectural, engineering, and related services	-	(479,845)	(198,597)	(678,442)
Real estate	-	(97,367)	(569,510)	(666,877)
Automotive repair and maintenance, except car washes	-	(92,447)	(557,581)	(650,028)
Legal services	-	(188,191)	(455,227)	(643,418)
Religious organizations	-	-	(616,297)	(616,297)
Retail - Food and beverage stores	-	(2,776)	(605,526)	(608,302)
Employment services	-	(232,260)	(346,014)	(578,274)
Accounting, tax preparation, bookkeeping, and payroll services	-	(266,217)	(289,171)	(555,388)
Management consulting services	-	(238,917)	(311,640)	(550,557)
Insurance agencies, brokerages, and related activities	-	(86,862)	(459,458)	(546,321)
Home health care services	-	-	(528,976)	(528,976)
Limited-service restaurants	-	(53,326)	(462,249)	(515,575)
Retail - Motor vehicle and parts dealers	-	(20,557)	(494,252)	(514,809)
Other	-	(4,341,697)	(13,301,674)	(17,643,354)
Total	\$(25,310,120)	\$(72,469,624)	\$(30,660,928)	\$(128,440,673)

Table A2 (continued). Detailed Results: Value Added, Pennsylvania

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Petroleum refineries	\$ (134,797,371)	\$ (869,915)	\$ (121,487)	\$ (135,788,772)
Extraction of natural gas and crude petroleum	-	(52,369,924)	(95,903)	(52,465,828)
Extraction of natural gas liquids	-	(30,543,194)	(55,933)	(30,599,127)
Wholesale trade	-	(6,317,327)	(2,494,868)	(8,812,195)
Owner-occupied dwellings	-	-	(7,039,407)	(7,039,407)
Pipeline transportation	-	(5,745,223)	(38,768)	(5,783,991)
Support activities for oil and gas operations	-	(5,672,873)	(18,330)	(5,691,203)
Real estate	-	(677,392)	(3,962,135)	(4,639,528)
Maintenance and repair construction of nonresidential structures	-	(3,456,871)	(265,628)	(3,722,499)
Management of companies and enterprises	-	(2,248,400)	(778,708)	(3,027,108)
Hospitals	-	-	(3,003,316)	(3,003,316)
Truck transportation	-	(1,631,251)	(388,509)	(2,019,759)
Offices of physicians	-	-	(1,958,228)	(1,958,228)
Insurance carriers	-	(241,659)	(1,520,792)	(1,762,451)
Monetary authorities and depository credit intermediation	-	(308,238)	(1,118,446)	(1,426,685)
Limited-service restaurants	-	(131,545)	(1,140,280)	(1,271,825)
Legal services	-	(316,129)	(764,703)	(1,080,832)
Wired telecommunications carriers	-	(185,247)	(837,215)	(1,022,463)
Electric power transmission and distribution	-	(394,125)	(523,290)	(917,416)
Retail - Nonstore retailers	-	(50,519)	(856,327)	(906,846)
Other financial investment activities	-	(141,045)	(757,456)	(898,502)
Junior colleges, colleges, universities, and professional schools	-	(5,376)	(882,626)	(888,002)
Retail - Food and beverage stores	-	(3,695)	(806,094)	(809,789)
Employment services	-	(323,448)	(481,864)	(805,313)
Full-service restaurants	-	(63,391)	(710,466)	(773,857)
Wireless telecommunications carriers (except satellite)	-	(129,422)	(624,525)	(753,947)
Insurance agencies, brokerages, and related activities	-	(119,391)	(631,517)	(750,908)
Commercial and industrial machinery and equipment rental and I	-	(624,809)	(104,299)	(729,107)
Automotive repair and maintenance, except car washes	-	(103,475)	(624,092)	(727,566)
Retail - General merchandise stores	-	(12,597)	(691,603)	(704,200)
Other	-	(6,723,269)	(18,194,819)	(24,918,088)
Total	\$ (134,797,371)	\$ (119,409,756)	\$ (51,491,636)	\$ (305,698,763)

Table A2 (continued). Detailed Results: Output, Pennsylvania

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Petroleum refineries	\$ (533,006,786)	\$ (3,439,759)	\$ (480,375)	\$ (536,926,920)
Extraction of natural gas and crude petroleum	-	(74,378,430)	(136,207)	(74,514,637)
Extraction of natural gas liquids	-	(38,230,589)	(70,010)	(38,300,599)
Wholesale trade	-	(9,801,229)	(3,870,747)	(13,671,976)
Owner-occupied dwellings	-	-	(10,517,303)	(10,517,303)
Support activities for oil and gas operations	-	(8,428,618)	(27,234)	(8,455,852)
Pipeline transportation	-	(8,352,365)	(56,360)	(8,408,725)
Maintenance and repair construction of nonresidential structures	-	(7,443,593)	(571,970)	(8,015,563)
Real estate	-	(864,290)	(5,055,316)	(5,919,605)
Hospitals	-	-	(5,236,930)	(5,236,930)
Truck transportation	-	(3,778,213)	(899,842)	(4,678,056)
Management of companies and enterprises	-	(3,387,679)	(1,173,285)	(4,560,964)
Insurance carriers	-	(478,436)	(3,010,855)	(3,489,290)
Offices of physicians	-	-	(2,795,339)	(2,795,339)
Other financial investment activities	-	(388,839)	(2,088,179)	(2,477,017)
Electric power transmission and distribution	-	(1,027,378)	(1,364,075)	(2,391,453)
Monetary authorities and depository credit intermediation	-	(512,299)	(1,858,880)	(2,371,178)
Limited-service restaurants	-	(228,536)	(1,981,035)	(2,209,571)
Religious organizations	-	-	(2,125,124)	(2,125,124)
Wired telecommunications carriers	-	(298,739)	(1,350,135)	(1,648,874)
Insurance agencies, brokerages, and related activities	-	(244,009)	(1,290,686)	(1,534,695)
Full-service restaurants	-	(122,476)	(1,372,665)	(1,495,140)
Retail - Nonstore retailers	-	(82,254)	(1,394,257)	(1,476,512)
Legal services	-	(425,740)	(1,029,848)	(1,455,588)
Junior colleges, colleges, universities, and professional schools	-	(8,593)	(1,410,855)	(1,419,448)
Retail - Food and beverage stores	-	(5,789)	(1,262,804)	(1,268,593)
Architectural, engineering, and related services	-	(896,984)	(371,242)	(1,268,226)
Wireless telecommunications carriers (except satellite)	-	(214,470)	(1,034,926)	(1,249,396)
Retail - General merchandise stores	-	(20,787)	(1,141,257)	(1,162,044)
Natural gas distribution	-	(939,300)	(182,688)	(1,121,988)
Other	-	(12,575,369)	(32,979,308)	(45,554,677)
Total	\$ (533,006,786)	\$ (176,574,765)	\$ (88,139,730)	\$ (797,721,281)

Table A3. Detailed Results: Employment, Central Atlantic Region

Industry	Direct	Indirect	Induced	Total
Extraction of natural gas and crude petroleum	-	(347)	(1)	(348)
Petroleum refineries	(100)	(1)	(0)	(101)
Wholesale trade	-	(44)	(17)	(61)
Maintenance and repair construction of nonresidential structures	-	(51)	(4)	(55)
Support activities for oil and gas operations	-	(47)	(0)	(47)
Hospitals	-	-	(37)	(37)
Full-service restaurants	-	(3)	(32)	(35)
Real estate	-	(5)	(26)	(31)
Limited-service restaurants	-	(3)	(26)	(29)
Truck transportation	-	(22)	(6)	(28)
Extraction of natural gas liquids	-	(24)	-	(24)
Retail - Food and beverage stores	-	(0)	(23)	(23)
Offices of physicians	-	-	(20)	(20)
Retail - General merchandise stores	-	(0)	(19)	(20)
Management of companies and enterprises	-	(15)	(5)	(20)
All other food and drinking places	-	(1)	(18)	(19)
Services to buildings	-	(7)	(10)	(17)
Other financial investment activities	-	(3)	(14)	(17)
Employment services	-	(7)	(10)	(17)
Individual and family services	-	-	(17)	(17)
Religious organizations	-	-	(13)	(13)
Retail - Nonstore retailers	-	(1)	(12)	(13)
Monetary authorities and depository credit intermediation	-	(3)	(10)	(13)
Nursing and community care facilities	-	-	(13)	(13)
Pipeline transportation	-	(13)	(0)	(13)
Junior colleges, colleges, universities, and professional schools	-	(0)	(13)	(13)
Personal care services	-	-	(12)	(12)
Automotive repair and maintenance, except car washes	-	(2)	(11)	(12)
Home health care services	-	-	(12)	(12)
Retail - Miscellaneous store retailers	-	(2)	(10)	(12)
Other	-	(95)	(290)	(388)
Total	(100)	(698)	(686)	(1,483)

Table A3 (continued). Detailed Results: Labor Income, Central Atlantic Region

Industry	Direct	Indirect	Induced	Total
Extraction of natural gas and crude petroleum	-	(44,815,656)	(86,984)	(44,902,639)
Petroleum refineries	(25,310,120)	(189,237)	(25,091)	(25,524,448)
Pipeline transportation	-	(6,076,358)	(41,529)	(6,117,888)
Wholesale trade	-	(4,044,356)	(1,592,250)	(5,636,607)
Support activities for oil and gas operations	-	(4,203,604)	(13,650)	(4,217,253)
Extraction of natural gas liquids	-	(3,910,746)	(7,461)	(3,918,207)
Maintenance and repair construction of nonresidential structures	-	(3,126,176)	(263,938)	(3,390,115)
Management of companies and enterprises	-	(2,166,237)	(777,821)	(2,944,057)
Hospitals	-	-	(2,932,138)	(2,932,138)
Offices of physicians	-	-	(2,222,464)	(2,222,464)
Truck transportation	-	(1,441,345)	(363,200)	(1,804,546)
Other financial investment activities	-	(185,513)	(905,701)	(1,091,214)
Monetary authorities and depository credit intermediation	-	(256,189)	(816,534)	(1,072,723)
Insurance carriers	-	(136,094)	(810,535)	(946,628)
Real estate	-	(152,324)	(761,784)	(914,107)
Junior colleges, colleges, universities, and professional schools	-	(5,440)	(855,425)	(860,865)
Architectural, engineering, and related services	-	(575,309)	(245,590)	(820,899)
Legal services	-	(256,660)	(561,462)	(818,122)
Radio and television broadcasting	-	(307,245)	(495,900)	(803,145)
Full-service restaurants	-	(69,299)	(714,150)	(783,450)
Accounting, tax preparation, bookkeeping, and payroll services	-	(371,124)	(389,369)	(760,492)
Securities and commodity contracts intermediation and brokerage	-	(176,483)	(564,641)	(741,124)
Management consulting services	-	(319,221)	(417,626)	(736,846)
Insurance agencies, brokerages, and related activities	-	(121,446)	(597,887)	(719,334)
Employment services	-	(280,242)	(422,707)	(702,948)
Automotive repair and maintenance, except car washes	-	(97,867)	(595,663)	(693,530)
Religious organizations	-	-	(668,776)	(668,776)
Retail - Food and beverage stores	-	(3,251)	(658,595)	(661,846)
Nondepository credit intermediation and related activities	-	(178,287)	(413,795)	(592,082)
Home health care services	-	-	(580,141)	(580,141)
Other	-	(5,599,415)	(16,090,900)	(21,690,309)
Total	(25,310,120)	(79,065,112)	(35,893,711)	(140,268,944)

Table A3 (continued). Detailed Results: Value Added, Central Atlantic Region

Industry	Direct	Indirect	Induced	Total
Petroleum refineries	(134,797,371)	(1,014,893)	(134,249)	(135,946,512)
Extraction of natural gas and crude petroleum	-	(52,537,791)	(96,501)	(52,634,293)
Extraction of natural gas liquids	-	(29,061,309)	(50,656)	(29,111,965)
Wholesale trade	-	(7,343,096)	(2,890,917)	(10,234,012)
Owner-occupied dwellings	-	-	(7,649,378)	(7,649,378)
Real estate	-	(1,004,003)	(5,104,833)	(6,108,837)
Pipeline transportation	-	(5,817,319)	(40,304)	(5,857,624)
Support activities for oil and gas operations	-	(5,709,854)	(18,505)	(5,728,360)
Maintenance and repair construction of nonresidential structures	-	(3,904,119)	(330,574)	(4,234,693)
Management of companies and enterprises	-	(2,632,069)	(945,237)	(3,577,307)
Hospitals	-	-	(3,249,245)	(3,249,245)
Monetary authorities and depository credit intermediation	-	(608,253)	(1,688,137)	(2,296,391)
Offices of physicians	-	-	(2,110,560)	(2,110,560)
Truck transportation	-	(1,654,543)	(417,565)	(2,072,107)
Insurance carriers	-	(294,944)	(1,730,511)	(2,025,455)
Limited-service restaurants	-	(141,251)	(1,256,020)	(1,397,271)
Legal services	-	(432,228)	(944,840)	(1,377,069)
Other financial investment activities	-	(209,710)	(1,023,885)	(1,233,596)
Wired telecommunications carriers	-	(225,268)	(938,351)	(1,163,619)
Electric power transmission and distribution	-	(513,792)	(629,885)	(1,143,678)
Insurance agencies, brokerages, and related activities	-	(173,550)	(848,295)	(1,021,845)
Employment services	-	(392,821)	(592,748)	(985,570)
Retail - Nonstore retailers	-	(56,229)	(928,117)	(984,347)
Junior colleges, colleges, universities, and professional schools	-	(6,136)	(961,710)	(967,847)
Retail - Food and beverage stores	-	(4,384)	(882,954)	(887,338)
Accounting, tax preparation, bookkeeping, and payroll services	-	(431,691)	(453,197)	(884,887)
Full-service restaurants	-	(77,571)	(800,559)	(878,129)
Commercial and industrial machinery and equipment rental and l	-	(731,409)	(123,149)	(854,557)
Wireless telecommunications carriers (except satellite)	-	(154,543)	(681,789)	(836,332)
Architectural, engineering, and related services	-	(575,481)	(245,713)	(821,194)
Other	-	(8,278,262)	(22,690,837)	(30,969,105)
Total	(134,797,371)	(123,986,520)	(60,459,233)	(319,243,123)

Table A3 (continued). Detailed Results: Output, Central Atlantic Region

Industry	Direct	Indirect	Induced	Total
Petroleum refineries	(533,006,786)	(4,054,370)	(534,476)	(537,595,632)
Extraction of natural gas and crude petroleum	-	(77,459,777)	(147,179)	(77,606,957)
Extraction of natural gas liquids	-	(39,081,132)	(73,039)	(39,154,171)
Wholesale trade	-	(11,333,287)	(4,462,273)	(15,795,560)
Owner-occupied dwellings	-	-	(11,428,637)	(11,428,637)
Maintenance and repair construction of nonresidential structures	-	(8,338,158)	(701,873)	(9,040,031)
Pipeline transportation	-	(8,479,965)	(59,079)	(8,539,044)
Support activities for oil and gas operations	-	(8,504,380)	(27,593)	(8,531,973)
Real estate	-	(1,275,145)	(6,492,754)	(7,767,898)
Hospitals	-	-	(5,647,902)	(5,647,902)
Management of companies and enterprises	-	(3,950,280)	(1,417,478)	(5,367,758)
Truck transportation	-	(3,833,673)	(969,027)	(4,802,701)
Insurance carriers	-	(563,366)	(3,345,125)	(3,908,490)
Monetary authorities and depository credit intermediation	-	(855,729)	(2,511,011)	(3,366,739)
Other financial investment activities	-	(525,638)	(2,618,977)	(3,144,613)
Offices of physicians	-	-	(3,019,185)	(3,019,185)
Electric power transmission and distribution	-	(1,325,949)	(1,630,030)	(2,955,979)
Limited-service restaurants	-	(243,797)	(2,163,011)	(2,406,808)
Religious organizations	-	-	(2,291,001)	(2,291,001)
Insurance agencies, brokerages, and related activities	-	(334,246)	(1,651,873)	(1,986,119)
Wired telecommunications carriers	-	(364,883)	(1,517,287)	(1,882,170)
Legal services	-	(571,901)	(1,256,628)	(1,828,530)
Full-service restaurants	-	(146,726)	(1,526,741)	(1,673,466)
Natural gas distribution	-	(1,356,607)	(236,997)	(1,593,604)
Retail - Nonstore retailers	-	(90,748)	(1,501,054)	(1,591,803)
Junior colleges, colleges, universities, and professional schools	-	(9,732)	(1,529,354)	(1,539,086)
Architectural, engineering, and related services	-	(1,064,138)	(453,525)	(1,517,664)
Wireless telecommunications carriers (except satellite)	-	(269,196)	(1,159,679)	(1,428,875)
Retail - Food and beverage stores	-	(6,778)	(1,373,151)	(1,379,929)
Retail - General merchandise stores	-	(23,202)	(1,234,276)	(1,257,478)
Other	-	(17,226,975)	(39,603,270)	(56,830,241)
Total	(533,006,786)	(191,289,774)	(102,583,489)	(826,880,049)

Table A4. Detailed Results: Employment, United States

Industry	Direct	Indirect	Induced	Total
Extraction of natural gas and crude petroleum	-	(612)	(4)	(616)
Petroleum refineries	(100)	(2)	(0)	(102)
Support activities for oil and gas operations	-	(100)	(1)	(101)
Wholesale trade	-	(52)	(40)	(92)
Maintenance and repair construction of nonresidential structures	-	(62)	(10)	(72)
Real estate	-	(9)	(60)	(69)
Full-service restaurants	-	(5)	(61)	(66)
Limited-service restaurants	-	(6)	(56)	(62)
Hospitals	-	-	(56)	(56)
Truck transportation	-	(28)	(14)	(42)
Management of companies and enterprises	-	(23)	(16)	(38)
Employment services	-	(12)	(25)	(38)
Retail - General merchandise stores	-	(1)	(36)	(37)
Offices of physicians	-	-	(35)	(35)
Retail - Food and beverage stores	-	(0)	(34)	(34)
Services to buildings	-	(10)	(23)	(34)
Other financial investment activities	-	(5)	(28)	(33)
Individual and family services	-	-	(31)	(31)
All other food and drinking places	-	(2)	(29)	(31)
Personal care services	-	-	(23)	(23)
Home health care services	-	-	(22)	(22)
Extraction of natural gas liquids	-	(22)	(0)	(22)
Religious organizations	-	-	(22)	(22)
Nursing and community care facilities	-	-	(22)	(22)
Retail - Nonstore retailers	-	(1)	(20)	(21)
Automotive repair and maintenance, except car washes	-	(2)	(19)	(21)
Monetary authorities and depository credit intermediation	-	(4)	(17)	(21)
Insurance agencies, brokerages, and related activities	-	(3)	(17)	(20)
Retail - Miscellaneous store retailers	-	(2)	(16)	(19)
Other personal services	-	(1)	(18)	(19)
Other	-	(190)	(654)	(848)
Total	(100)	(1,156)	(1,413)	(2,669)

Table A4 (continued). Detailed Results: Labor Income, United States

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Extraction of natural gas and crude petroleum	\$ -	\$ (79,953,338)	\$ (566,380)	\$ (80,519,718)
Petroleum refineries	(25,310,121)	(442,955)	(108,300)	(25,861,376)
Support activities for oil and gas operations	-	(9,237,738)	(98,874)	(9,336,612)
Pipeline transportation	-	(8,780,316)	(168,772)	(8,949,088)
Wholesale trade	-	(4,618,109)	(3,514,268)	(8,132,378)
Management of companies and enterprises	-	(2,885,658)	(1,972,520)	(4,858,178)
Hospitals	-	-	(4,459,714)	(4,459,714)
Maintenance and repair construction of nonresidential structures	-	(3,547,728)	(597,602)	(4,145,330)
Offices of physicians	-	-	(3,545,247)	(3,545,247)
Extraction of natural gas liquids	-	(2,720,578)	(19,272)	(2,739,851)
Truck transportation	-	(1,601,449)	(822,295)	(2,423,744)
Real estate	-	(229,446)	(1,552,231)	(1,781,677)
Monetary authorities and depository credit intermediation	-	(343,158)	(1,414,488)	(1,757,645)
Other financial investment activities	-	(262,951)	(1,423,110)	(1,686,061)
Full-service restaurants	-	(115,805)	(1,478,286)	(1,594,091)
Architectural, engineering, and related services	-	(941,978)	(582,951)	(1,524,929)
Employment services	-	(499,405)	(1,022,558)	(1,521,963)
Insurance carriers	-	(187,537)	(1,326,267)	(1,513,804)
Legal services	-	(379,773)	(1,121,492)	(1,501,265)
Securities and commodity contracts intermediation and brokerage	-	(265,613)	(1,158,250)	(1,423,863)
Management consulting services	-	(457,024)	(865,911)	(1,322,935)
Accounting, tax preparation, bookkeeping, and payroll services	-	(506,432)	(799,078)	(1,305,510)
Insurance agencies, brokerages, and related activities	-	(191,280)	(1,100,750)	(1,292,030)
Nondepository credit intermediation and related activities	-	(288,990)	(966,583)	(1,255,574)
Limited-service restaurants	-	(119,879)	(1,127,124)	(1,247,002)
Automotive repair and maintenance, except car washes	-	(125,972)	(1,010,729)	(1,136,702)
Retail - Food and beverage stores	-	(4,710)	(1,091,997)	(1,096,707)
Religious organizations	-	-	(1,063,154)	(1,063,154)
Retail - General merchandise stores	-	(15,603)	(1,025,314)	(1,040,917)
Junior colleges, colleges, universities, and professional schools	-	(4,859)	(1,025,742)	(1,030,601)
Other	-	(10,802,814)	(35,862,247)	(46,665,054)
Total	\$(25,310,121)	\$(129,531,103)	\$(72,891,494)	\$(227,732,718)

Table A4 (continued). Detailed Results: Value Added, United States

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Petroleum refineries	\$ (134,797,348)	\$ (2,359,104)	\$ (576,786)	\$ (137,733,237)
Extraction of natural gas and crude petroleum	-	(107,130,094)	(758,897)	(107,888,991)
Wholesale trade	-	(8,741,718)	(6,652,234)	(15,393,952)
Extraction of natural gas liquids	-	(14,752,531)	(104,505)	(14,857,036)
Owner-occupied dwellings	-	-	(12,444,725)	(12,444,725)
Support activities for oil and gas operations	-	(12,157,823)	(130,128)	(12,287,952)
Real estate	-	(1,392,279)	(9,418,935)	(10,811,215)
Pipeline transportation	-	(8,291,669)	(159,380)	(8,451,048)
Management of companies and enterprises	-	(3,522,281)	(2,407,690)	(5,929,971)
Maintenance and repair construction of nonresidential structures	-	(4,632,944)	(780,403)	(5,413,347)
Hospitals	-	-	(4,976,498)	(4,976,498)
Monetary authorities and depository credit intermediation	-	(936,338)	(3,859,564)	(4,795,902)
Insurance carriers	-	(451,707)	(3,194,475)	(3,646,182)
Offices of physicians	-	-	(3,404,683)	(3,404,683)
Limited-service restaurants	-	(290,153)	(2,728,080)	(3,018,233)
Truck transportation	-	(1,897,805)	(974,465)	(2,872,271)
Petrochemical manufacturing	-	(2,378,810)	(152,350)	(2,531,161)
Legal services	-	(609,391)	(1,799,566)	(2,408,957)
Employment services	-	(719,990)	(1,474,217)	(2,194,207)
Other financial investment activities	-	(336,886)	(1,823,255)	(2,160,141)
Insurance agencies, brokerages, and related activities	-	(280,955)	(1,616,798)	(1,897,753)
Electric power transmission and distribution	-	(624,586)	(1,152,287)	(1,776,873)
Full-service restaurants	-	(127,600)	(1,628,852)	(1,756,452)
Retail - General merchandise stores	-	(26,094)	(1,714,650)	(1,740,743)
Wired telecommunications carriers	-	(278,649)	(1,444,849)	(1,723,498)
Retail - Nonstore retailers	-	(81,071)	(1,593,602)	(1,674,672)
Retail - Food and beverage stores	-	(6,932)	(1,607,057)	(1,613,988)
Accounting, tax preparation, bookkeeping, and payroll services	-	(615,654)	(971,414)	(1,587,068)
Wireless telecommunications carriers (except satellite)	-	(240,072)	(1,308,759)	(1,548,831)
Architectural, engineering, and related services	-	(948,226)	(586,817)	(1,535,044)
Other	-	(17,618,356)	(55,811,222)	(73,429,564)
Total	\$ (134,797,348)	\$ (191,449,717)	\$ (127,257,132)	\$ (453,504,197)

Table A4 (continued). Detailed Results: Output, United States

Industry	Direct	Indirect	Induced	Total
	----- (\$) -----			
Petroleum refineries	\$ (533,006,786)	\$ (9,328,213)	\$ (2,280,688)	\$ (544,615,687)
Extraction of natural gas and crude petroleum	-	(150,275,678)	(1,064,535)	(151,340,213)
Extraction of natural gas liquids	-	(24,887,672)	(176,301)	(25,063,974)
Wholesale trade	-	(13,537,401)	(10,301,631)	(23,839,032)
Owner-occupied dwellings	-	-	(18,593,178)	(18,593,178)
Support activities for oil and gas operations	-	(18,178,675)	(194,571)	(18,373,246)
Petrochemical manufacturing	-	(16,330,758)	(1,045,900)	(17,376,658)
Real estate	-	(1,864,316)	(12,612,320)	(14,476,637)
Pipeline transportation	-	(11,664,236)	(224,206)	(11,888,442)
Maintenance and repair construction of nonresidential structures	-	(10,011,027)	(1,686,322)	(11,697,349)
Management of companies and enterprises	-	(5,583,373)	(3,816,569)	(9,399,941)
Hospitals	-	-	(8,624,888)	(8,624,888)
Truck transportation	-	(4,631,356)	(2,378,060)	(7,009,416)
Insurance carriers	-	(833,128)	(5,891,892)	(6,725,021)
Monetary authorities and depository credit intermediation	-	(1,268,465)	(5,228,585)	(6,497,050)
Other financial investment activities	-	(906,268)	(4,904,792)	(5,811,060)
Limited-service restaurants	-	(498,359)	(4,685,680)	(5,184,039)
Offices of physicians	-	-	(4,984,428)	(4,984,428)
Electric power transmission and distribution	-	(1,656,705)	(3,056,421)	(4,713,127)
Wireless telecommunications carriers (except satellite)	-	(607,512)	(3,311,868)	(3,919,380)
Insurance agencies, brokerages, and related activities	-	(567,115)	(3,263,552)	(3,830,668)
Religious organizations	-	-	(3,742,894)	(3,742,894)
Legal services	-	(830,617)	(2,452,858)	(3,283,475)
Wired telecommunications carriers	-	(529,065)	(2,743,302)	(3,272,368)
Full-service restaurants	-	(236,213)	(3,015,321)	(3,251,533)
Pharmaceutical preparation manufacturing	-	(5,071)	(3,094,264)	(3,099,335)
Other basic organic chemical manufacturing	-	(2,567,718)	(487,340)	(3,055,058)
Architectural, engineering, and related services	-	(1,737,271)	(1,075,123)	(2,812,394)
Employment services	-	(912,702)	(1,868,804)	(2,781,506)
Other local government enterprises	-	(702,183)	(2,024,419)	(2,726,602)
Other	-	(37,390,069)	(114,456,915)	(151,846,999)
Total	\$ (533,006,786)	\$ (317,541,169)	\$ (233,287,633)	\$ (1,083,835,588)