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New Jersey Conservation
FOUNDATION

November 6, 2015

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE, Room 1A
Washington, DC 20426

Re: Penneast Pipeline Project
Docket No. CP15-558-000

Dear Secretary Bose:

New Jersey Conservation Foundation submitted extensive comments regarding the PennEast pipeline application on 10/29/15. The attached expert report by the Goodman Group is an addendum to those comments. The report found that PennEast's economic impact study overstates the amount of jobs that would be created through construction of the pipeline by two-thirds or more. The report also notes inconsistencies in PennEast's jobs numbers, which the Federal Energy Regulatory Commission (FERC) pointed out but PennEast failed to fully explain.

This research demonstrates that PennEast used faulty assumptions in their economic impact analysis, including a jobs multiplier that is much higher than other economic studies of gas pipelines in the Northeast. This analysis by the Goodman Group discredits one of PennEast's primary justifications for the project. FERC should not consider the PennEast economic impact study as credible evidence of public benefit from the proposed project.

We urge FERC to reject the PennEast pipeline application, as the project does not adequately demonstrate public need and benefit, would have significant and unavoidable negative impacts on numerous sensitive environmental and cultural resources, and a full alternatives analysis has not been undertaken.

Thank you for your consideration of our comments. Please contact Alison Mitchell 908-234-1225 if you have any questions.

Sincerely,

Michele Byers, Executive Director
New Jersey Conservation Foundation

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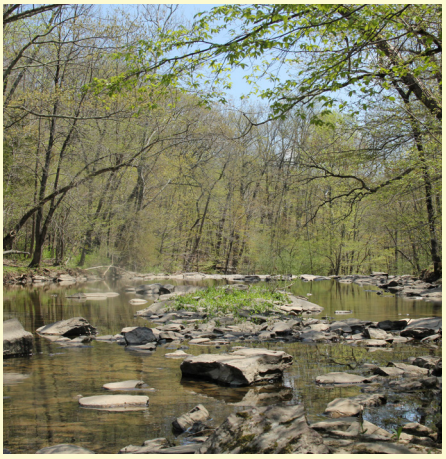
SUMMARY

Expert Report on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania

Presented to the New Jersey Conservation Foundation by Ian Goodman & Brigid Rowan

November 4, 2015



In their expert report, The Goodman Group, Ltd. (TGG) evaluates the economic impact study (PennEast Pipeline Project Economic Impact Analysis, referred to in this study as the PennEast Analysis) prepared for the PennEast Pipeline Company and co-authored by Econsult Solutions, Inc. and Drexel University School of Economics. TGG's evaluation demonstrates that the PennEast Analysis significantly overstates the Total Jobs (which PennEast estimated at 12,160) from designing and building the pipeline. Specifically, TGG concludes that **the PennEast Analysis has overstated these Total Jobs by approximately two thirds or more**.

Furthermore, it should be noted that these jobs are very short-term in nature. Actual construction would occur over a one-year period (late 2016-late 2017) with activity and jobs concentrated into only six months (early January-early July 2017). Most of the employment impacts (total onsite and offsite jobs) would take place during the same period. Direct Onsite Construction jobs have an average duration of 5.2 months. And half or more of Direct Onsite Construction labor for PennEast would be non-local (residing outside NJ and PA).

TGG's review of employment impact studies for other comparable gas pipelines in the Northeast US shows that the PennEast Analysis multiplier (10.7 jobs per $1 million project cost for all workers) is an outlier with respect to comparable pipelines. Specifically, the multipliers for other similar gas pipelines are only 8-36% of the PennEast Analysis multiplier. TGG therefore concludes that the PennEast Analysis has significantly overstated the Total Jobs numbers (by approximately two thirds or more) based on:

- **our review of employment impact studies for other comparable gas pipelines in the Northeast US;**
- **our evaluation of the PennEast Analysis job estimates and the internal inconsistencies in the PennEast Analysis; and**
- **our review and extensive experience with best practices in employment impact studies, notably for pipelines and other energy projects.**

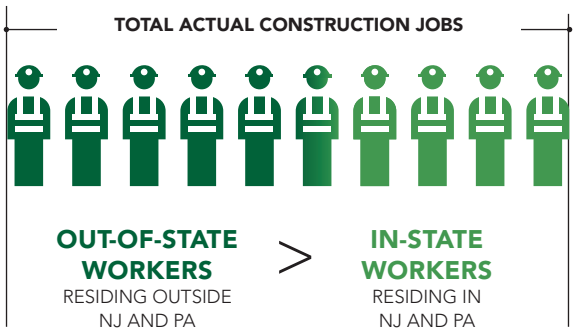
Direct Onsite Construction Jobs

5 MONTHS

Actual construction jobs last on average 5 months.

50% OR MORE

of actual construction jobs go to out-of-state workers



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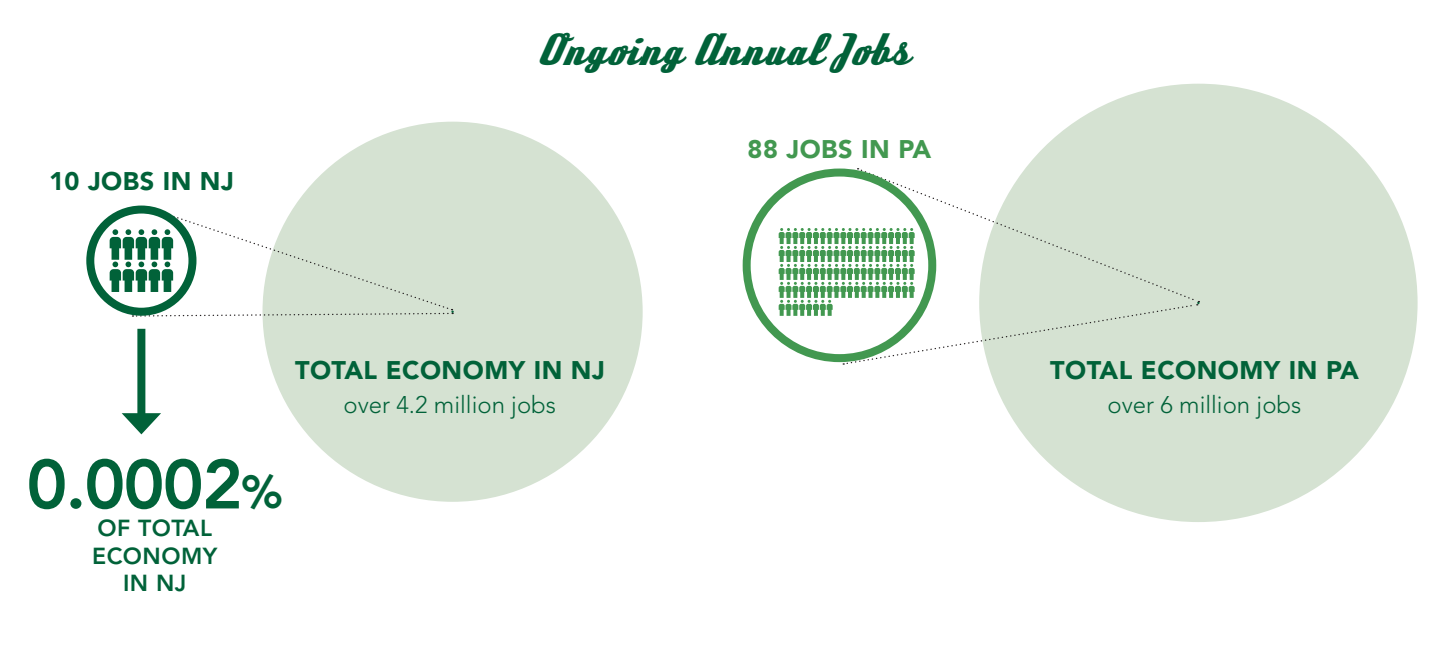
"TGG's evaluation demonstrates that the PennEast Analysis significantly overstates the Total Jobs (which PennEast estimated at 12,160) from designing and building the pipeline. Specifically, TGG concludes that **the PennEast Analysis has overstated these Total Jobs by approximately two thirds or more**."

The TGG Report also evaluates employment impacts from ongoing activities to operate and maintain the pipeline and related facilities. According to the PennEast Analysis, annual jobs from operations (including spinoffs) are 98 in total with 88 in Pennsylvania and 10 in New Jersey. TGG concludes that even using the PennEast estimates, pipeline operations result in very small expenditures (and employment impacts) and have very little positive impact on the economy, especially in New Jersey. But as low as they are, the PennEast estimates of annual jobs from operations may still be overstated. Other pipeline studies (notably for comparable Northeast US gas pipelines reviewed by TGG) estimate substantially lower job impacts from operations.

Finally, TGG also finds that even if the PennEast Analysis' employment impact estimates were realistic:

- the employment impacts from the design and construction of the Project are
  - (a) tiny in the context of the New Jersey and Pennsylvania state economies (less than 0.1% of total New Jersey jobs); and
  - (b) very short-term (mainly from actual construction and related spin-offs which occur over a one year period (mostly in 2017), but are concentrated into only six months);
- the employment impacts from ongoing activities to operate and maintain the pipeline are infinitesimally small, especially in the context of the New Jersey economy (10 jobs or about 0.0002% of total state jobs).



Media Contact:
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New Jersey Conservation Foundation
tom@njconservation.org
908-234-1225, x305

The full report is available at njconservation.org/docs/PennEastEconomicReport.pdf

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Expert Report on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania

Presented to the New Jersey Conservation Foundation

by Ian Goodman and Brigid Rowan

the goodman group, ltd.
www.thegoodman.com

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1 Executive Summary

In this report, The Goodman Group, Ltd. (TGG) evaluates the economic impact study (PennEast Pipeline Project Economic Impact Analysis, referred to in this study as the PennEast Analysis) prepared for the PennEast Pipeline Company, LLC (PennEast) and co-authored by Econsult Solutions, Inc. and Drexel University School of Economics. TGG's evaluation demonstrates that the PennEast Analysis significantly overstates the Total Jobs (estimated at 12,160) from designing and building the pipeline. Specifically, TGG concludes that **the PennEast Analysis has overstated these Total Jobs by approximately two thirds or more.**

Furthermore, it should be noted that these jobs are very short-term in nature. Actual construction would occur over a one-year period (late 2016-late 2017) with activity and jobs concentrated into only six months (early January-early July 2017). Most of the employment impacts (total onsite and offsite jobs) would take place during the same period. Half or more of Direct Onsite Construction labor for PennEast would be non-local (residing outside New Jersey and Pennsylvania).

TGG's review of employment impact studies for other comparable gas pipelines in the Northeast US shows that the PennEast Analysis multiplier (10.7 jobs per $1 million project cost for all workers) is an outlier with respect to comparable pipelines. Specifically, the multipliers for other similar gas pipelines are only 8-36% of the PennEast Analysis multiplier. TGG therefore concludes that the PennEast Analysis has significantly overstated the Total Jobs numbers (by approximately two thirds or more) based on:

- our review of employment impact studies for other comparable gas pipelines in the Northeast US;
- our evaluation of the PennEast Analysis job estimates and the internal inconsistencies in the PennEast Analysis; and
- our review and extensive experience with best practices in employment impact studies, notably for pipelines and other energy projects. (Sections 3 and 4)

The TGG Report also evaluates employment impacts from ongoing activities to operate and maintain the pipeline and related facilities. According to the PennEast Analysis, annual jobs from operations (including spinoffs) are 98 in total with 88 in Pennsylvania and 10 in New Jersey. TGG concludes that even using the PennEast estimates, pipeline operations result in very small expenditures (and employment impacts) and have very little positive impact on the economy, especially in New Jersey. But as low as

they are, the PennEast estimates of annual jobs from operations may still be overstated. Other pipeline studies (notably for comparable Northeast US gas pipelines reviewed by TGG) estimate substantially lower job impacts from operations. (Section 4)

Finally, TGG also finds that even if the PennEast Analysis' employment impact estimates were realistic:

- the employment impacts from the design and construction of the Project are (a) tiny in the context of the New Jersey and Pennsylvania state economies (less than 0.1% of total New Jersey jobs); and (b) very short-term (mainly from actual construction and related spin-offs which occur over a one year period (mostly in 2017), but are concentrated into only six months); (Section 3.3.1 and Appendix A);
- the employment impacts from ongoing activities to operate and maintain the pipeline are infinitesimally small, especially in the context of the New Jersey economy (10 jobs or about 0.0002% of total state jobs). (Section 5.2)

Key findings of this report are summarized as infographs in Figures 1 and 2 in Section 1.1.

Figure 1, The Great Pipeline Jobs Mystery, illustrates two major internal inconsistencies in the PennEast Analysis' job estimates:

- A major disjuncture between Direct Onsite Construction Jobs (2,500) and Total Jobs (12,160).
- A significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs (2,500) and Total Jobs (12,160); and (b) estimates for "construction" (6,000) and "other" (5,210) jobs in the Six-County Region.

These inconsistencies reveal that the PennEast analysis failed to perform a basic check to verify the reasonableness of the results from its economic modeling exercise. (Section 3.3.2)

Figure 2, Estimated Total Job Impacts from Building Northeast US Gas Pipeline Projects, compares employment impacts from PennEast (as estimated by the PennEast Analysis) to those of four similar gas pipeline projects in the Northeast US. **Figure 2** provides a graphic illustration that the PennEast Analysis multiplier is an outlier with respect to comparable pipelines. As indicated above, based on this comparison, as well as our review of the internal inconsistencies of the PennEast Analysis and our extensive experience with best practices in employment impact studies, TGG concludes the PennEast Analysis has significantly overstated the Total Jobs numbers. (Section 4)

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1.1 Figures

For the convenience of the reader, the complete group of infographs (Figures 1-2) is provided on the following pages.

Figure 1, The Great Pipeline Jobs Mystery, illustrates the internal inconsistencies in the PennEast's Job Estimates. These inconsistencies are examined in Section 3.3.2.

Figure 2, Estimated Total Job Impacts from Building Northeast US Gas Pipeline Projects, compares employment impacts from PennEast (as estimated by the PennEast Analysis) to those of four other comparable gas pipeline projects in the Northeast US. Figure 2 is described in Section 4. Appendix B provides detailed sources and notes for each of the pipelines in Figure 2.

FIGURE 1

THE GREAT PIPELINE JOBS MYSTERY

Revealing Internal Inconsistencies in PennEast's Job Estimates

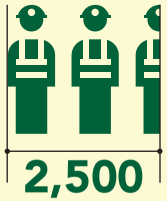
= 1,000 JOBS

ACCORDING TO **THE PENNEAST WEBSITE OVERVIEW**

"The project is expected to

CREATE 2,500 LOCAL JOBS

during construction, which is expected to take approximately seven months to complete."[1]



2,500

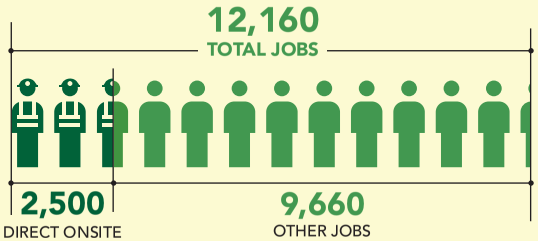
DIRECT ONSITE CONSTRUCTION JOBS OVER 7 MONTHS

?

ACCORDING TO **PENNEAST'S ANALYSIS**

In NJ and PA combined, the Project is expected to

SUPPORT 12,160 JOBS.[2]



?

ACCORDING TO **PENNEAST'S ANALYSIS**

In the six-county region, the Project is estimated to

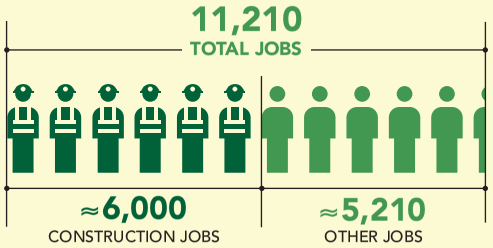
SUPPORT 11,210 JOBS.[3]

AND **THE PENNEAST WEBSITE ECONOMIC IMPACT FACT SHEET**

"Within the six-county region,

SLIGHTLY LESS THAN HALF

of the employment impact will occur in industries other than construction, including: food services, landscaping, legal services and the real estate establishment."[4]



1. http://penneastpipeline.com/overview/.
2. p. 11.
3. p. 11.
4. Economic Impact of the PennEast Pipeline's Construction and Operation Fact Sheet, http://penneastpipeline.com/DrexelFactSheet/.

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FIGURE 2

ESTIMATED TOTAL JOB IMPACTS

from Building Northeast US Gas Pipeline Projects

NOTE 1: The average duration of jobs is 1 year for all estimates except the PennEast Analysis, which did not explain the duration of estimated jobs.

NOTE 2: Total jobs for in-state residents were not provided for PennEast nor for Northeast Supply Link. Total jobs for all workers were not provided for Atlantic Sunrise.

2 Introduction

2.1 Objectives of the TGG Report

The New Jersey Conservation Foundation retained the services of The Goodman Group, Ltd. (TGG) to produce an independent expert report (TGG Report) on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania. The objective of this expert report is to evaluate the economic impact study (PennEast Pipeline Project Economic Impact Analysis, referred to in this study as the PennEast Analysis) prepared for the PennEast Pipeline Company, LLC (PennEast) and co-authored by Econsult Solutions, Inc. and Drexel University School of Economics.

2.2 TGG's Approach

TGG's approach is to review and evaluate the key sections of the PennEast Analysis relating to employment impacts of the Project from (a) Capital Infrastructure Economic Impacts (i.e. employment related to capital investment to design and construct the pipeline); and (b) Ongoing Economic Impacts (i.e. employment impacts related to the ongoing activities to operate and maintain the pipeline and related facilities). We strengthen our evaluation of the PennEast Analysis by providing a review of employment impact studies for other comparable gas pipelines in the Northeast US. TGG concludes that the PennEast Total Jobs estimate is significantly overstated. This conclusion is based on our review of comparable gas pipeline studies, as well as on our evaluation of the PennEast Analysis job estimates and their internal inconsistencies, and on our extensive experience with best practices in employment impact studies.

2.3 Road Map for the Report

Section 1 is the Executive Summary Section. The current section is Section 2, the Introduction.

Section 3 reviews and evaluates the PennEast Analysis relating to employment impacts of the Project from Capital Infrastructure Economic Impacts (i.e. employment impacts related to capital investment to design and construct the pipeline). Section 3.1 explains Capital Infrastructure Economic Impact and the various job categories used in

employment studies. Section 3.2 summarizes the PennEast Analysis' estimates of employment impacts related to capital investment to design and construct the pipeline. Section 3.3 provides TGG's evaluation of the PennEast Analysis' estimates of employment impacts to design and construct the pipeline. In Section 3.3.1, TGG emphasizes that (a) even if the PennEast employment impact estimates were realistic, the employment impacts from the Project are tiny in the context of the New Jersey and Pennsylvania state economies; and (b) the jobs are very short-term. Section 3.3.2 describes major internal inconsistencies in PennEast's job estimates. These inconsistencies reveal that PennEast has failed to perform a reasonableness test on the results from its economic modeling. Section 3.3.3.1 describes the information gaps in the PennEast Analysis that present challenge for understanding how their estimates were developed.

Despite these information gaps, TGG identified the following possible causes for the internal inconsistencies and overstatement of estimates in the PennEast Analysis:

- The inherent limitations of Input-Output (I-O) modeling and in particular a problematic application of I-O modeling that does not take into account the limitations of the model or perform reasonableness tests on the results. (Section 3.3.3.2)
- Given the nature of pipeline construction, the application of a generic I-O construction sector model leads to overstatement of employment impacts. (Section 3.3.3.3)
- The job impacts estimated by the PennEast Analysis significantly overstate the benefits for local workers residing in New Jersey and Pennsylvania. (Section 3.3.3.4)
- The percentage of in-state spending is overestimated in the PennEast Analysis. (Section 3.3.3.5)
- PennEast Analysis counts some jobs related to the Project that have already been created. (Section 3.3.3.6)
- Total jobs are not presented as annualized jobs. (Section 3.3.3.7).

Section 4 describes Figure 2, which compares employment impacts from PennEast (as estimated by the PennEast Analysis) to those of four other comparable gas pipeline projects in the Northeast US. As indicated above, this review of comparable pipelines provides further evidence that the PennEast Analysis has significantly overstated the Total Jobs numbers.

Section 5 reviews and evaluates Annual Ongoing Economic Impacts (i.e. employment impacts related to the ongoing activities to operate and maintain the pipeline and related

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facilities). Section 5.1 summarizes the PennEast Analysis' estimates of employment impacts related to ongoing activities to operate and maintain the pipeline. Section 5.2 provides TGG's evaluation of the PennEast Analysis' estimates in Section 5.1. TGG concludes that employment impacts related to ongoing activities to operate and maintain the pipeline are infinitesimally small, especially in the context of the New Jersey economy (10 jobs or about 0.0002% of total state jobs). But as low as they are, the PennEast Analysis estimates may still be overstated.

Finally Section 6 presents the key conclusions from the TGG Report.

Appendix A contains (a) a more detailed general explanation of the annualization of job estimates; and (b) a more specific discussion of the annualization of Direct Onsite Construction Labor for PennEast project, particularly in the context of the most recent information from the September 2015 PennEast FERC Application. Appendix B provides (a) a description of FERC (United States Federal Energy Regulatory Commission) process and documents for gas pipeline construction projects; and (b) detailed sources and notes for each of the pipelines described in Figure 2.

3 PennEast Analysis: Capital Infrastructure Economic Impacts

3.1 Capital Infrastructure Employment Impacts and Job Categories

Consistent with most studies on pipeline employment impacts, the PennEast Analysis classifies employment impacts of the Project in two categories: Capital Infrastructure Economic Impacts and Ongoing Economic Impacts. Employment impacts related to Capital Infrastructure are the employment impacts related to capital investment to design and construct the pipeline. Put more simply, these are the temporary jobs related to the design and construction of the Project. These temporary jobs represent the majority of the jobs relating to the Project expenditures.

Jobs related to the design and construction of the Project include both onsite and offsite jobs. The PennEast job estimates include a very wide range of spin-offs throughout the supply chain and economy. Put simply, in addition to the jobs onsite (Direct Onsite Construction jobs), these employment estimates include jobs offsite:

- direct design, engineering, permitting, and support jobs;
- upstream jobs in the supply chain, providing services, materials and other inputs (also known as indirect jobs); and
- downstream jobs as workers spend income from jobs upstream, offsite and onsite (also known as induced jobs).

Offsite jobs are widely dispersed in sectors throughout the economy, as well as geographically.[1] So it is not feasible to directly count the jobs for spin-offs, especially for a project that has not yet been built. Instead, jobs with spin-offs are estimated based on an economic model, which is a highly simplified representation of how the economy actually operates.[2]

[1] Onsite jobs are tied to project locations; jobs elsewhere (offsite, upstream, and downstream) can be located in other states and countries. And even if jobs are located in-state, the labor supply for these jobs (especially for onsite construction) may be workers from other states. Assumptions related to in-state workers and in-state respending are highly relevant to the PennEast job estimates and will be discussed in Section 3.3.3.

[2] As will be discussed in more detail in subsequent sections, PennEast job estimates including spin-offs were generated using an Input-Output (I-O) model. To estimate employment and other economic spin-off effects, I-O models generate regional economic impact estimates by tracing the industries involved in a study region throughout successive rounds of supply linkages. At each step, they trace the portion of the inputs required from each industry, which are supplied locally (within the regional economy being (footnote continued on next page)

Employment impacts related to Ongoing Economic Impacts are the "permanent" jobs related to the operation and maintenance of the Project. The jobs from operation of the Project are tiny; Ongoing Economic Impacts will be discussed in Section 5. The PennEast Analysis (pp. 13-14, 16) claims that the Project will also have Ongoing Annual Economic Impact in terms of energy cost savings, but does not specify the amount of these cost savings and related job impacts. So except as discussed in footnote 48, the TGG Report does not consider Ongoing Annual Economic Impact as it relates to energy cost savings.

The current section first describes PennEast's Estimates for the Capital Infrastructure employment impacts, i.e. the temporary jobs related to the design and construction of the project. TGG then provides its evaluation of PennEast's Estimates.

3.2 PennEast's Estimates

Section 3.2 of the PennEast Analysis (p. 8) explains that:

> The economic impact from the Project's expenditures can be modeled by constructing an input-output model. This was done using IMPLAN, an industry standard input-output model software program. Such models are designed to estimate two sets of spillover impacts from direct expenditures:
>
> - The indirect effect, which measures the multiplier effect from the purchase of goods and services from local vendors; and
> - The induced effect, which measures the multiplier effect from the spending of labor income by employees within a particular geography.[3]

(footnote continued from previous page)
modeled). Input-Output analyses consider a wide range of job impacts and include the following categories of effects:

- Direct Effects: first round impacts of a set of expenditures, i.e. those occurring before the involvement of supporting supply linkages;
- Indirect Effects: impacts generated through subsequent purchases by suppliers of materials and services to sustain the original activities;
- Induced Effects: impacts generated by workers spending incomes earned through direct and indirect employment activities;
- Total Effects: the sum of the direct, indirect, and induced effects.

[3] See preceding footnote for a more detailed generic explanation of the categories of effects considered by I-O models. See also Section A.3 Economic Impact Model, Appendix A, PennEast Analysis (pp. A-2 to A-5) for a discussion the report's economic modeling. Section 3.3.3 of the current report will evaluate the PennEast's Analysis' use of I-O modeling and related assumptions.

Table 3.1 of the PennEast Analysis (p. 10) provides Design and Construction Expenditure Inputs for PennEast's Economic Impact Model. The Total Project Expenditure is $1,193 million, of which Total Construction Labor Expenditure is $733 million.

Table 3.2 (p. 11) provides Direct Output, Indirect and Induced Output (in dollars); Employment Supported (jobs); and Labor Income Supported (in dollars), respectively broken down by Total Impact in Pennsylvania and New Jersey, Six-County Region,[4] and Commonwealth of Pennsylvania and State of New Jersey respectively.

Table 3.2 of the PennEast Analysis (p. 11) provides the following specific and relevant information concerning the employment impacts related to the design and construction of the Project:

- 12,160 jobs for Pennsylvania and New Jersey
- 11,210 jobs for the Six-County Region
- 9,290 jobs for Pennsylvania
- 2,870 jobs for New Jersey.

The above job estimates are based on the PennEast Analysis Input-Output modeling.

A fact sheet for the PennEast Analysis on the PennEast website also indicates the following:

> PennEast will support 12,160 jobs, of which a large portion will be related to the construction industry. Hundreds of architectural and engineering jobs in several related industries will also be supported. Within the six-county region, slightly less than half of the employment impact will occur in industries other than construction, including: food services, landscaping, legal services, and the real estate establishment.[5]

None of the job numbers in Table 3.2 (Total, Six-County Region, Pennsylvania or New Jersey) is broken down by category of job (direct, indirect, induced).[6] Nor is the duration provided for these temporary jobs. TGG was unable to find this information in any other PennEast documents reviewed. While the PennEast Analysis provides an abstract

[4] The Six-County area that the Project traverses (Hunterdon and Mercer Counties (in New Jersey) and Luzerne, Carbon, and Northampton Counties (in Pennsylvania)).
[5] Economic Impact of the PennEast Pipeline's Construction and Operation Fact Sheet. PennEast Pipeline website. Accessed August 25, 2015. http://penneastpipeline.com/DrexelFactSheet/
[6] PennEast Analysis, p. 11.

discussion of multipliers,[7] no concrete employment multipliers are provided in the Analysis. Moreover, the PennEast Analysis methodology is also poorly documented making it impossible to know how these estimates were developed. These information gaps will be discussed in more detail in Section 3.3.3.1.

As explained above, the PennEast Analysis estimates the project will support 11,210 jobs in the Six-County Region (and 12,160 jobs in New Jersey and Pennsylvania), with about half of these jobs in construction. Meanwhile, according to the PennEast website overview, "[t]he project is expected to create 2,500 local jobs during construction, which is expected to take approximately seven months to complete."[8] This figure of 2,500 jobs matches an estimate by PennEast for Direct Onsite Construction labor, as reported to FERC in April 2015. Prior to filing its September 2015 FERC Application, PennEast has provided various estimates ranging from 2,000 to 2,500 workers for Direct Onsite Construction Labor.

The September 2015 FERC Application now estimates 2,660 workers for Direct Onsite Construction Labor; duration of jobs for these workers would be very short-term (averaging 5.2 months). These estimates will be further discussed in Appendix A.[9]

---

[7] Section A.2 Application, Appendix A, PennEast Analysis (pp. A-1 to A-2). Multipliers with be discussed in Section 3.3.3.1.

[8] The PennEast Pipeline Project Overview. PennEast Pipeline website. Accessed September 1, 2015. http://penneastpipeline.com/overview/

In another (apparently earlier) version of Project Overview, the project is estimated to create 2,000 local jobs during construction that will take approximately seven months to complete. Factsheet: PennEast Pipeline Overview. PennEast Pipeline website. Accessed September 1, 2015. http://penneastpipeline.com/wp-content/uploads/2015/01/PennEast_Overview_11-7-14.pdf

[9] In a pre-filing draft submission to FERC, PennEast estimates a workforce of 625 workers at each of 4 construction spreads, for a total of 2,500 workers. Duration of these jobs is not specified, and it is unclear whether the estimated number of workers is peak or average workforce. Resource Report 5 (Pre-filing Draft April 2015, Penn East submission to FERC in Docket PF15-1), pp. 5-3-5-4. http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13844811
See Appendix B (p. 47) of this report, for explanation of FERC Process and Documents for Natural Gas Pipeline Construction Projects.

In a later revised pre-filing draft submission to FERC, PennEast estimates a construction workforce of approximately 2,300 workers. Draft Resource Report 1, General Project Description, Revised Draft July 2015, p. 1-86. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13946534

As documented above and in footnote 8, prior to filing its September 2015 FERC submission, PennEast has provided various estimates ranging from 2,000 to 2,500 workers during construction. PennEast has stated that construction will take about seven months to complete, but it did not specify how many workers will be needed for how long.

As will be further discussed in Appendix A of this report, in its September 2015 Application to FERC, PennEast estimates a workforce of 665 workers at each of 4 construction spreads, for a total of 2,660 workers. It is clear the estimated number of workers is peak workforce; the average workforce would be much smaller. Construction will occur over a one year period (late 2016-late 2017), but activity and jobs are concentrated into only six months (early January-early July 2017). Based on the PennEast estimates in the September 2015 FERC Application (Table 5.3-3, pp. 5-4 – 5-5), TGG has derived that (footnote continued on next page)

PennEast does not estimate Direct Onsite Construction Jobs based on the PennEast Analysis Input-Output modeling. Instead, PennEast estimates Direct Onsite Construction Jobs based on the detailed design/engineering/costing process required to develop a pipeline project. Direct Onsite Construction jobs are easier to measure than offsite jobs. Therefore, estimates for these jobs are generally more accurate than estimates for offsite jobs.[10]

3.3 TGG's Evaluation

This section presents TGG's evaluation of the PennEast Employment Impact Estimates.

3.3.1 Employment Impacts from Building PennEast Are Tiny and Short-Term

First, it should be understood that even if the PennEast Analysis' employment impact estimates were realistic, the employment impacts from the Project are tiny in the context of the New Jersey and Pennsylvania state economies. The PennEast Analysis estimates 2,870 total jobs (i.e. onsite and offsite) from design and construction in NJ and 9,290 total jobs from design and construction in PA.[11] However, NJ has more than 4 million total jobs, and PA has more than 6 million total jobs.[12] Therefore, even using

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(footnote continued from previous page)
the average workforce (over the entire one-year construction period) is only 1,158 workers. Given a peak workforce of 2,660 workers and average workforce of 1,158 workers over 1 year (equivalent to 1158 average annual jobs), TGG has calculated that the average duration of Direct Onsite Construction jobs is 5.2 months (1158 average jobs/2660 peak jobs=5.2 months/12 months). Resource Report 5 (September 2015, Penn East submission to FERC in Docket CP15-558), Section 5.3.2, pp. 5-3-5-5. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995678

Note: According to INGAA (Interstate Natural Gas Association of America), "a typical interstate, long-haul (long-distance) pipeline project is constructed in manageable sections known as construction spreads that use highly specialized and qualified work crews. Each crew has its own set of responsibilities." (Building Interstate Natural Gas Pipelines: A Primer, p. 25, http://www.ingaa.org/file.aspx?id=19618)

[10] As further discussed in Appendix A, the PennEast estimate of Direct Onsite Construction jobs is based on detailed project planning, including determining how many workers would be needed during each week of the construction period. Companies developing pipeline projects typically provide detailed estimates of Direct Onsite Construction jobs as part of their submissions to FERC.

Meanwhile, as indicated in Section 3.1, offsite jobs are widely dispersed in sectors throughout the economy and geographically and cannot be directly counted, especially for a project that has not been built. As such, they are estimated based on an economic model, which is a highly simplified representation of how the economy works. There is substantial judgment, uncertainty and controversy related to how offsite jobs are estimated.

[11] The state abbreviations for New Jersey and Pennsylvania, i.e. NJ and PA, are often used for brevity throughout this report.

[12] NJ has over 4.5 million workers and over 4.2 million jobs; PA has over 6.4 million workers and over 6.0 million jobs. http://www.bls.gov/eag/eag.nj.htm http://www.bls.gov/eag/eag.pa.htm

PennEast's own inflated estimates, the short-term employment benefits from building PennEast in NJ are less than 0.1% of total state jobs.

Moreover any jobs related to building the Project are very short-term. Based on estimates from the September 2015 FERC Application, TGG has calculated that jobs from actual construction have a duration averaging only 5.2 months.[13] Spinoffs from actual construction will also be short in duration. There are some additional jobs prior to actual construction (such as for design and engineering), but these job impacts are also small and of short-term duration.

Based on the schedule provided by PennEast, the prebuild period is in 2014-2016, with almost all of the actual construction in 2017, concentrated in a six-month period.[14] So while total jobs relating to development and building the Project will be spread over a 4-year period 2014-2017, most will occur in 2017.

According to PennEast's September 2015 FERC Application, actual construction will occur over a one-year period (late 2016-late 2017) with activity and jobs concentrated into only six months (early January-early July 2017). Most of the employment impacts (i.e. the total onsite and offsite jobs) will take place during the same period.

The following subsections (3.3.2 and 3.3.3) highlight the inconsistencies and missing information in the PennEast Analysis and examine why the PennEast estimates for employment impacts related to the Construction Phase are likely inflated.

3.3.2 Internal Inconsistencies in PennEast Job Estimates

Figure 1, The Great Pipeline Jobs Mystery: Revealing Internal Inconsistencies in PennEast's Job Estimates (see Section 1.1), illustrates two major inconsistencies related to the PennEast Analysis:

1. A major disjuncture between Direct Onsite Construction Jobs and Total Jobs.
2. A significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs and Total Jobs; and (b) estimates for "construction" and "other" jobs in the Six-County Region.

[13] See footnote 9.
[14] The PennEast Pipeline Project Overview. PennEast Pipeline website. Accessed September 1, 2015. http://penneastpipeline.com/overview/; and Resource Report 5, Socioeconomics, September 2015, Table 5.3-3: Construction Workforce Schedule Breakdown by Duration, pp. 5-4-5-5 http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995678.
Note: in the previous reference (part of PennEast's September 2015 Application to FERC), PennEast estimates that there will be a small amount of construction in late 2016 (October to early December).

1. Major Disjuncture Between Direct Onsite Construction Jobs and Total Jobs

In Figure 1, the first and second boxes provide a clear illustration of the major disjuncture between the very low number of Direct Onsite Construction jobs and the very high number of Total Jobs (which includes mainly offsite jobs).

As discussed in the previous section, according to the PennEast website overview, "[t]he project is expected to create 2,500 local jobs during construction, which is expected to take approximately seven months to complete."[15] This figure of 2,500 jobs matches an estimate by PennEast for Direct Onsite Construction labor, as reported to FERC, but PennEast has provided various estimates ranging from 2,000 to 2,660 workers during construction.[16]

However, Table 3.2 of the PennEast Analysis (p. 11) indicates that the total employment impact related to the design and construction of the Project in Pennsylvania and New Jersey is 12,160. In other words, the Total Jobs (Direct Onsite Construction Jobs and Offsite Direct Jobs, as well as offsite upstream (indirect) and downstream (induced)) from the Project are estimated by PennEast at 12,160.

Figure 1 compares (a) the 2,500 Direct Onsite Construction Jobs (based on PennEast's estimates of workers on site, as reported to FERC) with (b) the 12,160 Total Jobs related to design and construction labor for the PennEast Analysis (based on Input-Output modeling).

It is a mystery how 2,500 Direct Onsite Construction Jobs can result in 12,160 Total Jobs. For every Direct Onsite Construction Job to build the pipeline, PennEast is estimating that there are almost five (i.e. 4.9) Additional Offsite Jobs generated. Additional Offsite Jobs are defined as other direct offsite construction jobs and upstream jobs providing services and materials, as well as downstream jobs from respending of wages. (See Section 3.1 for a more detailed discussion of the breakdown of Total Jobs.)

An estimate of 4.9 Additional Offsite Jobs is much higher than what is normally expected for comparable pipelines. As will be demonstrated in Section 4, job studies for comparable pipelines typically estimate much lower job impacts per dollar expended compared to the PennEast Analysis.

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[15] The PennEast Pipeline Project Overview. PennEast Pipeline website. Accessed September 1, 2015. http://penneastpipeline.com/overview/

[16] The PennEast Analysis does not provide an estimate for the number of Direct Onsite Construction Jobs; however information on Construction Labor requirements is provided in other PennEast documentation, including documents submitted to FERC. In other PennEast documentation (see footnotes 8 and 9), Direct Onsite Construction Labor is estimated to require between 2,000-2,660 workers.

As such, the Total Jobs estimate of 12,160 for the design and construction of the pipeline appears to be significantly inflated.

Estimates of the Additional Offsite Jobs vary according to the specific characteristics of the gas pipeline considered. In particular, these estimates depend on how labor-intense the construction is in terms of Additional Offsite Jobs versus Onsite Jobs.

The relative labor intensity of gas pipelines can vary based on numerous characteristics, including:

- project design and budget (notably the mix of Direct Onsite Construction and other project inputs including materials and services), which are affected by project characteristics, including:
    - mix of pipeline versus other facilities (including compressor stations, and meter and regulator stations)
    - mix of new facilities, versus expansion/modification of existing facilities
    - pipeline diameter
    - terrain
    - proximity to populated and other sensitive areas
    - amount and complexity of permitting, design, and construction
- the extent to which project inputs are sourced and produced in-state
- respending (notably, the extent to which labor income is spent in-state and results in in-state jobs)
- relative labor income per job (notably for Direct Onsite Construction, versus other jobs, such as from responding).

In general, pipeline projects will result in more spinoffs/offsite jobs in states like Texas, which have the following characteristics:

- large and diverse economy
- extensive in-state supply chain and workforce for pipeline projects
- high labor income per job for Direct Onsite Construction and relatively low labor income for other jobs, such as from respending.

But Pennsylvania and especially New Jersey do not have enough of these characteristics, such that pipeline projects in these states will not typically result in a high level of spinoffs/offsite jobs. Likewise, the economies in other Northeast US states are broadly similar to Pennsylvania and especially New Jersey, and also do not have the characteristics that result in a high level of spinoffs for pipeline projects.

The above discussion of the labor intensity of gas pipelines further reinforces TGG's assessment that 4.9 Additional Offsite Jobs for each Direct Onsite Construction Job is unusually high. TGG's review of employment impact studies for other comparable gas pipelines in the US Northeast (which will be provided in Section 4) demonstrates that job studies for comparable pipelines typically estimate much lower job impacts per dollar expended compared to the PennEast Analysis.

We note that New Jersey observers have also been confused by the disjuncture between the 2,500 Direct Onsite Construction Jobs and the 12,160 Total Jobs. A February 2015 article entitled "PennEast natural gas pipeline economic study questioned: Is it 12,160 or 2,500 jobs?" in the Times of Trenton/nj.com focused on this same mystery:

> For months during public meetings, PennEast company representatives said it was going to take about 2,000 construction workers to build its proposed $1.2 billion natural gas pipeline from Northeastern Pennsylvania to Mercer County.
>
> But on Monday, PennEast -- a consortium of major East Coast natural gas providers - released a study backed by Drexel University's business school saying the construction of the bi-state pipeline would "support" 12,160 jobs.
>
> The difference comes from the definition of "support."
>
> The project would employ 2,500 temporary construction workers to actually build the pipeline, a task expected to take about seven months, said to Patricia Kornick, PennEast spokeswoman.
>
> The remainder of the 9,960 [sic][17] jobs cited in the Drexel study are ancillary positions created by the $1.6 billion in economic activity generated by the construction, Kornick said.
>
> "The other jobs [sic] be across other supporting industries," Kornick said. "There would be consulting and architectural, food services and other sectors."
>
> For instance, if the operator of a taco truck pulled up to a construction area to feed hungry workers at lunchtime, that operator would be counted as one of the 12,160 jobs "supported" by the a pipeline, under the formula employed by the Drexel study.
>
> "That would fall under the food services category," Kornick said.[18]

[17] 12,160 minus 2,500 = 9,690 not 9,960.
[18] "PennEast natural gas pipeline economic study questioned: Is it 12,160 or 2,500 jobs?" Times of Trenton/NJ.com, February 14, 2015. Accessed August 31, 2015. http://www.nj.com/mercer/index.ssf/2015/02/penneast_pipeline_would_create_just_2500_temporary.html

The article highlights that it is simply not credible that the original 2,500 Direct Onsite Construction Jobs generated a total of 12,160, including "ancillary positions" of 9,690[19] jobs. This defies common sense and is inconsistent with employment impacts from comparable pipeline studies, as will be shown in Section 4.

2. Significant Internal Inconsistency in PennEast's Documentation Regarding Construction Jobs and Other Jobs

In addition to the disjuncture between Direct Onsite Construction Jobs and Total Jobs, there is also significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs and Total Jobs; and (b) estimates for "construction" and "other" jobs in the Six-County Region (as will be further detailed below).

This internal inconsistency is illustrated in Figure 1 (between the second and third boxes).

As mentioned in the previous section, a fact sheet for the PennEast Analysis on the PennEast website indicates the following:

> PennEast will support 12,160 jobs, of which a large portion will be related to the construction industry. Hundreds of architectural and engineering jobs in several related industries will also be supported. Within the six-county region, slightly less than half of the employment impact will occur in industries other than construction, including: food services, landscaping, legal services, and the real estate establishment.[20]

According to Table 3.2 of the PennEast Analysis (p. 11), Total Jobs in the Six-County Region are estimated at 11,210. Therefore TGG has assumed that PennEast is implying that approximately 6,000 (of these 11,210 jobs) will be in construction and about 5,210 ("slightly less than half" of the 11,210) will be in other industries.

Even if the 6,000 construction jobs are assumed to include jobs offsite as well as onsite, there is a considerable disjuncture between 6,000 construction jobs and 2,500 Direct Onsite Construction Jobs. This would imply that there are more construction jobs offsite than onsite jobs, which seems highly unlikely.

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[19] As explained in the preceding footnote, 12,160 minus 2,500 = 9,690 not 9,960.
[20] Economic Impact of the PennEast Pipeline's Construction and Operation Fact Sheet. PennEast Pipeline website. Accessed August 25, 2015. http://penneastpipeline.com/DrexelFactSheet/

FERC Staff has also identified this inconsistency in PennEast's construction job numbers. In its Information Request 4 to PennEast on May 29, 2015 in regard to the PennEast Analysis, FERC Staff asked the following:[21]

> Many commenters expressed concern about the conclusions of the Econsult Solutions Inc. and Drexel University economic impact analysis, which estimates that construction of the Project would support a total of 12,160 jobs. The fact sheet on PennEast's web site states that "slightly less than half (of these jobs) would be in industries other than construction." This implies that more than 6,000 jobs would be in the construction sector. This appears to conflict with other estimates presented in draft Resource Report 5 of 2,500 people employed during construction. Explain this apparent discrepancy.

In conclusion, the internal inconsistencies discussed in this section reveal that PennEast failed to perform a basic check to verify the reasonableness of the results from its economic modeling exercise (particularly for the 12,160 Total Jobs) by comparing these to other estimates for construction jobs in the company's own documents. In the following section, TGG offers some potential explanation for these internal inconsistencies and the overstatement of employment estimates in the PennEast Analysis.

3.3.3 Explaining the Internal Inconsistencies and Overstatement of Job Estimates in PennEast Analysis

3.3.3.1 Information Gaps in the PennEast Analysis

Before we outline possible causes for the internal inconsistencies and overstatement in the employment impact estimates related to Capital Infrastructure Investment, this section discusses the information gaps in the PennEast Analysis. These information gaps present a challenge for understanding how the PennEast estimates were developed.

No Breakdown of Job Numbers by Category of Employment

As discussed in Section 3.1, the PennEast Analysis provides job numbers related to the design and construction of the Project by various geographical regions (Total, Six-County Region, Pennsylvania, New Jersey), but fails to provide a breakdown of these numbers by job category (either in terms of direct, indirect and induced jobs; or in terms of direct onsite construction and other offsite jobs (i.e. direct offsite construction jobs, upstream jobs (indirect jobs) or downstream jobs (respending)).[22] A breakdown of

[21] http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13890804
[22] See Section 3.1.

employment estimates by job category is considered a best practice and is commonly provided in other employment impact studies.

No Definition of Jobs and No Duration for Temporary Jobs

The PennEast Analysis fails to provide a definition of what a job constitutes. In particular, the Analysis fails to provide a duration for the 12,160 temporary jobs. TGG was unable to find this information in any other PennEast documents reviewed.

The failure to provide a duration for the 12,160 temporary jobs is highly problematic because without a duration, it is impossible to:

- evaluate with certainty the employment benefits estimated for the Project;
- compare the employment benefits estimated for the Project with the benefits estimated in employment impact studies for other pipelines.

Various jobs can be of various durations, so it is useful to define them by expressing them in terms of a standard measure. There are several standard measures including (a) average annual jobs, (b) job-years/person-years, and (c) Full-Time Equivalents (FTEs). These various measures can differ a bit in their precise definition and calculation, but in general they are measured in terms of 1 job for 1 worker for 1 year. The annualization of job estimates is common in other pipeline studies and allows for jobs of varying duration to be meaningfully compared. Job-years/person-years and FTEs have been used in employment studies of natural gas pipelines comparable to PennEast, including Atlantic Sunrise and Northeast Supply Link. The Average annual jobs measure was used by the US Department of State in its Final Supplementary Environmental Impact Statement (FSEIS) for Keystone XL.[23] As will be discussed in Appendix A, the annualization of employment benefits is considered a best practice in employment impact studies. Annualization of PennEast jobs will be revisited in Appendix A.

We note that Econsult Solutions Inc. (lead author of the PennEast Analysis) has also published an economic impact study on another pipeline in Pennsylvania (Sunoco Logistics' Mariner East Projects for natural gas liquids).[24] The Mariner East study was released just four days before the February 9, 2015 release of the PennEast Analysis, and it is in some ways very similar to the PennEast Analysis. However, the job numbers

[23] http://keystonepipeline-xl.state.gov/documents/organization/221186.pdf pp. 4.10-13-4.10-15.
[24] The Economic Impact of Sunoco Logistics' Mariner East Projects in Pennsylvania**,** Econsult Solutions Inc., February 5, 2015, p. 7. Accessed September 4, 2015. http://www.econsultsolutions.com/wp-content/uploads/Sunoco-Logistics-Mariner-East-Economic-Impact-Report.pdf

for Mariner East are expressed in FTEs.[25] Therefore Econsult is familiar with this best practice in employment impact analysis, but chose not to present the PennEast job numbers in this standard and meaningful manner.

No Job Multipliers

While the PennEast Analysis provides an abstract discussion of multipliers,[26] no concrete employment multipliers are provided in the Analysis.[27] In the examination of the employment impacts of pipeline projects, a useful multiplier (and summary metric) is jobs per dollar (typically in terms jobs per $1 million project cost). Multipliers facilitate comparison of results within and across studies. With results expressed in terms of multipliers, projects (and other activities) with differing levels of spending can be compared to determine relative intensity of impacts.

While the PennEast Analysis does not present any of its results in terms of multipliers, an overall multiplier for the Potential Economic Impact from Design and Construction of the Project can easily be derived from Tables 3.1 and 3.2. Table 3.2 provides the Total Employment Impact of the Project (12,160 jobs) and Table 3.1 provides the total project expenditure for Design and Construction ($1,193 million). The overall multiplier for the Potential Economic Impact from Design and Construction of the Project would be 10.2 jobs per $1 million project cost.[28] Figure 2 (Section 1.1) as described in Section 4, will present the multipliers for a number of comparable natural gas pipelines in the Northeast.

Poorly Documented Methodology

The PennEast Analysis has not provided adequate documentation of the methodology used in its economic modeling, making it impossible to understand how the company

[25] The Mariner East study (pp. 6, 7, 12) specifically identifies job numbers as FTEs. The Mariner East study (pp. 8-9) also provides a breakdown of job numbers by category (direct, indirect and induced).
[26] Section A.2 Application, Appendix A, PennEast Analysis (pp. A-1 to A-2).
[27] The PennEast Analysis does not provide employment multipliers for Capital Infrastructure Investment (expenditures to design and construct the Project). Nor does the PennEast Analysis provide multipliers for Ongoing Annual Operations (expenditures to operate and maintain the Project). But as discussed in footnote 48, the PennEast Analysis (p. 14) does provide a multiplier for Additional Economic Benefits (energy cost savings): 9 jobs per $1 million of increased disposable income derived from energy cost savings.
[28] As further discussed in Section 4 and Appendix A, in the September 2015 PennEast FERC Application, PennEast has now updated its cost estimate for building the Project. The Project is estimated to cost $1,131 million. (Application for Certificate of Public Convenience and Necessity, September 24, 2015 ("Certificate Application"), Exhibit K (Cost of Facilities), PDF p. 176. Accessed October 13, 2015. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995667.

Given that PennEast has not updated the Total Employment Impact of the Project (12,160 jobs) in the September 2015 FERC Application, the overall multiplier for the Potential Economic Impact from Design and Construction of the Project with the updated Project Cost Estimate is 10.7 jobs per $1 million.

developed its employment estimates. While the PennEast Analysis provides some information about its methodology for modeling employment impacts,[29] the discussion is not sufficient to explain how the estimates were derived or all of the assumptions used. Nor does the methodology provided help to resolve the inconsistencies described in Section 3.3.2.

Despite the information gaps described in this section, TGG has nonetheless identified a number of assumptions in the PennEast Analysis, which may explain the inconsistencies in PennEast's estimates, as well as the overstatement of the employment impact estimates related to Capital Infrastructure Investment (i.e. the construction phase). The following sections will discuss possible causes for the inconsistencies and overstatement in the employment impact estimates.

3.3.3.2 Limitations of I-O Modeling and Overstatement of PennEast Estimates

As outlined in Section 3.2, the PennEast Analysis is based on IMPLAN, an input-output (I-O) model.

Application of Generic I-O Construction Sector Model Leads to Overstatement of Employment Impacts of Pipeline Construction

For pipeline projects such as PennEast, input-output analysis can substantially overestimate jobs, especially for direct onsite construction. Input-output models provide only limited disaggregation for the large and diverse construction sector. Pipeline construction is grouped together with many other types of construction.[30] But compared with other types of construction, pipeline projects such as PennEast are very specialized, distinctive, and atypical; pipelines result in fewer jobs, but the jobs onsite are very highly paid.[31]

[29] Section A.3 Economic Impact Model, Appendix A, PennEast Analysis (pp. A-2 to A-5).
[30] IMPLAN Industry 58 (Construction of other new nonresidential structures) includes all types of pipelines (natural gas, oil, water, and sewer), as well as a variety of other structures (including billboards, fencing, outdoor swimming pools, and waste disposal).
[31] PennEast is a large diameter, high-pressure gas pipeline. Pipeline construction for project such as PennEast is highly mechanized, with a sizable proportion of the onsite construction workers in high skill/high wage specialties such as welding. Due to the nature of pipeline construction (outdoors, weather/terrain sensitive, ranging over considerable distances, very schedule constrained), pipeline construction workers typically have a long workweek (e.g., 10 hours/day, 6 days/week, 60 hours/week). The graphic in Appendix A (PennEast FERC Application Number of Direct Onsite Construction Workers by Two-Week Time Period) further reinforces the very short-term nature and the condensed schedule of the pipeline construction work.

Simply put, construction labor expenditures[32] on pipeline projects result in a small number of highly-paid Direct Onsite Construction Jobs. However, if construction labor expenditures are input into a more generic I-O construction sector model (such as IMPLAN Industry 58), the model will estimate a higher number of lower-paid construction jobs.

Given the overstatement of the PennEast job estimates, as well as the inconsistencies in PennEast documentation concerning construction job estimates, it is quite possible that the PennEast Analysis is based on a more generic I-O construction sector model (such as IMPLAN Industry 58). This problem will be further discussed in Section 3.3.3.3.

I-O Tends to Overstate Employment Impacts in a Tighter Labor Market

Another key limitation of I-O models is that they are highly simplified representations of how the economy actually operates, and the results of these models tend to represent the higher end of a range of potential employment impacts. The reason for this is that I-O models assume that there will be no supply constraints for labor and other resources and that people employed as a result of the proposed project would otherwise be unemployed. Employment impact estimates generated with I-O models tend to overstate actual net job impacts, especially in a context of tighter labor market conditions. When the economy is closer to full employment (as is increasingly the case in New Jersey and Pennsylvania with the economy in recovery), I-O models will tend to overestimate employment impacts, and particularly overstate spinoff effects. This is especially true of respending employment impacts in a tight economy (since respending is always the most challenging to meaningfully model).

Put another way, when the economy is closer to full utilization of available workers and other resources, overall economic activity and employment are constrained. Adding a new activity (such as building a pipeline) is more likely to displace some other new or existing activity, such that the potential net increase in jobs due to the new activity will be less than estimated by an I-O model.

[32] It should be understood that construction labor on pipeline projects typically involves contractors, rather than direct employees of pipeline companies. Hence, the “labor” category in pipeline construction cost estimates is typically payments to contractors, rather than payments directly to construction workers. Moreover, payments to contractors (construction companies) include Direct Onsite Construction labor costs, but can also include other sizable compensation, such as for construction company profit, overhead, use of company-owned equipment.

I-O is Inputs-Driven and Prone to Garbage In, Garbage Out Problems

I-O models are also inputs-driven; and the output from an I-O model can only be as good as its inputs. In other words, the principal of “garbage in, garbage out” applies. An I-O model will unquestioningly process flawed input data ("garbage in") and produce unrealistic (even nonsensical) output ("garbage out"). So if the inputs are flawed (perhaps due to unrealistic assumptions), then the model will produce results that are flawed and unrealistic.

Judicious I-O Modeling Can Produce Reasonable Employment Studies but Reasonableness Checks Are Required

In TGG’s review of comparable gas pipelines in the Northeast (discussed in Section 4), we have noted that it is possible to use I-O modeling more judiciously in order to develop reasonable employment impact estimates. More sophisticated employment studies take the nature of pipeline construction into account and rely on the pipeline company’s own estimates for Direct Onsite Construction Jobs, and/or customize the I-O model to better reflect the nature of pipeline construction. Generally speaking, pipeline company estimates of Direct Onsite Construction Jobs (based on the detailed design/engineering/costing process required to develop a pipeline project) are much more reliable than estimates based on a more generic I-O construction sector model.

The better employment studies also take into account either implicitly or explicitly the limitations of I-O related to the tightness of the labor market and respending. These studies also have explicit and reasonable assumptions regarding the percentage of local workers and local respending.

The limitations of I-O modeling are very relevant for analysis of pipeline projects and specifically PennEast. If the I-O modeling is not used judiciously, employment studies (such as the PennEast Analysis) can generate highly overstated job numbers, which are not reflective of the potential real world impacts. Therefore, reasonableness checks are necessary, as well as a check for consistency related to other company estimates (e.g. an estimate of Direct Onsite Construction Jobs not based on an I-O model). It would appear that the PennEast Analysis has failed to perform this kind of reasonableness check. Moreover, as will be discussed in following subsections, not only did the PennEast Analysis fail to take into account the limitations of the I-O model, but it has also made unrealistic assumptions about local labor and local respending that further overstate the total job numbers.

3.3.3.3 Overstatement of Jobs per Dollar of Labor Income

As outlined in the previous subsection, given the nature of pipeline construction, the application of a generic I-O construction sector model leads to overstatement of employment impacts. Pipeline projects produce a small number of highly-paid Direct Onsite Construction Jobs. However, if construction labor expenditures are input into a more generic I-O construction sector model, the model will generate a higher number of lower-paid construction jobs.

The inconsistencies and overstatement in the PennEast job estimates may be partly explained by a problematic application of a more generic I-O construction sector model. This section describes how the inconsistencies identified in Section 3.3.2 can be partly explained by the overstatement of jobs per dollar of labor income.

As discussed in Section 3.3.2 and illustrated in Figure 1, there are two major inconsistencies related to the PennEast Analysis:

1. A major disjuncture between Direct Onsite Construction Jobs and Total Jobs
2. A significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs and Total Jobs; and (b) estimates from construction and other jobs.

The first inconsistency addresses the mystery how the 2,500 Direct Onsite Construction Jobs (estimated on PennEast's website and in its FERC submission) results in 12,160 Total Jobs (according to the PennEast Analysis). Therefore the Total Jobs number appears to be highly inflated compared to the original Direct Onsite Construction Jobs.

The second inconsistency relates a significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs and Total Jobs (i.e. 2,500 and 12,160); and (b) estimates for "construction" and "other" jobs in the Six-County Region. According to a fact sheet on the PennEast website, less than half of the employment impact in the Six-County Region (estimated to be 11,210 jobs) would occur in jobs other than construction.

According to this logic, just over half the jobs (approximately 6,000 jobs) would occur in construction with the remaining jobs in other fields (approximately 5,210). The 6,000 jobs are highly inconsistent with 2,500 Direct Onsite Construction Jobs that have been estimated by PennEast outside the model. It is quite possible that this inflated construction job number (and the internal inconsistencies in PennEast's estimates) are, at least in part, the result of a problematic application of the I-O model (i.e. inputting construction labor expenditures into a more generic I-O construction sector model,

which generates a higher number of lower-paid jobs, rather than the smaller number of higher-paid jobs that result from pipeline construction).

In summary, it possible and perhaps likely that the PennEast Analysis has inflated the employment estimates, and specifically direct jobs, by assuming an unrealistically low labor income per job.

3.3.3.4 Employment Benefits for Local Workers in NJ and PA Significantly Overstated

The job impacts estimated by the PennEast Analysis significantly overstate the benefits for local workers residing in NJ and PA. When estimating job impacts for NJ and PA, the PennEast Analysis includes employment for workers from out-of-state. Much of the construction workforce for the Project would come from outside of NJ and PA. These non-local workers would only be in-state temporarily (for part of one year) building the Project. The employment benefits (direct/indirect/induced) reported in the PennEast Analysis[33] would not all go to workers from NJ and PA.

The PennEast Analysis (p. 10) acknowledges that "[t]he workforce for the Project is likely to be comprised of personnel from across the country due to the specialized nature of pipeline construction." But the PennEast Analysis does not specify what proportion of workers is assumed to come from out-of-state, stating that the "geographic distribution of construction workers is not finalized at this time."

Based on our review of other comparable gas pipeline projects in the Northeast US, TGG assumes that half or more of Direct Onsite Construction labor for PennEast will be non-local (residing outside NJ and PA). We also note that the PennEast Analysis assumes that only 10% of materials expenditures will be sourced locally in the Six-County Region along the pipeline routing in NJ and PA (footnote 8, p. 10, PennEast Analysis). This assumption does not appear to be unreasonable. Local spending on materials ($24 million in NJ and PA[34] and perhaps about $6 million in NJ alone) is too small to provide a substantial benefit in the context of the NJ and PA state economies.[35]

[33] PennEast Analysis, Table 3.2 (p. 11) (Employment Supported – Jobs) for NJ and PA for construction and design.
[34] PennEast Analysis, Table 3.1 (p. 10) (Materials – Modeled Direct Expenditure).
[35] Local spending in NJ on materials (about $6 million dollars) would be only 0.01% of overall economic activity in NJ and is therefore too small to have a substantial impact on the NJ economy. NJ GSP (Gross State Product, a measure of overall economic activity) was about $549 billion in 2014 and is forecasted to grow by about 2% annually (in real terms, not including inflation).
http://www.bea.gov/newsreleases/regional/gdp_state/2015/pdf/gsp0615.pdf
http://recon.rutgers.edu/wp-content/uploads/2014/03/recon-execsum-oct2015.pdf

3.3.3.5 Percentage of In-State Spending Is Overestimated

Another key issue when evaluating the employment benefits of the Project for NJ and PA is spending by non-local (i.e. out-of-state) workers and how this affects the economy locally (in NJ and PA). The job impacts estimated by the PennEast Analysis include induced effects from spending of labor income; consumer spending (notably by workers on PennEast) is estimated to result in some added employment (such as in restaurants and retail).

Hence, in estimating local job impacts (in NJ and PA), it matters to what extent money is spent locally, and in turn this is affected by whether workers are local or from out-of-state. Put simply, workers from out-of-state are less likely to spend their earnings in-state. As explained in the PennEast Analysis (p. 10):

> […] [I]t is necessary to account for the non-resident construction workers who spend a portion of their income outside of the region. For example, a construction worker from Texas who moves to Pennsylvania for six months of construction work will not spend his entire income in the area. It is likely the construction worker will spend a portion of that income in Texas. […] It is estimated that 25 percent of the disposable income of the construction workforce will be spent outside of Pennsylvania and New Jersey.

It is unclear whether the PennEast Analysis is implying that 25% of the disposable income of the construction workforce overall or that 25% of the disposable income of the non-resident construction workforce will be spent out-of-state. In either case, the actual percentage spent out-of-state is likely to be higher than 25%.[36]

As discussed in the previous subsection, TGG has assumed that out-of-state workers would spend 50% or more of their income out-of-state. The September 2015 PennEast FERC Application indicates that actual construction will occur over a one-year period,

[36] In TGG's review of comparable gas pipelines in the Northeast, we found many parallels between the Massachusetts section of the Northeast Energy Direct (NED) project and the PennEast project. The NED analysis considers local spending by both local and non-local workers, and the NED assumptions are much more realistic than the PennEast assumptions. NED assumes pipeline construction workers spend $800/week for local living expenses such as temporary housing and meals. Meanwhile NED (like a number of other comparable studies) assumes labor income per week per worker is quite high, about $3900 ($65/hour for 60 hours per week of work). So local living expenses are assumed to be only about 20% of labor income. Labor income includes taxes and benefits. Assuming disposable income is 50% or more of labor income, local living expenses would be 40% or less of disposable income.

In our review of the comparable gas pipelines, TGG has determined that other employment impact studies also assume local spending of $800/week by non-local workers for lodging, meals, and sundries. This provides further confirmation that workers from outside NJ and PA would spend most of their compensation outside of NJ and PA.

but is concentrated into only six months; duration of Direct Onsite Construction jobs would be very short-term, averaging only 5.2 months.[37] Thus, out-of-state workers will be in NJ and PA for only a few months (or less), and they will likely spend a large amount of this time working with limited opportunity to spend money locally. [38] Meanwhile, 50% or more of construction workers are likely to come from out-of-state.

Thus, a more realistic estimate would imply that over 25% of the disposable income of the construction workforce overall and over 50% of the disposable income of the non-resident construction workforce would be spent out-of-state. If the proportion of out-of-state workers is higher than 50% (which is quite possible), then the percent of the disposable income of the construction workforce spent out-of-state will be even higher.

Conversely, this implies that less than 75% of the disposable income of the construction force overall and less than 50% of the disposable income of the non-resident construction workforce will be spent in-state. If the proportion of out-of-state workers is higher than 50% (which is quite possible), then the percent of the disposable income of the construction workforce spent in-state will be even lower.

Moreover, the non-local workers are typically more specialized and higher paid workers (i.e. inspectors and other pipeline construction specialists), and therefore this will also increase the out-of-state disposable income expenditures.

The implication once again is that PennEast is making assumptions that will increase the estimate of the employment impact benefits.

3.3.3.6 The PennEast Analysis Counts Some Jobs That Have Already Been Created

Given the development schedule discussed above, some of the PennEast project budget has already been spent, and some jobs related to the Project have already been created. And by the time a decision is made by FERC on whether to allow construction to proceed (in late 2016),[39] even more of the project budget will have been spent and even more of the jobs related to the Project will already have been created. While the Project is unlikely to have significant expenditures prior to the main construction phase in 2017, the employment impacts from the PennEast Analysis consider the entire

[37] See Appendix A.
[38] Pipeline construction for projects such as PennEast is undertaken by crews of highly specialized workers with a typically long workweek (e.g., 10 hours/day, 6 days/week, 60 hours/week). See footnotes 9 and 31. Some workers may be onsite for only a small portion of the overall construction period, notably for specialized short-duration tasks.
[39] PennEast has requested that FERC issue a decision approving construction by December 1, 2016 in order to enable a project in-service date of November 1, 2017. https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13654024 pp. 1-3.

project. As such, the PennEast Analysis counts some jobs that have already been created. An alternate more realistic consideration of the employment impact benefits for NJ and PA should consider only new job creation from the Project, and would discount expenditures (and jobs) prior to the main construction phase.

3.3.3.7 Failure to Present Total Jobs as Annualized Jobs

The failure of the PennEast Analysis to define a job and particularly to provide a duration for the 12,160 temporary jobs (as discussed above in Section 3.3.3.1) is not in itself a flawed assumption that was input into the I-O model. However, if the average duration of these temporary 12,160 jobs is less than one year, then the failure to annualize these 12,160 jobs would be misleading and would inflate the employment impact. Put more simply, if the estimated 12,160 Total Jobs are for less than one year, they could be equivalent to substantially less than 12,000 annual jobs.

If the average duration of the jobs estimated in the PennEast Analysis is seven months (matching the duration indicated in the PennEast website overview for the estimated 2,500 Direct Onsite Construction jobs), the 12,160 Total Jobs estimated in the PennEast Analysis are equivalent to about 7,100 annual jobs.[40]

If the average duration of the jobs estimated in the PennEast Analysis is only 5.2 months (matching the duration based on the PennEast FERC Application for the estimated 2,660 peak Direct Onsite Construction jobs), the 12,160 Total Jobs estimated in the PennEast Analysis are equivalent to about 5,300 annual jobs.[41] As discussed in Section 3.3.3.1, the more relevant flaw in the PennEast study related to annualization is that the study fails to specify the duration of the Total Jobs estimated, so the total number of annual jobs remains unclear. It is therefore problematic to evaluate the true employment impacts of the Project and to compare these with other studies.

[40] 12,160 workers for 7 months are equivalent to 7,093 average annual jobs (=12,160*7/12). See Section 3.2 and specifically footnote 8 for discussion of the PennEast website overview and estimated construction jobs.

[41] 12,160 workers for 5.2 months are equivalent to 5,270 average annual jobs (=12,160*5.2/12). As discussed in Section 3.3.1 and Appendix A, the September 2015 PennEast FERC Application indicates that actual construction will occur over a one-year period, but is concentrated into only six months. The PennEast FERC Application estimates there will be 2,660 peak Direct Onsite Construction jobs, but the duration of these jobs would be very short-term, averaging only 5.2 months; 2,660 peak jobs is equivalent to only 1,158 average annual direct construction jobs.

4 Employment Impacts for Comparable Pipelines

Section 3 examined the claims of the PennEast Analysis regarding Capital Infrastructure Economic Impacts (i.e., employment impacts related to capital investment to design and construct the pipeline). TGG's evaluation revealed a number of internal inconsistencies in PennEast's documents concerning job estimates. We also concluded that the Total Jobs estimate (12,160) for designing and building the pipelines was inflated. TGG then examined possible causes for the inconsistences and the overstatement in the employment impact estimates. In particular, the report explained how the limitations of input-output modeling in combination with a series of unrealistic assumptions could produce highly inflated job numbers. We also examined a number of the unrealistic assumptions from the PennEast Analysis to expose possible reasons why the model produced such inflated job numbers.

In this section, TGG reviews the employment impact studies for other comparable gas pipelines in the Northeast US. Our review demonstrates that the PennEast Analysis job multiplier[42] (10.7 jobs per $1 million project cost for all workers) is an outlier with respect to comparable pipelines. Specifically, the multipliers for other similar gas pipelines are only 8-36% of the PennEast Analysis multiplier. This review strongly supports TGG's conclusion that the PennEast Analysis has significantly overstated the Total Jobs related to designing and building the pipeline.

This section focuses on the information summarized in Figure 2, Estimated Total Job Impacts from Building Northeast US Gas Pipeline Projects (contained in Section 1.1). Figure 2 compares the employment impacts from PennEast with the employment impacts from four other comparable Northeast US Gas Pipeline Projects: Atlantic Sunrise, Northeast Supply Link, Northeast Energy Direct (NED), and Constitution.[43] Two multipliers are presented for PennEast: the first multiplier, 10.2 jobs per $1 million project cost is based on the PennEast Analysis Total Jobs estimate (12,160) with the PennEast Analysis Project Cost Estimate ($1,193 million). The second multiplier, 10.7 jobs per $1 million project cost is based on the PennEast Analysis Total Jobs estimate

[42] As will be explained in this section, the 10.7 multiplier is derived from the Total Jobs Estimate of 12,160 in the PennEast Analysis and the recently updated Project Cost Estimate of $1,131 million from the September 2015 PennEast FERC Application.

[43] TGG notes that the data in Figure 2 is presented in terms of nominal dollars. Converting the data into real dollars would not significantly change the results. All of the pipelines projects being compared are of similar vintage, with project in-service dates from 2013 to 2018. PennEast, Atlantic Sunrise, and Northeast Energy Direct (the three largest projects in Figure 2) have project in-service dates in 2017 and 2018.

(12,160) with the updated Project Cost Estimate from the September 2015 PennEast FERC Application ($1,131 million).[44]

In the September 2015 PennEast FERC Application, PennEast has now updated its cost estimate for building the Project. The Project is estimated to cost $1,131 million. Given that PennEast has not updated the Total Employment Impact of the Project (12,160 jobs) in the September 2015 FERC Application, the overall multiplier for the Potential Economic Impact from Design and Construction of the Project with the updated Project Cost Estimate is 10.7 jobs per $1 million.

Appendix B provides detailed sources and notes for each of the pipelines described in Figure 2.

Figure 2 clearly demonstrates that both of the PennEast Analysis job multipliers for all workers (based on the Total Jobs claims of the PennEast Analysis and the original and updated Project Costs Estimates) are much higher (at 10.2 and 10.7 jobs per $1 million respectively) than the job multipliers for each of the other four comparable gas pipelines described. This comparison shows that PennEast Analysis job multipliers for all workers are likely significantly overstated (and this in turn is the result of significantly overstated Total Jobs). The concept and derivation of the multipliers in Figure 2 is explained in this section.

In the Northeast US, there are many natural gas pipeline projects in various stages of development (proposed, under construction or recently completed). Construction of interstate gas pipelines is subject to an extensive review process at the US Federal Energy Regulatory Commission (FERC). As part of the FERC review process, there is considerable public information regarding economic impacts of gas pipelines comparable to PennEast. Appendix B contains links to publicly available FERC documents for PennEast and comparable gas pipelines. TGG has reviewed these documents to obtain employment impact information for PennEast and comparable gas pipelines in Figure 2.

TGG also reviewed economic impact studies based on Input-Output modeling for comparable gas pipelines. From these studies and other information sources related to the pipelines (provided in Appendix B), we calculated job multipliers for PennEast and other comparable gas pipelines.

[44] Application for Certificate of Public Convenience and Necessity, September 24, 2015 ("Certificate Application"), Exhibit K (Cost of Facilities), PDF p. 176. Accessed October 13, 2015. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995667.

In the examination of the employment impacts of pipeline projects, a useful multiplier (and summary metric) is jobs per dollar (typically in terms jobs per $1 million project cost). Multipliers facilitate comparison of results within and across studies. With results expressed in terms of multipliers, projects (and other activities) with differing levels of spending can be compared to determine relative intensity of impacts.

Both TGG and the PennEast Analysis agree that project expenditures are a key input in an I-O model. Based on the relationships estimated by the I-O model and other assumptions, the employment analyses estimate employment impacts. The results of the PennEast Analysis and analyses for other pipelines can be usefully compared in terms of multipliers.

The PennEast Analysis does not present any of its results in terms of multipliers. However, overall multiplier for the Potential Economic Impact from Design and Construction of the Project can easily be derived from Tables 3.1 and 3.2. Table 3.2 provides the Total Employment Impact of the Project (12,160 jobs) and Table 3.1 provides the total project expenditure for Design and Construction ($1,193 million). The overall multiplier for the Potential Economic Impact from Design and Construction of the Project would be 10.2 jobs per $1 million project cost.

As indicated above and further discussed in Appendix B, PennEast has now updated its cost estimate for building the Project. In the Application (Exhibit K: Cost of Facilities) submitted to FERC in September 2015, the Project is estimated to cost $1,131 million. The PennEast Analysis has not been updated to be based on the September 2015 Project cost estimate. In its September 2015 Application to FERC, PennEast submitted the same PennEast Analysis document (from February 2015), as was submitted to FERC in April 2015 (as part of the pre-filing process).

Based on the Total Employment Impact of the Project estimated in the PennEast Analysis (12,160 jobs) and the total cost for building the Project estimated in the September 2015 FERC Application ($1,131 million), the most up-to-date overall multiplier for the Potential Economic Impact from Design and Construction of the Project would be 10.7 jobs per $1 million project cost.

As Figure 2 clearly illustrates, the multiplier of 10.7 jobs per $1 million project cost for all workers (from the PennEast Analysis), is an outlier compared to the other comparable Northeast US gas pipelines in Figure 2. The multiplier for Northeast Supply Link (3.9 jobs per $1 million) is only 36% of the PennEast Analysis multiplier. The job multipliers for Constitution (1.5) and Northeast Energy Direct (NED)

in MA (2.0) are only 14-19% of the PennEast Analysis multiplier.[45] This comparison shows that the PennEast Analysis job multiplier for all workers is significantly overstated (and this overstated multiplier is the result of PennEast's significantly overstated Total Jobs estimate).

The PennEast Analysis did not provide Total Jobs for in-state residents (in NJ and PA), so TGG was unable to calculate a job multiplier for in-state residents for the PennEast Analysis. But a comparison of the PennEast Analysis multiplier (for all workers), with the jobs multipliers for other comparable pipelines (for in-state workers), further confirms that the PennEast Analysis has significantly overstated job impacts. The multiplier for Atlantic Sunrise (3.8 jobs per $1 million project cost for in-state residents) is only 36% of the PennEast Analysis multiplier (for all workers). The job multipliers for in-state residents for Constitution (0.9) and Northeast Energy Direct (NED) in MA (1.4) are only 8-13% of the PennEast Analysis multiplier (for all workers). Again, this comparison shows that the PennEast Analysis job multiplier for all workers is significantly overstated (and this in turn is the result of significantly overstated Total Jobs).

In summary, this review of the employment impacts of comparable gas pipelines in the Northeast US shows that the multipliers for other similar gas pipelines are only 8-36% of the PennEast Analysis multiplier. **Specifically, this review strongly supports TGG's conclusion that the PennEast Analysis has overstated the Total Jobs related to designing and building the pipeline by approximately two thirds or more.**

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[45] The PennEast Analysis multiplier of 10.7 jobs/$1 million project cost for all workers is based on the assumption that the PennEast Total Jobs claim is for 12,160 **annual** jobs. But as discussed in Sections 3.3.3.1 and 3.3.3.7 and Appendix A, the PennEast Analysis fails to specify a duration for the 12,160 temporary jobs; if the estimated 12,160 Total Jobs are for less than one year, they could be equivalent to substantially less than 12,000 annual jobs.

If the average duration of the jobs estimated in the PennEast Analysis is seven months (matching the duration indicated in the PennEast website overview for the estimated 2,500 Direct Onsite Construction jobs), the 12,160 Total jobs estimated in the PennEast Analysis are equivalent to about 7,100 annual jobs. See Section 3.3.3.7 and specifically footnote 40. If Average Annual Total Jobs from the Project are estimated to be 7,100, then the PennEast Analysis multiplier (with the updated Project Cost Estimate) would be 6.3 jobs per $1 million project cost for all workers (7,100 jobs/$1,131 million).

If the average duration of the jobs estimated in the PennEast Analysis is only 5.2 months (matching the duration calculated based on the PennEast FERC Application for the estimated 2,660 peak Direct Onsite Construction jobs), the 12,160 Total Jobs estimated in the PennEast Analysis is equivalent to about 5,300 annual jobs. See Section 3.3.3.7 and specifically footnote 41. If Average Annual Total Jobs from the Project are estimated to be 5,300, then the PennEast Analysis multiplier (with the updated Project Cost Estimate) would be 4.7 jobs per $1 million project cost for all workers (5,300 jobs/$1,131 million).

TGG would conclude that multipliers of 4.7 and especially 6.3 are high and still outliers compared to the multipliers of the other comparable gas pipelines in the Northeast US, but not nearly as overstated as the PennEast Analysis 10.7 jobs per $1 million multiplier.

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The conclusion that the PennEast Analysis has significantly overstated the Total Jobs numbers (by approximately two thirds or more) is based on:

- our review of employment impact studies for other comparable gas pipelines in the Northeast US;
- our evaluation of the PennEast Analysis job estimates and the internal inconsistencies in the PennEast Analysis; and
- our review and extensive experience with best practices in employment impact studies, notably for pipelines and other energy projects.

5 Ongoing Annual Economic Impacts

As set out in Section 3.1, consistent with other studies on pipeline employment impacts, the PennEast Analysis groups the employment impacts of the Project into two categories: Capital Infrastructure Economic Impacts and Ongoing Economic Impacts. Employment impacts related to Capital Infrastructure are those related to the capital investment to design and construct the pipeline. These temporary jobs related to the design and construction of the Project, which represent the majority of the jobs associated with PennEast expenditures, have been discussed at length in Sections 3 to 4.

Employment impacts associated with Ongoing Annual Economic Impacts are employment impacts related to the ongoing activities to operate and maintain the pipeline and related facilities (e.g. compressor stations) once PennEast goes into service.[46] These "permanent" jobs are long-term annual jobs that last over the lifetime of the Project.[47]

PennEast Analysis (Section 4.1, p. 13) claims that the Project will have "significant" Ongoing Annual Economic Impact in two ways:

> 1. Operating, maintaining, and inspecting the physical pipeline and its facilities will require the creation of long-term jobs and the purchase of additional materials. This, in turn, will spur economic activity in the Six-County Region (Section 4.2).
>
> 2. As new natural gas supply is introduced to the market, prices of natural gas and electricity are likely to decrease. This translates into savings on energy bills that will then result in additional household income for residents of Pennsylvania and New Jersey, which will induce spending in multiple industries in both states creating an additional economic impact (Section 4.3).

The TGG Report only considers Ongoing Annual Economic Impact as it relates to the ongoing activities to operate and maintain the pipeline and related facilities.[48]

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[46] For brevity and simplicity, this section sometimes refers to ongoing activities as "operations", with related and "operating" costs and jobs. But it should be understood that once a pipeline enters service, ongoing activities include both operations and maintenance, and that the costs and jobs relating to these activities involve both operations and maintenance.

[47] Natural gas pipeline projects are typically designed and operated to remain in-service for 30 years or more.

[48] The PennEast Analysis (pp. 14, 16) claims that natural gas and electricity consumers in New Jersey and Pennsylvania will have lower costs due to the Project, without specifying the amount of these cost (footnote continued on next page)

5.1 PennEast's Estimates

According to the PennEast Analysis (p. 14, Tables 4-1 and 4-2), total annual operating expenditures are $13.2 million (with $2.4 million for labor); these expenditures are almost all in PA versus NJ ($12.6 million in PA versus just $0.6 million in NJ). Annual jobs from operations (including spinoffs) are 98 in total, with 88 in PA and 10 in NJ; 80 of the estimated 98 jobs are within the Six-County Region traversed by PennEast.

5.2 TGG's Evaluation

For pipelines, operating costs are typically very small relative to construction costs. Pipelines are highly mechanized and automated. Operations typically require a very small number of workers, but these workers are highly skilled and highly paid.

For PennEast (in both NJ and PA), estimated annual operating costs ($13.2 million) are equivalent to only 1.1% of construction costs ($1,193 million). And in NJ, estimated annual operating costs ($0.6 million) are equivalent to only 0.2% of construction costs ($298 million).[49] Given the small annual operating costs, job impacts are also quite small, especially in NJ.

Only a small portion of annual operating costs are directly for labor. PennEast labor costs ($2.4 million) are only 18% of total annual operating costs ($13.2 million). Likewise, only a small portion of the estimated jobs from operations are direct jobs and specifically employees of PennEast. While not provided in the PennEast Analysis, PennEast in reports to FERC elsewhere estimates that there will be about 24

(footnote continued from previous page)
savings and related job impacts. So except as discussed below, the TGG Report does not consider Ongoing Annual Economic Impact as it relates to energy cost savings.

The PennEast Analysis (p. 16) uses IMPLAN to estimate a jobs multiplier for energy cost savings: 9 jobs per $1 million of increased disposable household income derived from energy cost savings. TGG concludes that this multiplier does not provide a reliable measure of Ongoing Annual Economic Impact as it relates to energy cost savings. In New Jersey and especially in Pennsylvania, most natural gas and electricity is consumed by businesses (commercial and industrial customers). Thus, energy cost savings will mainly result in additional business income, rather than additional household income. For a variety of reasons, respending of energy savings by businesses will typically result in fewer in-state jobs per dollar, compared with respending by households.

[49] In PA, estimated annual operating costs ($12.6 million) are equivalent to only 1.4% of construction costs ($895 million). The PennEast Analysis does provide a breakdown of total construction costs by state, but the estimated expenditures within NJ and PA ($890 million) are about 25% in NJ and 75% in PA. Thus, in this report, it has also been assumed that total estimated PennEast construction costs ($1,193 million) are 25% in NJ ($298 million) and 75% in PA ($898 million).

employees directly hired by the Project for ongoing operations and maintenance.[50] Thus, most of the estimated 98 annual jobs from operations (including spin-offs) are other jobs (contractors and upstream jobs in the supply chain providing services and materials and downstream jobs from respending on wages).

Even using the PennEast estimates, pipeline operations result in very small expenditures and have very little positive impact on the economy, especially in NJ. Pipeline operations are estimated to result in only 10 jobs (including spin-offs) in NJ, which has more than 4.2 million total jobs. 10 "permanent" jobs from PennEast would be about 0.0002% of total NJ jobs (about 2 PennEast jobs per 1 million total jobs).

But as low as they are, the PennEast estimates of annual jobs from operations (Direct Employees and Total Jobs including spinoffs) may still be overstated. Other pipeline studies (notably for comparable Northeast US Gas Pipeline Projects included in Figure 2 and discussed in Section 4 and Appendix B) estimate substantially lower job impacts from operations.

PennEast claims there will be 24 employees directly hired. Meanwhile, as documented in Appendix B, Atlantic Sunrise in PA has only 15 in-state employees, despite being a much larger project than PennEast. Constitution and Northeast Energy Direct (NED) in MA each have only 7 employees, but are similar in scale (or perhaps a bit smaller) than PennEast. The entire NED Project is much larger than PennEast, with operations across 5 Northeast states, but NED has only 26 employees (2 more than PennEast),

The PennEast total job estimates are also high relative to other pipelines. As also documented in Appendix B, the jobs study for Atlantic Sunrise estimates that in addition to the 15 in-state employees, there will be another 14 (indirect and induced) jobs, for a total of 29 jobs. Likewise, the jobs study for Constitution estimates there will be 5 other "spillover" jobs in addition to the 7 employees, for a total of 12 jobs.

So relative to other pipelines (and scaled for size of operations), PennEast is claimed to have both substantially more employees, and substantially more other jobs including spin-offs.

That said, it is possible that job impacts from operations will be somewhat higher for PennEast than might be expected based on other Northeast US Gas Pipeline Projects. These other projects are typically operated by companies (notably Williams/Transco

[50] Penn East submission to FERC in Docket PF15-1, Draft Resource Report 5, Socioeconomics, April 2015, pp. 5-3, 5-18. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13844811
Annual cost per employee is about $100,000 (including taxes and benefits; $2.4 million annual cost for labor for about 24 employees).

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and Kinder Morgan/Tennessee) that operate large pipeline networks in the Northeast and elsewhere. Moreover, some of these other projects include substantial components, which involve the expansion/modifications of existing facilities. Thus, these other projects may benefit from economies of scale and scope, such as being able to share employees, contractors, and other inputs with other operations of the pipeline company. Also, as part of large pipeline systems, typically based in and operated from Texas, some of the job impacts from these other pipeline projects may be outside of the states where the project is located.

Meanwhile, PennEast appears to be more of a stand-alone new pipeline project. And PennEast would be operated by UGI Energy Services (UGIES), a Pennsylvania-based company.

Nonetheless, as was also the case for the PennEast Analysis of jobs related construction, the estimates of jobs related to operations are substantially higher than would be expected based on job estimates for other comparable pipelines. Moreover, the PennEast Analysis does not provide adequate documentation to support its results.[51]

[51] For example, as shown in PennEast Analysis Figure 4.1 (p. 15), 21% of the estimated jobs are in Natural Gas Distribution. This would appear to be the IMPLAN Industry 50, which is retail gas utilities (local distribution companies). Meanwhile, interstate gas pipelines are part of IMPLAN Industry 413 (Pipeline Transportation). UGIES is part of UGI http://www.ugicorp.com/, which also includes retail gas utility operations, but it is unclear why the operating costs of the PennEast gas pipeline have been modeled in IMPLAN as retail gas utility operations.

6 Conclusions

TGG's Main Conclusions on Temporary and Ongoing Annual Employment Impacts

1. **Temporary Jobs:** The PennEast Analysis has significantly overstated the Total Jobs (i.e. temporary jobs estimated at 12,160) for the design and construction of the Project by approximately two-thirds or more. This key conclusion is based on:
    a. TGG's review of employment impact studies for other comparable gas pipelines in the Northeast US;
    b. TGG's evaluation of the PennEast Analysis job estimates and the internal inconsistencies in the PennEast Analysis; and
    c. TGG's review and extensive experience with best practices in employment impact studies, notably for pipelines and other energy projects.

2. **Ongoing Annual Jobs**: The TGG Report only considers Ongoing Annual Economic Impact as it relates to the ongoing activities to operate and maintain the pipeline and related facilities. Annual jobs from operations (including spinoffs) are 98 in total, with 88 in PA and 10 in NJ.

    In reports to FERC, PennEast estimates that there would be 24 employees directly hired by the Project for ongoing operations and maintenance. Therefore, most of the estimated 98 annual jobs from operations (including spin-offs) are other jobs (contractors and upstream jobs in the supply chain providing services and materials and downstream jobs from respending on wages). TGG concludes that even using the PennEast estimates, pipeline operations result in very small expenditures (and employment impacts) and have very little positive impact on the economy, especially in NJ. But as low as they are, the PennEast estimates of annual jobs from operations (Direct Employees and Total Jobs including spinoffs) may still be overstated. Other pipeline studies (notably for comparable Northeast US Gas Pipeline Projects included in Figure 2) estimate substantially lower job impacts from operations.

Other Conclusions on Capital Infrastructure Economic Impacts (i.e. Temporary Jobs)

TGG's evaluation of the PennEast Project Economic Analysis (PennEast Analysis) related to the design and construction of the Project also concludes the following:

1. Even if the PennEast Analysis' employment impact estimates were realistic, the employment impacts from the design and construction of the Project are (a) tiny in the context of the New Jersey and Pennsylvania state economies (less than 0.1% of total NJ jobs); and (b) very short-term. Actual construction would occur over a one-year period (late 2016-late 2017) with activity and jobs concentrated into only six months (early January-early July 2017). Most of the employment impacts (total onsite and offsite jobs) would take place during the same period.

2. Jobs from actual construction have an average duration of only 5.2 months. Moreover, TGG estimates that half or more of the Direct Onsite Construction labor would come from outside NJ and PA with a significant proportion of the spinoff employment benefits also going out-of-state.

3. There are two major internal inconsistencies in PennEast's Jobs Estimates, which are illustrated in Figure 1:
    a. A major disjuncture between Direct Onsite Construction Jobs (2,500) and Total Jobs (12,160).
    b. A significant internal inconsistency in PennEast's documentation between (a) estimates for Direct Onsite Construction Jobs (2,500) and Total Jobs (12,160); and (b) estimates for "construction" (6,000) and "other" (5,210) jobs in the Six-County Region.

    These inconsistencies reveal that the PennEast analysis failed to perform a basic check to verify the reasonableness of the results from its economic modeling exercise.

4. There are a number of information gaps in the PennEast Analysis that present a challenge for understanding how their estimates were developed. The failure to provide a duration for the Total Jobs estimate is particularly problematic because without a duration, it is impossible to evaluate with certainty the employment benefits estimated for the Project. As such, TGG carefully analyzed the duration and timing details for the actual construction jobs in the PennEast's September 2015 FERC Application in order to better evaluate the PennEast Analysis' employment estimates. Moreover, despite the significant information gaps in the PennEast Analysis, TGG identified the following possible causes for the internal inconsistencies and overstatement of estimates in the PennEast Analysis:
    a. The inherent limitations of Input-Output (I-O) modeling and in particular a problematic application of I-O modeling that does not take into account the limitations of the model or perform reasonableness tests on the results.
    b. Given the nature of pipeline construction, the application of a generic I-O construction sector model leads to overstatement of employment impacts.

c. The job impacts estimated by the PennEast Analysis significantly overstate the benefits for local workers residing in NJ and PA.
d. The percentage of in-state spending is overestimated in the PennEast Analysis.
e. PennEast Analysis counts some jobs related to the Project that have already been created.
f. Total jobs are not presented as annualized jobs.

Employment Impacts for Comparable Pipelines

Figure 2 compares the employment impacts from the PennEast Analysis with the employment impacts from four other comparable Northeast US Gas Pipeline Projects. **As Figure 2 clearly illustrates, the multiplier of 10.7 jobs per $1 million project cost for all workers (from the PennEast Analysis), is an outlier compared to the other comparable Northeast US gas pipelines in Figure 2.**

In summary, TGG's review of the employment impacts of comparable gas pipelines in the Northeast US shows that the multipliers for other similar gas pipelines are only 8-36% of the PennEast Analysis multiplier. **Specifically, this review strongly supports TGG's conclusion that the PennEast Analysis has overstated the Total Jobs related to designing and building the pipeline by approximately two thirds or more.**

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Appendix A: Annualization of Job Estimates

This Appendix provides a more detailed general explanation of the annualization of job estimates as a best practice in employment impact studies. The general explanation is followed by a more specific discussion of annualization of Direct Onsite Construction Labor for the PennEast project, particularly in the context of the most recent information from the September 2015 PennEast FERC Application.

Annualization of Job Estimates: A Best Practice for Employment Impact Studies

As indicated in Sections 3.3.3.1 and 3.3.3.7, PennEast has failed to provide a definition of what a job constitutes and, in particular, to provide a duration for the 12,160 Total Jobs estimate (which are temporary jobs).

As explained in Section 3.3.3.1, the failure to provide a duration for the 12,160 temporary jobs is highly problematic because without a duration, it is impossible to:

- evaluate with certainty the employment benefits estimated for the Project;
- compare the employment benefits estimated for the Project with the benefits estimated in employment impact studies for other pipelines.

Various jobs can be of various durations, and it is useful to define them by expressing them in terms of a standard measure, which can include (a) average annual jobs, (b) job-years/person-years, and (c) Full-Time Equivalents (FTEs). These various measures can differ a bit in their precise definition and calculation, but in general they are measured in terms of 1 job for 1 worker for 1 year.

In our review and experience of best practices in employment impact studies, the annualization of job estimates is common in other pipeline studies and allows for employment impacts to be compared. Job-years/person-years and FTEs have been used in employment studies of natural gas pipelines comparable to PennEast, including Atlantic Sunrise and Northeast Supply Link. The Average annual jobs measure was used by the US Department of State in its Final Supplementary Environmental Impact Statement (FSEIS) for Keystone XL.

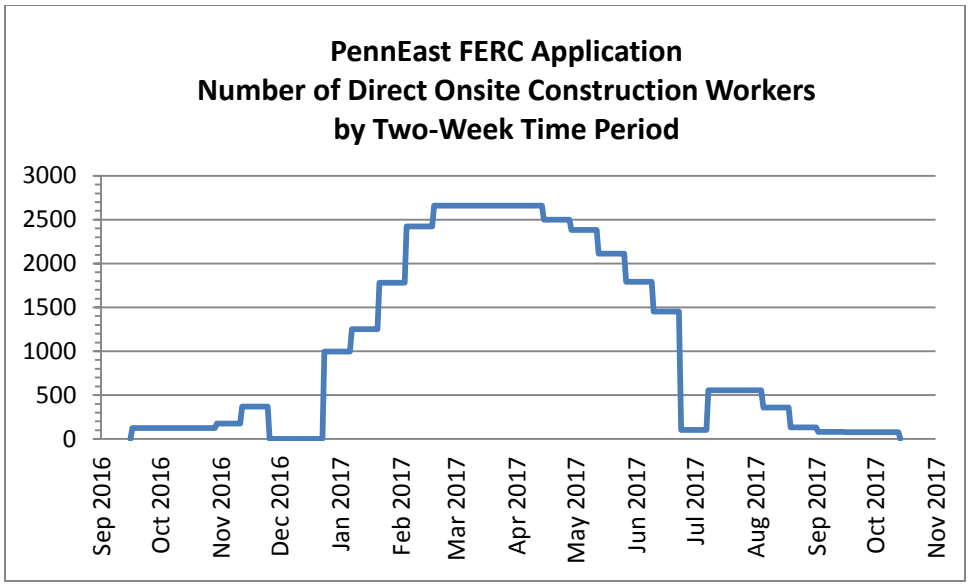
Annualization of Direct Onsite Construction Labor for the PennEast Project

As discussed in Section 3.2, PennEast has claimed that the Project will create jobs for 2,500 construction workers during construction, which is expected to take approximately seven months to complete. 2,500 jobs for seven months are equivalent to about 1,450 average annual jobs.[52]

But prior to the September 2015 PennEast FERC Application, PennEast has also provided various estimates from 2,000 to 2,500 workers. As discussed in footnotes 8 and 9, it was unclear from the earlier PennEast documentation (Project Overview on the website and pre-filing draft submissions to FERC from April and July 2015) if the 2,000 to 2,500 worker estimates represented an average or a peak. If the 2,000 to 2,500 workers represented a peak (versus an average), then the average number of Direct Onsite Construction workers would be lower. Therefore the annualized number of Direct Onsite Construction workers would be lower than 1,450 average annual jobs.

Compared with any of the previously available information, the September 2015 PennEast FERC Application provides much more detail on Direct Onsite Construction Labor: the number of workers is specified, as is the duration and timing of these jobs. TGG has reviewed this new information carefully because this detail is essential to the evaluation of employment benefits. As discussed in this report (and particularly in Section 3.3.3.1, the PennEast Analysis has failed to provide this key information. The FERC Application estimates for Onsite Construction Workers are shown in the graphic below.[53]

[52] 2500 workers for 7 months are equivalent to 1458 average annual jobs (=2,500*7/12).
[53] Source: Resource Report 5, Socioeconomics, September 2015, Table 5.3-3: Construction Workforce Schedule Breakdown by Duration, pp. 5-4-5-5.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995678



In the recent FERC Application, PennEast now estimates a workforce of 665 workers at each of 4 construction spreads[54], for a total of 2,660 workers. This is the peak workforce, which is required for only eight weeks (early March-late April 2017); the average workforce is much lower. Construction will be spread over one year, averaging 1,158 workers, for a total of 1,158 annual jobs.[55] Construction will occur during 42 weeks of 2017 (early January-late October, averaging 1,394 workers), plus 10 weeks of 2016 (October-early December, averaging only 182 workers).

Given a peak workforce of 2,660 workers and average workforce of 1,158 workers over 1 year (equivalent to 1,158 average annual jobs), TGG has calculated that the average duration of Direct Onsite Construction jobs is 5.2 months (1,158 average jobs/2,660 peak jobs=5.2 months/12 months).

The Direct Construction Labor derived from the estimates in the FERC Application (1,158 annual jobs) is thus equivalent to 2,660 jobs (the peak workforce) for a duration averaging about 5.2 months.[56]

While construction is spread over one year (52 weeks of work, with 4 weeks winter break early December 2016 to early January 2017), over 90% of annual jobs occur

[54] See end of footnote 9 for the definition of construction spreads.
[55] Based on the PennEast estimates in the September 2015 FERC Application (see footnote 53), TGG has derived that the average workforce (over the entire one-year construction period) is only 1,158 workers.
[56] In terms of average annual jobs, this is equivalent to 2,000 workers for 7 months (= 1,167 average annual jobs = 2,000*7/12).

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within the six month-long core construction period (early January-early July 2017), averaging about 2,100 workers for six months, or about 1,050 annual jobs.

Meanwhile, during the other six months with construction (October-early December 2016, and early July-late October 2017), activity is much lower, averaging about 220 workers for six months, or about 110 annual jobs.

The jobs related to building PennEast are very short-term and occur mainly during a brief construction period. Construction will occur over a one-year period (late 2016-late 2017), but activity and jobs are concentrated into only six months (early January-early July 2017).

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Appendix B: Sources and Notes for Figure 2 (Estimated Total Job Impacts from Building Northeast US Gas Pipeline Projects)

This Appendix provides sources and notes for Figure 2, entitled Estimated Total Job Impacts from Building Northeast US Gas Pipeline Projects (contained in Section 1.1 and described in Section 4). Figure 2 compares the employment impacts related to the design and construction of PennEast (as estimated in the PennEast Analysis) with the employment impacts estimated for four other comparable Northeast US Gas Pipeline Projects: Atlantic Sunrise, Northeast Supply Link, Northeast Energy Direct and Constitution.[57] This Appendix provides sources and notes for each of the pipelines described in Figure 2.

[57] To the extent possible, for the pipelines reviewed in Figure 2, this Appendix also provides information on the employment impacts associated with Ongoing Annual Economic Impacts (i.e. employment impacts related to the ongoing activities to operate and maintain the pipeline and related facilities). For the sake of brevity, these jobs are classified in this Appendix as “Operating Phase Jobs.”

Preamble: FERC Process and Documents for Natural Gas Pipeline Construction Projects

Most of the sources for Figure 2 are documents from pipeline companies submitted to FERC (United States Federal Energy Regulatory Commission http://www.ferc.gov/). FERC regulates the construction of interstate natural gas pipelines. To obtain authorization to construct an interstate transmission pipeline, the pipeline company must first file an application for a Certificate of Public Convenience and Necessity (Certificate Application).

The Certificate Application is an extensive document. Among other things, the Certificate Application contains a description of the new facilities, need for the project, detailed maps, schedules, and various environmental reports. This information details the various studies and analyses that have been conducted to determine what effect construction and operation could potentially have on the environment and community. The environmental reports include an analysis of route alternatives, as well as an analysis of potential impacts to water resources, vegetation and wildlife, cultural resources, socioeconomics (including jobs), soils, geology and land use.

When a pipeline company is ready to begin preparing its Certificate Application, it typically initiates what is known as the FERC pre-filing process. As part of the pre-filing process, the pipeline company submits draft versions of the environmental reports that are required as part of the Certificate Application. The pre-filing process includes some procedures for involvement by citizens, government entities and other interested parties during the design stage of a proposed project.

Once the pre-filing process begins, a Pre-Filing (PF) Docket Number is assigned by FERC. All documents and correspondence submitted to or issued by FERC regarding the project during the pre-filing process can be accessed by referencing the Pre-Filing (PF) Docket Number on FERC's website: http://elibrary.ferc.gov/.

When the Certificate Application is filed, a Certificate Proceeding (CP) Docket Number is assigned by FERC. All documents and correspondence submitted to or issued by FERC regarding the project during the Certificate Proceeding can be accessed by referencing the Certificate Proceeding (CP) Docket Number on FERC's website: http://elibrary.ferc.gov/.

The rest of this Appendix consists of sources and notes for each of the pipelines described in Figure 2.

PennEast Pipeline Project

Project Websites:

PennEast Pipeline: http://penneastpipeline.com/

Spectra Energy PennEast Project: http://www.spectraenergy.com/Operations/New-Projects-and-Our-Process/New-Projects-in-US/PennEast-Pipeline-Project/

Project Owner/Constructor/Operator: Joint Venture of AGL Resources, NJR Pipeline Company, PSEG Power, South Jersey Industries, Spectra Energy Partners, and UGI Energy Services (UGIES). UGIES is the project manager for development of the project and will operate the pipeline

Sources: Project Websites.

Project Facilities, Cost, and Jobs:

FERC Docket PF15-1

Draft Resource Report 1, General Project Description, Revised Draft July 2015, especially pp. 1-9-1-15; 1-61-1-70.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13946534

Draft Resource Report 5, Socioeconomics, April 2015, especially pp. 5-1; 5-3-5-9; 5-18.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13844811

Appendix M (Economic Impact Report and Analysis: PennEast Pipeline Project Economic Impact Analysis. Econsult Solutions and Drexel University School of Economics. February 9, 2015 ("PennEast Analysis").
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13844817

FERC Docket CP15-558

Application for Certificate of Public Convenience and Necessity, September 24, 2015 ("Certificate Application"), especially Exhibit K (Cost of Facilities)
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995667

Resource Report 1, General Project Description, September 2015, especially pp. 1-6; 1-10-1-17; 1-52-1-53; 1-63-1-89;1-110.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995668

Resource Report 5, Socioeconomics, September 2015, especially pp. 5-1; 5-3-5-5; 5-7-5-10; 5-22. [58] http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995678

Appendix M (Economic Impact Report and Analysis: PennEast Pipeline Project Economic Impact Analysis. Econsult Solutions and Drexel University School of Economics. February 9, 2015 ("PennEast Analysis"). http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995753

Project Schedule:

FERC Docket PF15-1 (and other Information Publicly Available Prior to September 2015 FERC Application)

Construction Start Date: Spring 2017 (prior to large scale construction starting in Spring 2017, there is limited activity relating to winter tree clearing, notably in areas with sensitive habitat).

Project In-Service Date: November 2017

Sources:

PennEast Analysis, pp. 4, 10, 13;

PennEast Pre-Filing Letter, October 7, 2014, pp. 2-3: https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13654024

> PennEast […] requests issuance of a final environmental document on or before August 1, 2016, and a certificate order on or before December 1, 2016.
>
> Adhering to this timeline will allow for receipt of any remaining applicable permits and authorizations necessary for PennEast to begin pre-construction activities, including the orderly mobilization of contractors and materials and the resolution of any outstanding landowner issues, in the fourth quarter of 2016 in order to complete winter tree clearing and allow for full commencement of construction in the second quarter of 2017. Timely commencement of these activities in late 2016 is critical to meet the Project's in-service date of November 1, 2017.

[58] See Appendix A of this report for the September 2015 PennEast FERC Application (Resource Report 5, pp. 5-3-5-5) estimates of Direct Onsite Construction Labor, including the number of workers by two-week time period.

Draft Resource Report 1, General Project Description, Revised Draft July 2015, p. 1-61; http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13946534

PennEast Project Website Overview: http://penneastpipeline.com/overview/

> […] [P]ipeline construction will begin in spring 2017. The project is expected to create 2,500 local jobs during construction, which is expected to take approximately seven months to complete.

FERC Docket CP15-558

Construction Start Date: October 2016/Spring 2017 (between October 2016 and Spring 2017, a smaller number of workers conduct construction in compliance with certain timing restrictions (including tree clearing that that is time restricted related to threatened and endangered species; installation of horizontal directional drill (HDD) segments (notably crossing of Lehigh River after water levels have receded in late 2016); and contractor yard preparation); large scale mainline pipeline and facilities construction starts Spring 2017)

Project In-Service Date: November 2017 (Gas transportation for shippers to commence by November 1, 2017, with all Project facilities in-service by late November 2017)

Sources:

Certificate Application, September 24, 2015, p. 7
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995667

> PennEast respectfully requests the authorizations proposed herein by August 1, 2016. An order by this date will allow for timely commencement of construction that is critical for PennEast to comply with seasonal construction limitations and still meet the Project's in-service date of November 1, 2017.

Resource Report 1, General Project Description, September 2015, pp. 1-63-1-64.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995668

Resource Report 5, Socioeconomics, September 2015, pp. 5-3-5-5.[59]
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13995678

Notes:

[59] See footnote 58.

During most of the time period when this report was being prepared by TGG (August to October, 2015), the PennEast Project was still in the pre-filing process at FERC. Thus, the PennEast Project (including design and other aspects that affect job impacts) was still being finalized for submittal to FERC of its Certificate Application. On September 24, 2015, PennEast submitted to FERC its Application for Certificate of Public Convenience and Necessity.

As elaborated upon below, the PennEast Analysis is based on a February 2015 Project cost estimate and design: $1,193 million for 114 miles of pipeline. In its September 2015 Application to FERC, PennEast updated the Project cost estimate and design: $1,131 million for 118 miles of pipeline.

The PennEast Analysis has not been updated to be based on the September 2015 Project cost estimate and design. In its September 2015 Application to FERC, PennEast submitted the same PennEast Analysis document (from February 2015), as was submitted to FERC in April 2015 (as part of the pre-filing process).

The jobs estimate in the PennEast Analysis is for constructing 114 miles of pipeline (primarily 36" diameter) and other facilities in NJ and PA, with a total estimated cost of $1,193 million (PennEast Analysis, pp. 4, 9-10). The PennEast Analysis (pp. 9-11) assumes that about $890 million of this total cost will be expended in NJ and PA, with $220 million in NJ and $670 million in PA. About 25% of total in-state expenditures are in NJ and about 75% in PA. Likewise, the PennEast Analysis (p. 11) estimates that about 25% of PennEast jobs are in NJ and 75% in PA (12,160 Total Jobs in NJ+PA; 2,870 total jobs in NJ; 9,290 total jobs in PA).

The PennEast Analysis is based on a February 2015 Project cost estimate and design; since then, the project cost estimate and design have been updated.[60]

As described in the Application (Exhibit K: Cost of Facilities) submitted to FERC in September 2015, PennEast is now estimated to cost $1,131 million.

As described in the Resource Report 1 submitted to FERC in September 2015, PennEast now includes 118 miles of pipeline and other facilities in NJ and PA:

- PennEast Mainline Route (114.0 miles 36" new pipeline in NJ and PA; 36.2 miles in NJ (Hunterdon and Mercer Counties); 77.8 miles in PA (Luzerne, Carbon, Northampton, and Bucks Counties))
- Hellertown Lateral (2.1 miles 24" new pipeline in Northampton County, PA)

[60] Resource Report 5, September 2015, p. 5-9, which specifies that Project cost estimates have changed since February 2015, due to updated unit cost estimates and Project scope changes.

- Gilbert Lateral (0.6 miles 12” new pipeline in Hunterdon County, NJ)
- Lambertville Lateral (1.4 miles 36” new pipeline in Hunterdon County, NJ)
- all new associated aboveground facilities (1 new compressor station in PA (Carbon County); various interconnects, launchers, receivers, and mainline block valves in NJ and PA).

Operating Phase Jobs:

See Section 5 of this Report for the PennEast Analysis’ estimate of operating phase jobs, as well as TGG’s evaluation of this estimate. According to the PennEast Analysis, annual jobs from operations (including spinoffs) are 98 in total, with 88 in PA and 10 in NJ; 80 of the estimated 98 jobs are within the Six-County Region traversed by PennEast.

Atlantic Sunrise Pipeline Project

Project Website: http://atlanticsunriseexpansion.com/

Project Owner/Constructor/Operator: Transcontinental Gas Pipe Line Company (Transco). Transco is a 10,200-mile natural gas pipeline system, extending across approximately 2,000 miles from South Texas and the offshore Gulf of Mexico to New York City. Transco is the nation's largest-volume interstate natural gas pipeline system, and is a large-scale Owner/Constructor/Operator of natural gas pipelines in the Northeast US, including NJ, PA, and NY. Transco is owned by Williams, a large energy infrastructure company primarily involved in activities relating to natural gas in the US and Canada.

Project Facilities, Cost, and Jobs:

FERC Docket CP15-138:

Application for Certificate of Public Convenience and Necessity, March 31, 2015 ("Certificate Application"), especially Exhibit K (Cost of Facilities)
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13820971

Resource Report 1, General Project Description, March 2015, especially pp. 1-1-1-19.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13820974

Resource Report 5, Socioeconomics, March 2015, especially pp. 5-2-5-3; 5-10-5-12; 5-28
Appendix 5A (Economic Impacts of the Atlantic Sunrise Pipeline Project. Blumsack, Seth and Andrew Kleit, Penn State University. January 9, 2015 ("Penn State Study"), especially pp. 2-3; 27-28.
http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13820998

Construction Schedule:

Construction Start Date: July 2016

Project In-Service Date: July 2017

Sources: Certificate Application, p. 1; Resource Report 5, p. 5-2.

Notes:

Atlantic Sunrise is a large and complex project, both absolutely and in comparison with PennEast. The entire Atlantic Sunrise Project has a total estimated cost of $2,588 million, and includes facilities in PA, MD, VA, NC, and SC. The Penn State Study jobs

estimate for Atlantic Sunrise (8,122 total jobs in PA) is for constructing pipeline and other facilities in PA. As now designed, these facilities in PA include 221 miles of pipeline and have a total estimated cost of $2,099 million:

- Central Penn Line (CPL) North (57 miles 30” new pipeline),
- CPL South (125 miles 42” new pipeline),
- Chapman Loop (3 miles 36” pipeline loop),
- Unity Loop (9 miles 42” pipeline loop), and
- all new associated aboveground facilities (2 compressor stations (in Columbia and Wyoming Counties), 2 meter stations, and 3 regulator stations).

The Penn State Study jobs estimate for Atlantic Sunrise in PA is for an earlier project design, which also included one additional meter station (Owego) in PA. Assuming a cost of $21 million for this additional meter station, the Penn State Study jobs estimate for Atlantic Sunrise in PA is for facilities with a total cost of $2,120 million ($2,099 million for facilities in current project design + $21 million for Owego Meter Station). As explained in Resource Report 5 (pp. 5-1; 5-11-5-12), small changes in project design (such as removing the Owego Meter Station) do not significantly affect project cost and job impacts.

Operating Phase Jobs:

Atlantic Sunrise (Resource Report 5, p. 5-11) estimates that 15 full time permanent positions will be needed to operate and maintain the pipeline, compressor stations, and related facilities. The Penn State Study (pp. 27-28) incorporates this estimate as Direct Jobs, specifically in Columbia and Wyoming Counties where new compressor stations are located and the operational workforce will be based. Annual Labor Income per Direct Employee is about $76,000.

In addition to these Direct Jobs, the Penn State Study estimates there will 14 other jobs (Indirect and Induced) in Columbia and Wyoming Counties. Thus, the Penn State Study estimates 29 total annual jobs for the operations phase of Atlantic Sunrise.

Northeast Supply Link Pipeline Project

Project Owner/Constructor/Operator: Transcontinental Gas Pipe Line Company (Transco). Transco is a 10,200-mile natural gas pipeline system, extending across approximately 2,000 miles from South Texas and the offshore Gulf of Mexico to New York City. Transco is the nation's largest-volume interstate natural gas pipeline system, and is a large-scale Owner/Constructor/Operator of natural gas pipelines in the Northeast US, including NJ, PA, and NY. Transco is owned by Williams, a large energy infrastructure company primarily involved in activities relating to natural gas in the US and Canada.

Project Facilities, Cost, and Jobs:

FERC Docket CP12-30:

Application for Certificate of Public Convenience and Necessity, December 14, 2011 ("Certificate Application"), especially Exhibit K (Cost of Facilities) http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=12840054

Resource Report 1, General Project Description, December 2011, especially pp. 1-1-1-14. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=12840055

Resource Report 5, Socioeconomics, December 2011, especially pp. 5-1-5-4; 5-7-5-8. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=12840060

Resource Report 5, Attachment 5A (Economic Impact Studies):

- Economic Impacts of Pipeline System Expansion in Four Pennsylvania Counties (Revision 01-Removed Renovo Loop Impact and added Leidy Gas Odorization Upgrade). Institute for Public Policy and Economic Development. May 2012 ("IPPED Study"), especially p. 4;
- Economic Impacts of the Proposed Transcontinental Gas Pipeline Company, LLC Pipeline System Expansion in New Jersey and Selected Counties (Revised Estimates-April 2012). Seneca, Joseph J. et al. Rutgers, The State University of New Jersey, Edward J. Bloustein School of Public Planning and Public Policy. April 2012 ("Rutgers Study"), especially pp. i, 6.

http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12975808

Construction Schedule:

Estimated Schedule (assumed in estimates of Project Cost and Jobs):

Construction Start Date: November 2012/April 2013 (between November 2012 and March 2013, a small number of workers conduct tree clearing that that is time restricted related to threatened and endangered species; large scale construction starts April 2013)

Project In-Service Date: November 2013

Sources: Certificate Application, pp. 1-2; Resource Report 5, p. 5-7-5-8.

Actual Project In-Service Date: September 2013 (half of capacity)/November 2013 (half of capacity)

Source: Williams Press Release, November 4, 2013
http://investor.williams.com/press-release/williams/williams-partners-brings-transco-northeast-supply-link-expansion-full-service

Comments: The estimates of Project Cost and Jobs in Figure 2 for Northeast Supply Link are based on estimates (including estimated construction schedule) provided in the FERC Certificate Proceeding prior to actual project construction. As explained above, actual construction has differed from the scheduled November 2013 in-service date estimated prior to project construction (for a November 2013 in-service date). Half of Northeast Supply Link capacity was brought in-service three months ahead of schedule, and the other half was in-service on schedule. Information on changes in construction schedule is provided here for completeness and context, but it should be understood that the estimates of Project Cost and Jobs in Figure 2 are based on the project schedule estimated prior to project construction, rather than the subsequently revised schedule.

Notes:

The entire Northeast Supply Link Project has a total estimated cost of $341 million, and includes facilities in NJ, PA, and NY.

The Rutgers Study jobs estimate for Northeast Supply Link in NJ (696 total jobs) is for constructing pipeline and other facilities in NJ. The IPPED Study jobs estimate for Northeast Supply Link in PA (574 total jobs) is for constructing pipeline and other facilities in PA. Thus, the total jobs estimate for Northeast Supply Link in NJ and PA is 1,270 total jobs (696 total jobs in NJ (Rutgers Study) + 574 total jobs in PA (IPPED Study)).

The total jobs estimate for Northeast Supply Link in NJ and PA is for constructing 12.5 miles of pipeline and other facilities in NJ and PA, which have a total estimated cost of $325 million:

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- Muncy, Palmerton, and Stanton Loops (12 miles 36” and 42” pipeline loop, estimated cost $152 million),
- Caldwell B Replacement (0.5 miles 36” pipeline replacement, estimated cost $10 million),
- Caldwell Uprate (26 miles 36” pipeline pressure uprate, estimated cost $18 million), and
- aboveground facilities (1 new compressor station; 1 new electrical substation; modifications to 2 compressor stations, 4 meter and regulator stations, and other facilities; total estimated cost $145 million).

Northeast Supply Link did not provide an economic impact study and total jobs estimate for constructing facilities in NY, which have a total estimated cost of $16 million:

- Long Island Extension Uprate (estimated cost $4 million),
- aboveground facilities (modifications to 2 meter and regulator stations and 1 other facility (estimated cost for meter stations, regulators, and other modifications is $50 million for the entire Northeast Supply Link project in NJ, PA, and NY; assuming 76% of this project cost is in NJ and PA, and 24% in NY, the estimated cost in NY is $12 million).

Northeast Energy Direct (NED) Pipeline Project

Project Website: http://northeastenergyfuture.com/ http://www.kindermorgan.com/pages/business/gas_pipelines/east/neenergydirect/default.aspx

Project Owner/Constructor/Operator: Tennessee Gas Pipeline Company ("Tennessee" or "TGP"). Tennessee is a 11,900-mile natural gas pipeline system, extending across approximately 2,000 miles from South Texas and the offshore Gulf of Mexico to the New York City and Boston areas. Tennessee is a large-scale Owner/Constructor/Operator of natural gas pipelines across the Northeast US, including NJ, PA, NY, CT, MA, NH, and RI. Tennessee is owned by Kinder Morgan, the largest energy infrastructure company in North America.

Project Facilities, Cost, and Jobs:

FERC Docket PF14-22:

Draft Resource Report 1, General Project Description, July 2015, especially pp. 1-1-1-9; 1-13-1-24. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13939503

Draft Resource Report 5, Socioeconomics, July 2015, especially pp. 5-1; 5-3-5-4; 5-24-5-28. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13939513

Recent Documents Not Yet Submitted to FERC:

The Economic Impact on Massachusetts of the Proposed Northeast Energy Direct Pipeline. Bachman, Paul, et al. Beacon Hill Institute at Suffolk University. June 2015 ("BHI Study", funded by Kinder Morgan (the Owner/Constructor/Operator of NED)), especially pp. 3, 9-12.
http://www.kindermorgan.com/content/docs/NED_Beacon_Hill_Study.pdf
http://www.beaconhill.org/BHIStudies/NED-Pipeline2015/BHI-NortheastDirect2015-0619.pdf http://www.beaconhill.org/BHIStudies/NED-Pipeline2015/FINAL-PressRelease-BHI-PR-NEDPipe-2015-0624.pdf

Press Releases:

"Kinder Morgan Approves Proceeding with Tennessee Gas Pipeline's Northeast Energy Direct Project," July 16, 2015.
http://www.kindermorgan.com/content/docs/PR_NEEnergy_Direct.pdf

"Kinder Morgan Increases Quarterly Dividend to $0.49 Per Share, up 14%," July 15, 2015 http://news.kindermorgan.com/press-release/all/kinder-morgan-increases-quarterly-dividend-049-share-14

Project Schedule:

Construction Start Date: January 2017

Project In-Service Date: November 2018 (November 2019 for 300 Line Looping in CT)

Annual Seasonal Activity Levels: Most project construction will occur over a two-year period (2017-2018), with a much smaller amount of construction in 2019 (for 300 Line Looping in CT). In all three years, construction activity will be mainly in the summer/warmer weather months, with the peak summer Direct Onsite Construction workforce more than twice as large as average annual workforce

Sources: Resource Report 1, p. 1-3; Resource Report 5, pp. 5-1, 5-30.

Notes:

During the time period while this report was being prepared by TGG (August to October, 2015), the Northeast Energy Direct (NED) Project was still in the pre-filing process at FERC. Thus, the NED Project (including design and other aspects that affect job impacts) is still being finalized for submittal to FERC of an Application for Certificate of Public Convenience and Necessity.

The Northeast Energy Direct (NED) Project is a very large and complex project, both absolutely and in comparison with PennEast. As most recently described in the Draft Resource Reports submitted to FERC in July 2015, the entire NED Project includes 418 miles of pipeline and other facilities in PA, NY, CT, MA, and NH:

- Pennsylvania to Wright (132 miles 30” new pipeline in PA and NY)
- Wright to Dracut (188 miles 30” new pipeline in NY, MA, and NH)
- 300 Line Looping (39 miles 36” pipeline loops in PA; 15 miles 24” pipeline loops in CT)
- Laterals (44 miles 12”, 20”, 24”, and 30” laterals in MA and NH)
- associated aboveground facilities (9 new compressor station; 13 new meter stations; modifications to 1 compressor station and 12 meter stations; and other facilities).

As stated in Press Releases (July 15 and 16, 2015), the entire NED Project is estimated to cost approximately $5 billion, including $3.3 billion for the Market Path sections (from Wright to Dracut and Laterals beyond).

The NED Project includes extensive facilities in 5 Northeast US states (PA, NY, CT, MA, and NH). But to date, an economic impact study and total jobs estimate has been provided for only one state: the BHI Study for MA. As further discussed later in these Notes, economic impact studies and total job estimates for NED in other states may be provided subsequently, but they are not now publicly available.

The jobs estimate in the BHI Study is for constructing 101 miles of pipeline and other facilities in MA:

- Wright to Dracut (64 miles 30" new pipeline)
- Laterals (9 miles 12", 8 miles 20", 21 miles 24", and 1 mile 30")
- aboveground facilities (3 new compressor station; 9 new meter stations; modifications to 11 meter stations; and other facilities).

As stated in the BHI Study (pp. 3, 9, 12), NED in MA has an estimated total cost of $1,300 million, with the following job impacts:

- 1,713 Total Jobs, including
- 680 Direct Onsite Construction Jobs, and
- 1,033 Other Jobs (1,713 Total Jobs - 680 Direct Onsite Construction jobs), which include:
    - other direct jobs (design, engineering, permitting, and support jobs, typically offsite),
    - upstream jobs in the supply chain, providing services, materials and other inputs (also known as indirect jobs); and
    - downstream jobs as workers spend income from jobs upstream, offsite and onsite (also known as induced jobs).

The BHI Study used IMPLAN (input-output analysis) to estimate the economic impact (jobs, labor income, and value added) of NED in MA. But the BHI Study estimates of Direct Onsite Construction Jobs and labor income are based on data from Kinder Morgan (the Owner/Constructor/Operator of NED) for onsite labor on each construction spread, rather than generic IMPLAN estimates for the construction sector.

The BHI Study estimate of Direct Onsite Construction Jobs (680 jobs) matches the Draft Resource Report 5 (pp. 5-25-5-26) estimate of construction jobs in MA for local workers. These Direct Onsite Construction Jobs are for more than 1 year, with a weighted average duration of 60 weeks.

As discussed above (in the Section on Project Schedule/Actual and Seasonal Activity Levels), NED construction in MA will occur over a two-year period (2017-2018), mainly in the summer/warmer weather months. NED Direct Onsite Construction Jobs are estimated to have a duration averaging 60 weeks, which is equivalent to 30 weeks per year (during the warmer weather months) for two years (2017-2018).

Thus, for NED in MA, the estimated 680 Direct Onsite Construction Jobs (for 60 weeks) are equivalent to 785 annual jobs for 52 weeks (680*60/52).

The above jobs estimate includes only construction workers residing in MA. As stated in Draft Resource Report 5 (pp. 5-23-5-26), construction workers are estimated to reside 50% locally, and the payroll for local construction workers is 50% of the payroll for all construction workers. So in addition to the Direct Onsite Construction Jobs for local workers residing in MA (680 jobs, equivalent to 785 annual jobs), there is an equal number of construction jobs for non-local workers (680 jobs, equivalent to 785 annual jobs).

As documented in Draft Resource Report 5 (pp. 5-25-5-26), Direct Onsite Construction Jobs (in MA, as well as in PA, NY, CT, and NH) have very high income per job, due to both a high hourly rate, and high hours per week, typically averaging:

- $65/hour (total labor income including benefits and taxes)
- 60 hours/week (10 hours/day, 6 days/week)
- $3,900/week (total labor income including benefits and taxes).

The BHI Study estimate of Labor Income for Direct Onsite Construction Jobs in MA ($159 million) matches the Draft Resource Report 5 (pp. 5-25-5-26) estimate of Labor Income for construction jobs in MA for local workers. Labor Income per job averages over $200,000 for Direct Onsite Construction workers on NED in MA ($159 million/680 jobs for 60 weeks is over $233,000 per job for 60 weeks; $159 million/785 annual jobs for 52 weeks is over $202,000 per annual job for 52 weeks). These results are consistent with the estimates for NED described above: labor income per worker averaging $3,900/week ($65/hour for 60 hours/week).

Direct Onsite Construction Jobs in other states along the NED routing (PA, NY, CT, and NH) have similarly high labor income per worker, consistent with income averaging $3900 per week and over $200,000 per year (based on 52 weeks of work).

The BHI Study does not indicate whether the estimated 1,033 other jobs are annual jobs. The BHI Study used IMPLAN to estimate other jobs, and IMPLAN typically estimates employment in terms of annual jobs.

Assuming these 1,033 other jobs are annual jobs, the total jobs estimate for NED in MA for all workers is 2,603 annual jobs:

= jobs for workers residing in MA + jobs for Onsite Construction workers residing elsewhere

= 1,033 other jobs for workers residing in MA + 785 Direct Onsite Construction Jobs for local workers residing in MA + 785 Direct Onsite Construction Jobs for workers residing elsewhere.

Also assuming these 1,033 other jobs are annual jobs, the total jobs estimate for NED in MA for in-state workers residing in MA is 1,818 jobs:

= jobs for workers residing in MA
= 1,033 other jobs for workers residing in MA + 785 Direct Onsite Construction Jobs for local workers residing in MA.

As mentioned earlier in these Notes, the NED Project includes extensive facilities in 5 Northeast US states (PA, NY, CT, MA, and NH), but an economic impact study and total jobs estimate has only been provided for MA. Studies and total job estimates for NED in other states may be provided subsequently, but they are not now available.

Kinder Morgan (the Owner/Constructor/Operator of NED) was funding the New Hampshire Center for Public Policy Studies (NHCPPS) to perform an economic impact study for NED in NH, with terms of engagement for NHCPPS to retain full control over the design and editorial content of the study and report. However this agreement has now been terminated owing to a disagreement over its terms, and NHCPPS is not aware of any other organization contemplating this kind of study at the present time.
http://www.policyblognh.org/policy_blog_nh/2015/02/a-new-research-project-for-the-center.html
http://www.policyblognh.org/policy_blog_nh/2015/04/update-on-our-pipeline-project.html

Operating Phase Jobs:

NED (Resource Report 5, pp. 5-26-5-28) estimates that 26 new full time local employees will be added for operation of the NED facilities, with estimated average salaries ranging from $51,500 to $110,000. These jobs would be located in the 4 Northeast US states along the NED routing:

PA: 4 jobs (average annual income per job $75,000)
NY: 10 jobs (average annual income per job $78,500)
MA: 7 jobs (average annual income per job $98,200)
NH: 5 jobs (average annual income per job $87,000)

Pipelines employees have high average annual incomes. These are high-skill, specialized, technical jobs, with titles including:

Damage Prevention
Operations Specialist
Corrosion
Technicians (Measurement, Engineering, Equipment and Controls)
Supervisors (Operations, Corrosion)
Controls Engineer.

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As noted by NED (Resource Report 5, p. 5-26), in addition to Direct Employees, there will be some benefits to local economies, via contractors and workers involved in pipeline operations (including maintenance and repair):

> [L]ocal economies will also benefit from routine operations and maintenance activities, including vegetation clearing on the ROW and repairs of pipeline and compressor station facilities, as well as including plumbers, painters, electricians, and other trades/services associated with normal operations of compressor stations […].

But NED does not quantify these benefits in terms of other jobs relating to pipeline operations. The BHI Study for NED in MA estimates jobs relating to pipeline construction, but does not estimate jobs relating to operations.

Constitution Pipeline Project

Project Website: http://constitutionpipeline.com/

Project Owner/Constructor/Operator: Joint Venture of Williams Partners (Williams), Cabot Pipeline Holdings (an independent gas producer), Piedmont Constitution Pipeline Company (subsidiary of Piedmont Natural Gas Company), and Capital Energy Ventures (subsidiary of WGL Holdings). Williams is a large energy infrastructure company primarily involved in activities relating to natural gas in the US and Canada. Williams has a 41% ownership share in Constitution, and is constructing and operating the project. Williams also owns Transcontinental Gas Pipe Line Company (Transco). Transco is a 10,200-mile natural gas pipeline system, extending across approximately 2000 miles from South Texas and the offshore Gulf of Mexico to New York City. Transco is the nation's largest-volume interstate natural gas pipeline system, and is a large-scale Owner/Constructor/Operator of natural gas pipelines in the Northeast US, including NJ, PA, and NY.

Project Facilities, Cost and Jobs:

FERC Docket CP13-499:

Application for Certificate of Public Convenience and Necessity, June 13, 2013 ("Certificate Application"), especially Exhibit K (Cost of Facilities) http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13282099 http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13282102;

Resource Report 1, General Project Description, November 2013 (Supplement to June 13, 2013 and July 24, 2013 Environmental Reports), especially pp. 1-3-1-11. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13391257

Resource Report 5, Socioeconomics, November 2013 (Supplement to June 13, 2013 and July 24, 2013 Environmental Reports), especially pp. 5-1; 5-19-5-11; Appendix 5A (The Economic Impact of the Constitution Pipeline. Gardner, Kent and Scott Sittig. Center for Governmental Research (CGR). June 2013 ("CGR Study")), especially pp. 2-9. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=13391263

Construction Schedule:

Estimated Schedule (assumed in estimates of Project Cost and Jobs):

Construction Start Date: June 2014/September 2014 (between June 2014 and September 2014, a small number of workers construction on protected

streams/waterbodies winter timing restrictions related to trout; large scale construction starts September 2014)

Project In-Service Date: March 2015

Sources: Certificate Application, p. 2; Resource Report 5, p. 5-9-5-11.

Revised Schedule:

Construction Start Date: Late Summer 2015

Project In-Service Date: Second Half 2016

Source: Constitution Project Website http://constitutionpipeline.com/

Comments: The estimates of Project Cost and Jobs in Figure 2 for Constitution are based on estimates (including estimated construction schedule) provided in the FERC Certificate Proceeding prior to project construction. As explained above, actual construction has differed from the schedule estimated prior to project construction. Construction start and project in-service have been delayed by over a year. Information on changes in construction schedule is provided here for completeness and context, but it should be understood that the estimates of Project Cost and Jobs in Figure 2 are based on the project schedule estimated prior to project construction, rather than the subsequently revised schedule.

Notes:

The entire Constitution Project has a total estimated cost of $683 million, and includes facilities in PA and NY:

- Pipeline (124 miles 30" new pipeline),
- associated aboveground facilities (1 new meter station, 1 new meter and regulator station, and other facilities).

As stated in Resource Report 5 (p. 5-9-5-11) and the CGR Study (pp. 4-8), Constitution (including both PA and NY) has the following job impacts:

- 1,575 Total Jobs, including
- 1,300 Direct Onsite Construction Jobs, and
- 275 Other Jobs (1,575 Total Jobs - 1,300 Direct Onsite Construction Jobs; other jobs include "spillover effects", including:
    - upstream jobs in the supply chain, providing services, materials and other inputs (also known as indirect jobs); and
    - downstream jobs as workers spend income from jobs upstream, offsite and onsite (also known as induced jobs).

The CGR Study used IMPLAN (input-output analysis) to estimate the economic impact (jobs and labor income, and value added) for Constitution in PA and NY. But the CGR Study estimates of Direct Onsite Construction Jobs and labor income are based on data from Williams (Joint Owner/Constructor/Operator of Constitution) for onsite labor on each construction spread, rather than generic IMPLAN estimates for the construction sector.

The CGR Study estimate of Direct Onsite Construction Jobs (1,300 jobs) matches the Resource Report 5 (p. 5-10) estimates of construction jobs for local and non-local workers. These 1,300 Direct Onsite Construction Jobs are for less than 1 year, with duration per construction spread ranging 26-33 weeks, and a weighted average duration of 29.4 weeks. Thus, the 1,300 Direct Onsite Construction Jobs for 29.4 weeks are equivalent to 735 annual jobs for 52 weeks (1,300*29.4/52).

The above job estimates include all construction workers, residing in PA, NY, and elsewhere. As stated in Resource Report 5 (p. 5-9) and the CGR Study (p. 5), construction workers are estimated to reside 25% locally in 5 PA and NY counties along the pipeline routing, 25% in-state elsewhere in PA and NY, and 50% out-of-state. Only 50% of the Direct Onsite Construction Jobs are for in-state workers; so for workers residing in PA and NY, Constitution is estimated to have 650 Direct Onsite Construction Jobs (1,300 jobs * 0.5), equivalent to 368 annual jobs (735 jobs* 0.5=367.5 jobs).

As documented in Resource Report 5 (pp. 5-11) and the CGR Study (p. 7), Direct Onsite Construction Jobs (in PA and NY) have very high income per job. Labor Income per annual job averages over $175,000 for Direct Onsite Construction workers ($1,300 million/1,300 jobs for 29.4 weeks is $100,000 per job for 29.4 weeks; $1,300 million/735 annual jobs for 52 weeks is over $176,000 per annual job for 52 weeks). Stated another way, labor income per Direct Onsite Construction worker averages $3,400/week.

These estimates for labor income per Direct Onsite Construction Job on the Constitution Project (in PA and NY) are broadly similar to the estimates for the Northeast Energy Direct (NED) Project (in PA, NY, CT, MA, and NH). As discussed in the Notes above for NED, labor income per Direct Onsite Construction worker on NED averages $3,900 per week and over $200,000 per year (based on 52 weeks of work).

The CGR Study does not indicate whether the estimated 275 other jobs are annual jobs. The CGR Study used IMPLAN (input-output analysis) to estimate other jobs, and IMPLAN typically estimates employment in terms of annual jobs.

Assuming these 275 other jobs are annual jobs, the total jobs estimate for Constitution (in PA and NY) for all workers is 1,010 annual jobs:

= jobs for workers residing in PA and NY + jobs for Onsite Construction workers residing elsewhere
= 275 other jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing elsewhere.

Also assuming these 275 other jobs are annual jobs, the total jobs estimate for Constitution (in PA and NY) for in-state workers residing in PA and NY is 643 annual jobs:
= jobs for workers residing in PA and NY
= 275 other jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing in PA and NY.

Resource Report 5 (p. 5-9) states that the duration of the 275 other jobs will be tied to the duration of project construction. As explained above, Constitution is estimated to have duration per construction spread ranging 26-33 weeks and averaging 29.4 weeks. This would indicate that the 275 other jobs are equivalent to only 155 annual jobs (275*29.4/52).

Assuming only 155 other annual jobs, the total jobs estimate for Constitution (in PA and NY) for all workers is 890 annual jobs:
= jobs for workers residing in PA and NY + jobs for Onsite Construction workers residing elsewhere
= 155 other jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing elsewhere.

Also assuming only 155 other annual jobs, the total jobs estimate for Constitution (in PA and NY) for in-state workers residing in PA and NY is 523 annual jobs:
= jobs for workers residing in PA and NY
= 155 other jobs for workers residing in PA and NY + 367.5 Direct Onsite Construction Jobs for workers residing in PA and NY.

Operating Phase Jobs:

Constitution (Resource Report 5, p. 5-13) estimates that 7 new full time local employees will be needed to operate and maintain the pipeline; these employees will work along the entire pipeline routing in both PA and NY; additional operational needs will be met using existing staff in surrounding area and Houston:

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> These local employees will conduct the operation and maintenance functions. These workers will be responsible for the entire pipeline (all counties). The majority of these workers are expected to be located near the central point of the pipeline at an operations warehouse. The staff may be working at one of the two meter stations, and on any given day, they may be anywhere along the pipeline. Additional operational needs will be met using existing staff located in surrounding areas and Houston, Texas.

Constitution will be operated by Williams. Williams owns Transco, a large-scale operator of natural gas pipelines extending from Texas to the Northeast US, including NJ, PA, and NY. Williams/Transco is based in and operated from Texas. Thus, Williams/Transco can to some extent utilize existing staff based elsewhere in Northeast and in Texas to operate Constitution.

The CGR (p. 8) incorporates the estimate of 7 new full time local employees as 7 Direct Jobs, including 2 in PA and 5 in NY. Annual Labor Income per Direct Employee is about $72,500.

In addition to these Direct Jobs, the CGR Study estimates there will 5 other jobs ("spillover impact"), including 1 in PA and 4 in NY. Thus, the CGR Study estimates 12 total annual jobs for the operations phase of Constitution.

Document Content(s)

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