Exhibit D

The Goodman Group, Ltd. Report

INTERVENORS' ADDITIONAL COMMENTS ON FERC'S MARCH 2018
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE NORTHEAST SUPPLY ENHANCEMENT PROJECT
FERC DOCKET #CP17-101-000

SUBMITTED ON BEHALF OF:

NY/NJ Baykeeper,
Food & Water Watch,
Central Jersey Safe Energy Coalition, and
Princeton Manor Homeowners Association

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Expert Report on the Northeast Supply Enhancement (NESE) Project Economic Impact Analysis for New Jersey, New York and Pennsylvania

Presented to Eastern Environmental Law Center (EELC)

by Ian Goodman and Brigid Rowan

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1 Executive Summary

In this report, The Goodman Group, Ltd. (TGG) evaluates the economic impact study (Economic Impacts of the Proposed Northeast Supply Enhancement in New Jersey, Pennsylvania and New York, referred to in this report as the Rutgers Analysis) prepared for the Transcontinental Gas Pipe Line Company, LLC (Transco) by Michael Lahr and Will Irving, Rutgers University Bloustein School of Planning and Public Policy.

TGG's evaluation demonstrates that the Rutgers Analysis substantially overstates the jobs from building the Northeast Supply Enhancement (NESE) Project.

The Rutgers Analysis estimates 2,411 Total Job-Years in New Jersey. TGG concludes that **the Rutgers Analysis has overstated these Total Jobs by approximately 40-60%.**

The Rutgers Analysis estimates 276 Total Job-Years in New York and 499 Total Job-Years in Pennsylvania. TGG concludes that **the Rutgers Analysis has overstated Total Jobs in New York by approximately 45-70%, with little or no overstatement of Total Jobs in Pennsylvania.**

For the tri-state area (New Jersey, New York and Pennsylvania), the Rutgers Analysis estimates 3,186 Total Job-Years. TGG concludes that **the Rutgers Analysis has overstated these Total Jobs by approximately one-third to one-half.**

The Rutgers Analysis estimates of Total Jobs include both onsite construction workers and a wide variety of offsite jobs (spin-offs throughout the supply chain and economy).

Specifically in the construction sector, the Rutgers Analysis estimates 858 Job-Years in New Jersey, 96 Job-Years in New York, and 166 Job-Years in Pennsylvania. TGG concludes that **the Rutgers Analysis has overstated these Construction Jobs by approximately 80-90% in New Jersey and New York, with little or no overstatement in Pennsylvania.**

For the tri-state area, the Rutgers Analysis estimates 1,120 Job-Years in the construction sector. TGG concludes that **the Rutgers Analysis has overstated these Construction Jobs by approximately 70-80%.**

TGG concludes that the Rutgers Analysis has significantly overstated Total Jobs (by approximately one-third to one-half for the tri-state area), and greatly overstated Construction Jobs (by approximately 70-80% for the tri-state area), based on the following:

- our evaluation of the Rutgers Analysis and the significant discrepancies with the Transco Construction Workforce data (Section 3);
- Transco's failure to provide a credible explanation reconciling the Rutgers Analysis job estimates with the Construction Workforce data (Section 3.4.2.1);
- Rutgers Analysis overstatement of in-state share of direct jobs and spending (Rutgers Analysis assumes 60% of NESE construction workers reside in-state; Transco Construction Workforce data estimates only about 40% local hires) (Section 3.4.2.2);
- Rutgers Analysis failure to provide reliable results for specialized pipeline construction, and especially for the offshore Raritan Bay Loop (Section 3.4.2.3);
- Rutgers Analysis overstatement of indirect jobs and spending (resulting from Rutgers Analysis overstatement of in-state direct jobs and spending) (Section 3.4.3);
- given a context of tighter labor market conditions, impacts from building NESE are likely to be at (or below) the lower end of the estimated range for direct, indirect, and total jobs (Section 3.4.4); and
- our extensive experience and expertise conducting and reviewing studies of employment and other impacts for pipelines and other energy-related activities. (Section 2.2)

The FERC DEIS relies upon inconsistent information from the Rutgers Analysis and Transco Construction Workforce data. In turn, DEIS conclusions are inconsistent regarding NESE Project economic impacts. These conclusions are neither well explained, nor well supported (Section 3.4.2.1).

The jobs from building NESE are one-time and temporary. Actual construction and restoration would occur over a one-year period (first quarter 2019 to first quarter 2020). Most of the employment impacts (total onsite and offsite jobs) would take place during the same period.

This report also evaluates employment impacts from ongoing activities to operate and maintain the pipeline and related facilities. According to Transco, annual jobs from operations are 2 in total (in New Jersey). **TGG concludes that pipeline operations result in very small expenditures (and employment impacts) and have very little positive impact on the economy, in New Jersey and elsewhere in the tri-state area.** (Section 4)

TGG concludes that even if the Rutgers Analysis' employment impact estimates were realistic, the impact of the Project on the tri-state area economies would be negligible, for the following reasons:

- the employment impacts from Project construction are tiny in the context of the tri-state area economies (less than 0.06% of total New Jersey jobs) (Section 3.4.1);
- the employment impacts from ongoing activities to operate and maintain the pipeline are infinitesimally small, especially in the context of the New Jersey economy (2 jobs or about 0.00005% of total state jobs) (Section 4.3.1);
- the property taxes from the Project are also tiny (about $1 million annually in New Jersey or less than 0.004% of total state property taxes) (Section 4.3.2).

However, as demonstrated in this report, the Rutgers Analysis employment impact estimates are significantly overstated. Therefore, the impact of NESE on the tri-state area economies is even more negligible than would be concluded based on the Rutgers Analysis estimates.

Hence, there would be little if any local benefits from the Project to offset any costs, risks, and adverse impacts from the Project. (Section 4.3.2)

Key findings of this report are summarized in Tables 1-4 in Section 1.1.

1.1 Tables

For the convenience of the reader, the complete group of Tables (1-4) is provided on the following pages.

Table 1, NESE Construction Employment Impacts (Job-Years), is described in Sections 3.3 and 3.4. Comparison of the Rutgers Analysis with the TGG Analysis (which is based on the Transco Construction Workforce data (Table 4) illustrates that that the Rutgers Analysis is inconsistent with the Transco Construction Workforce data. These significant discrepancies are examined in Section 3.4 (especially Section 3.4.2.1).

Table 2, NESE In-State Construction and Related Expenditures, is described in Section Sections 3.3 and 3.4.2.3.

Table 3, NESE Job-Years per Payroll $; Payroll and Compensation $ per Job-Year, is described in Sections 3.3 and 3.4.2.3.

Table 4, NESE Direct Onsite Construction Jobs (Transco Construction Workforce Data & Conversion into Job-Years), is described in Section 3.4 (especially Sections 3.4.1, 3.4.2.1, and 3.4.2.2).

Table 1: NESE Construction Employment Impacts (Job-Years)

	Rutgers Analysis				TGG Analysis				TGG Analysis (% of Rutgers Analysis)			
Facility/Location	Direct Construction [1]	Other Direct [2]	Indirect [3]	Total [3]	Direct Construction [1][4]	Other Direct [5]	Indirect [3][6]	Total [3]	Direct Construction	Other Direct	Indirect	Total
Madison Loop	86	27	210	323	49 - 88	27	221 - 215	297 - 330	57 - 102%	100%	105 - 103%	92 - 102%
Compressor Station 206	86	21	152	259	22 - 20	21	105 - 129	148 - 169	26 - 23%	100%	69 - 85%	57 - 65%
Raritan Bay Loop (NJ)	686	78	1065	1829	20 - 52	78	437 - 814	535 - 944	3 - 8%	100%	41 - 76%	29 - 52%
New Jersey Total	858	126	1427	2411	90 - 160	126	763 - 1158	980 - 1444	11 - 19%	100%	53 - 81%	41 - 60%
Raritan Bay Loop (NY)	96	19	161	276	3 - 8	19	63 - 122	85 - 148	3 - 8%	100%	39 - 76%	31 - 54%
New York Total	96	19	161	276	3 - 8	19	63 - 122	85 - 148	3 - 8%	100%	39 - 76%	31 - 54%
Quarryville Loop	103	22	197	322	124 - 159	22	207 - 202	353 - 383	120 - 155%	100%	105 - 103%	110 - 119%
Compressor Station 200	63	11	104	177	16 - 16	11	73 - 88	100 - 115	25 - 25%	100%	70 - 85%	56 - 65%
Pennsylania Total	166	33	301	499	139 - 175	33	280 - 291	453 - 498	84 - 105%	100%	93 - 97%	91 - 100%
Tri-State Area Total (NJ+NY+PA)	1120	178	1889	3186	233 - 342	178	1106 - 1570	1517 - 2091	21 - 31%	100%	59 - 83%	48 - 66%

Notes:

[1] Direct Construction = Construction Sector Job-years (Rutgers Analysis, p. 7); hence would include Direct Onsite

[2] Other Direct = Total - Direct Construction - Indirect; hence would include Direct Offsite

[3] As defined in Rutgers Analysis, Indirect includes Induced and Total = Direct + Indirect (including Induced); for comparability, TGG Analysis adopts this (i.e. Rutgers') nomenclature

[4] Direct Construction (TGG Analysis) = Local Workforce Job-years based on Transco Construction Workforce data (Table 4)

[5] Other Direct (TGG Analysis) = Other Direct (Rutgers Analysis)

[6] Indirect (TGG Analysis) = Indirect (Rutger Analysis), adjusted by TGG Analysis % of Rutgers (Total Expenditures) [fraction of 1; e.g., 65% = 0.65] (Table 2), range expanded by 1/3 on both left side [typically low end] and right side [typically high end] of range to bracket uncertainty; hence, left side [typically low end] of range = Indirect (Rutger Analysis) * (((((TGG Analysis Expenditures % of Rutgers Expenditures) * 4) - 1)) /3); right side [typically high end] of range = Indirect (Rutger Analysis) * ((((TGG Analysis Expenditures % of Rutgers Expenditures) * 2) + 1)) /3)

Table 2: NESE In-State Construction and Related Expenditures

	Rutgers Analysis				TGG Analysis				TGG Analysis Expenditures		
	Construction	Expenditures ($millions)			Construction	Expenditures ($millions)			(% of Rutgers Expenditures)		
Facility/Location	Payroll (% In-State)	Construction Payroll	Other [1]	Total	Payroll (% In-State) [2]	Construction Payroll [3]	Other [4]	Total	Construction Payroll	Other	Total
Madison Loop	60%	$14.3	$16.3	$30.6	65%	$15.5	$16.3	$31.8	108%	100%	104%
Compressor Station 206	60%	$9.0	$10.5	$19.5	30%	$4.5	$10.5	$15.0	50%	100%	77%
Raritan Bay Loop (NJ) [5]	60%	$71.4	$63.1	$134.5	10 - 20%	$11.9 - $23.8	$63.1	$75.0 - $86.9	17 - 33%	100%	56 - 65%
New Jersey Total	60%	$94.7	$90.0	$184.7	20 - 28%	$31.9 - $43.8	$90.0	$121.9 - $133.8	34 - 46%	100%	66 - 72%
Raritan Bay Loop (NY) [5]	60%	$10.2	$8.4	$18.6	10 - 20%	$1.7 - $3.4	$8.4	$10.1 - $11.8	17 - 33%	100%	54 - 63%
New York Total	60%	$10.2	$8.4	$18.6	10 - 20%	$1.7 - $3.4	$8.4	$10.1 - $11.8	17 - 33%	100%	54 - 63%
Quarryville Loop	60%	$16.0	$18.7	$34.7	65%	$17.3	$18.7	$36.0	108%	100%	104%
Compressor Station 200	60%	$7.8	$9.6	$17.4	30%	$3.9	$9.6	$13.5	50%	100%	78%
Pennsylania Total	60%	$23.8	$28.3	$52.1	54%	$21.2	$28.3	$49.5	89%	100%	95%
Tri-State Area Total (NJ+NY+PA)	60%	$128.7	$126.7	$255.4	26 - 32%	$54.8 - $68.4	$126.7	$181.5 - $195.1	43 - 53%	100%	71 - 76%

Notes:

[1] Other = Total - Construction Payroll = Material & Equipment + Other Payments to Construction Companies (profit & overhead) + Easement/Right of Way + Miscellaneous (travel costs, consulting, permits and other miscellaneous)

[2] % In-State = Transco Construction Workforce data Local Hires % (Table 4)

[3] Construction Payroll (Rutgers Analysis) * Payroll % In-State (TGG Analysis) / Payroll % In-State (Rutgers Analysis=60%)

[4] Other (TGG Analysis) = Other (Rutgers Analysis)

[5] Raritan Bay Construction Payroll (Rutgers Analysis): Total (NJ+NY) = $81.6 million; 87.5% in NJ, 12.5% in NY

Table 3: NESE Job-Years per Payroll $; Payroll and Compensation $ per Job-Year

Facility/Location	Construction job-years per $1 million Construction Labor Payroll			Construction Labor Payroll ($000 per Construction job-year)			Compensation per job-year		
	Rutgers Analysis	TGG Analysis	TGG Analysis (% of Rutgers Analysis)	Rutgers Analysis	TGG Analysis	TGG Analysis (% of Rutgers Analysis)	Rutgers Analysis ($000/job-year)		
	(job-years/$1 million)			($000/job-year)			Direct	Indirect	Total
		[1]			[2]				
Madison Loop	6.0	3.1 - 5.7	52 - 94%	$166	$177 - 318	106 - 191%	$127	$58	$82
Compressor Station 206	9.6	4.9 - 4.4	51 - 46%	$105	$227 - 205	217 - 195%	$86	$56	$68
Raritan Bay Loop (NJ)	9.6	1.7 - 2.2	17 - 23%	$104	$454 - 604	436 - 580%	$91	$55	$70
New Jersey Total	9.1	2.8 - 3.7	31 - 40%	$110	$274 - 353	248 - 319%	$95	$55	$71
Raritan Bay Loop (NY)	9.4	1.6 - 2.2	18 - 24%	$106	$447 - 607	421 - 571%	$72	$52	$60
New York Total	9.4	1.6 - 2.2	18 - 24%	$106	$447 - 607	421 - 571%	$72	$52	$60
Quarryville Loop	6.4	7.1 - 9.2	111 - 143%	$155	$109 - 140	70 - 90%	$118	$73	$90
Compressor Station 200	8.1	4.0 - 4.0	50 - 50%	$124	$250 - 250	202 - 202%	$109	$81	$93
Pennsylania Total	7.0	6.6 - 8.2	94 - 118%	$143	$121 - 152	85 - 106%	$115	$76	$91
Tri-State Area Total (NJ+NY+PA)	8.7	4.2 - 5.0	49 - 58%	$115	$200 - 236	174 - 205%	$96	$58	$73

Notes:

[1] This range is compressed owing to structure of scenarios; the right-side [typically high end] of the range assumes 20% local share for Raritan Bay Loop (which has low Job-Years per Payroll $), and the left-side [typically low end] of the range assumes 10% local share for Raritan Bay Loop

[2] This range is compressed owing to structure of scenarios; the right-side [typically high end] of the range assumes 10% local share for Raritan Bay Loop (which has high Payroll $ per Job-Year) and the left-side [typically low end] of the range assumes 20% local share for Raritan Bay Loop

Table 4: NESE Direct Onsite Construction Jobs (Transco Construction Workforce Data & Conversion into Job-Years)

Facility/Location	Construction Duration (months) [3]	Total Workforce (Local + Non-Local)			Local Hires (% of Total) [5]	Local Workforce [1]			Non-Local Workforce [2]		
		Maximum (Workers)	Average (Workers)	Job-Years [4]		Maximum (Workers)	Average (Workers)	Job-Years [4]	Maximum (Workers)	Average (Workers)	Job-Years
Madison Loop	5	162	135	75 - 135	65%	105	88	49 - 88	57	47	26 - 47
Compressor Station 206	10	88	66	73 - 66	30%	26	20	22 - 20	62	46	51 - 46
Raritan Bay Loop (NJ) [6]	9	262	197	197 - 262	10 - 20%	26 - 52	20 - 39	20 - 52	236 - 210	177 - 158	177 - 210
New Jersey Total	7	512	398	345 - 463	26 - 37%	157 - 183	127 - 147	90 - 160	355 - 329	271 - 251	255 - 303
Raritan Bay Loop (NY) [6]	9	38	28	28 - 38	10 - 20%	4 - 8	3 - 6	3 - 8	34 - 30	25 - 22	25 - 30
New York Total	9	38	28	28 - 38	10 - 21%	4 - 8	3 - 6	3 - 8	34 - 30	25 - 22	25 - 30
Quarryville Loop	7	294	245	191 - 245	65%	191	159	124 - 159	103	86	67 - 86
Compressor Station 200	9	77	52	52 - 52	30%	23	16	16 - 16	54	36	36 - 36
Pennsylania Total	7	371	297	243 - 297	57 - 59%	214	175	139 - 175	157	122	103 - 122
Tri-State Area Total (NJ+NY+PA)	7	921	723	616 - 798	38 - 45%	375 - 405	305 - 327	233 - 342	546 - 516	418 - 396	383 - 456

Notes:

[1] Local Workforce = Total Workforce * Local Hires % of Total [fraction of 1; e.g., 65% = 0.65]

[2] Non-Local Workforce = Total Workforce - Local Workforce; for comparability with Local Workforce range:
Non-Local Workforce (left-side of range) = Total Workforce - Local Workforce (left-side [low end] of range)
Non-Local Workforce (right-side of range) = Total Workforce - Local Workforce (right-side [high end] of range)

[3] Construction Duration (State Totals) = weighted averages (Duration for Local Workforce Job-Years, left-side [typically low end] of range)

[4] Workforce Job Years (left-side [typically low end] of range) = Average Workforce (Workers) * Construction Duration (Months) / 9 (months per year)
Workforce Job Years (right-side [typically high end] of range) = Maximum (Raritan Bay Loop) Workers or Average (all other facilities) Workers

[5] Local Hires % (State Totals) = weighted averages (MIN & MAX % Local Workforce/Total Workforce for Maximum Workers, Average Workers, Job-Years)

[6] Raritan Bay Loop: Maximum Workforce = 300 Workers; Average Workforce = 225 Workers; Workforce includes both offshore segment (23.3 miles in NJ & NY) and onshore segment (0.2 miles in NJ); Workforce allocated 87.5% to NJ & 12.5% to NY

2 Introduction

2.1 Objectives of the TGG Report

Eastern Environmental Law Center (EELC) retained the services of The Goodman Group, Ltd. (TGG) to produce an independent expert report (TGG Report) on the Northeast Supply Enhancement (NESE) Project Economic Impact Analysis for New Jersey, New York and Pennsylvania. The objective of this expert report is to evaluate the economic impact study (Economic Impacts of the Proposed Northeast Supply Enhancement in New Jersey, Pennsylvania and New York,[1] referred to in this report as the Rutgers Analysis) prepared for Transco[2] by Michael Lahr and Will Irving, Rutgers University Bloustein School of Planning and Public Policy.

This expert report also evaluates the FERC DEIS for the NESE Project, in regard to employment impacts.[3] The DEIS restates (and uncritically accepts) the information provided by Transco regarding employment impacts, notably the Rutgers Analysis and Construction Workforce data.

2.2 TGG's Approach and Expertise

TGG's approach is to review and evaluate the Rutgers Analysis and other estimates provided by Transco relating to (a) employment impacts of the Project from Construction and Related Expenditures (i.e. employment related to capital investment to

[1] Submitted to US Federal Energy Regulatory Commission (FERC), Docket No. CP17-101-000, Environmental Reports, Supplemental Information Filing, Attachment 5, Economic Impacts Analysis, June 2017. https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14608804

[2] Transcontinental Gas Pipe Line Company (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, NY and PA. Transco is owned by Williams, a large energy infrastructure company primarily involved in activities relating to natural gas in the US and Canada.

[3] Northeast Supply Enhancement Project Draft Environmental Impacts Statement (DEIS), March 2018 http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20180323-3005

§2.4 Construction Workforce And Schedule, p. 2-52
§4.8.2 Population and Employment, pp. 4-239—4-243, especially pp. 4-242—4-243
§4.8.9 Economy and Tax Revenues, pp. 4-257—4-260
§4.12.3.9 Socioeconomics, pp. 4-355—4-359.

construct the pipeline); and (b) Ongoing Economic Impacts (i.e. employment and property tax impacts related to the ongoing activities to operate and maintain the pipeline and related facilities). TGG concludes that (a) the Rutgers Analysis estimates of construction jobs are significantly overstated; and (b) the employment and property tax benefits from ongoing Project operations would be tiny and insignificant.

These conclusions are based on TGG's detailed review of the Rutgers Analysis, Transco Construction Workforce data, and their inconsistencies. In turn, our conclusions and review rely upon TGG's extensive experience and expertise conducting and reviewing studies of employment and other impacts for pipelines and other energy-related activities.[4] In particular, this report relating to the NESE Project builds on TGG's report for the PennEast Project which reviewed numerous recent job analyses for Northeastern US pipeline projects, including several involving Transco/Williams.[5]

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 Rutgers Analysis relating to employment impacts of In-State Construction and Related Expenditures (i.e. employment impacts related to capital investment to construct the pipeline). Section 3.1 provides an Introduction. Section 3.2 explains capital investment economic impact and the various job categories

[4] The relevant experience of TGG and the co-authors of this report (Ian Goodman and Brigid Rowan) are described on TGG's website:
http://www.thegoodman.com/economic-development-pipelines-rail-crude
http://www.thegoodman.com/economic-development
http://www.thegoodman.com/pdf/TGG20160716IanGoodmanCV.pdf
http://www.thegoodman.com/pdf/TGG20160716BrigidRowanCV.pdf

[5] Expert Report on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania, presented to the New Jersey Conservation Foundation, November 4, 2015, submitted November 7, 2015 in FERC Docket CP15-558
https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14040359
This TGG report reviewed jobs analyses for the following projects:
- Transco: Northeast Supply Link (NESL) in NJ and PA; and Atlantic Sunrise in PA;
- Joint Venture of Williams & 3 others: Constitution in NY and PA
- Kinder Morgan: Northeast Energy Direct (NED) in MA
- Joint Venture UGI & 4 others: PennEast in NJ and PA

Like the Rutgers Analysis for NESE, the jobs analysis for NESL in NJ was prepared for Transco by Rutgers University Bloustein School, and co-authored by Michael Lahr and Will Irving; the NESL analysis also had 2 additional co-authors from Rutgers.

used in employment studies. Section 3.3 summarizes the Rutgers Analysis estimates of employment impacts related to capital investment to construct the pipeline.

Section 3.4 provides TGG's evaluation of the Rutgers Analysis estimates of employment impacts to construct the pipeline. In Section 3.4.1, TGG emphasizes that even if the Rutgers Analysis employment impact estimates were realistic, the one-time employment impacts from Project construction are tiny in the context of the New Jersey, New York and Pennsylvania state economies.

Section 3.4.2.1 examines the significant discrepancies between the Rutgers Analysis and Transco's Construction Workforce data. This section describes Transco's failure to provide a credible explanation for these inconsistencies, and the reliance of the FERC DEIS on this inconsistent information as a basis for inconsistent conclusions regarding NESE Project economic impacts.

Section 3.4.2.2 focuses on the Rutgers Analysis overstatement of in-state share of direct jobs and spending. The Rutgers Analysis assumes 60% of NESE construction workers reside in-state; Transco Construction Workforce data estimates only about 40% local hires.

Section 3.4.2.3 evaluates the failure of the Rutgers Analysis to provide reliable results for specialized pipeline construction, and especially for the offshore Raritan Bay Loop.

Section 3.4.3 explains the Rutgers Analysis overstatement of indirect jobs and spending (as a result of the Rutgers Analysis overstatement of in-state direct jobs and spending identified in Section 3.4.2.2).

In Section 3.4.4, TGG explains that, given a context of tighter labor market conditions, impacts from building NESE are likely to be at (or below) the lower end of the estimated range for direct, indirect, and total jobs.

Section 4 reviews and evaluates Annual Ongoing Economic Impacts (i.e. employment and property tax impacts related to the ongoing activities to operate and maintain the pipeline and related facilities). Section 4.2 summarizes the Transco estimates of employment and property tax impacts related to ongoing activities to operate and maintain the pipeline.

Section 4.3 provides TGG's evaluation of the Transco's estimates in Section 4.2. TGG concludes that employment impacts and tax revenues related to ongoing activities to operate and maintain the pipeline are extremely small, especially in the context of the New Jersey economy. Hence, there would be little if any ongoing local benefits from the Project to offset any costs, risks, and adverse impacts from the Project.

Section 5 presents the key conclusions from the TGG Report.

Section 6 is a Technical Appendix for the TGG Analysis of NESE Employment Impacts. It contains discussion of topics including the annualization of job estimates (conversion into job-years) (Section 6.1); Direct Jobs and Spending (Section 6.2); and Indirect Jobs (Section) 6.3).

Section 7 provides sources and notes, including (a) a general description of FERC (United States Federal Energy Regulatory Commission) process and documents for gas pipeline construction projects; and (b) specific sources and notes for the NESE Project and this report.

3 Rutgers Analysis: Project Construction Economic Impacts

3.1 Introduction

NESE (and other projects) generate economic impacts, including employment, from two types of activities:

- Construction and Related Expenditures, and
- Operations and Maintenance Expenditures.

Employment impacts related to Construction Expenditures are the employment impacts related to capital investment to construct the Project. Put more simply, these are the temporary jobs related to Project construction. These temporary jobs represent the vast majority of the jobs relating to NESE Project expenditures.

Employment impacts related to Ongoing Economic Impacts are the "permanent" jobs related to the operation and maintenance of the Project. These jobs are typically small for pipelines, and they are especially tiny for the NESE Project.

The Rutgers Analysis estimates employment impacts of In-State Construction and Related Expenditures. Transco separately provided estimates of the temporary jobs for the construction workforce (Direct Onsite Construction Labor). In regards to the employment impacts of NESE construction, the FERC DEIS basically just restates the information provided by Transco, including both the Rutgers Analysis and separate Construction Workforce data.

The current section describes Rutgers Analysis Estimates for the Construction Expenditures employment impacts, i.e. the temporary jobs related to construction of the project. TGG then provides its evaluation of Rutgers Analysis Estimates, including an analysis of employment impacts based on the Transco Construction Workforce data.

Ongoing Economic Impacts (as estimated by Transco and in the Rutgers Analysis) will be discussed in Section 4.

3.2 Project Construction Employment Impacts and Job Categories

Jobs related to Project construction include both onsite and offsite jobs. The Rutgers Analysis 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 engineering, permitting, and support jobs;
- upstream jobs in the supply chain, providing services, materials and other inputs ("indirect jobs" in standard Input-Output nomenclature);[6] and
- downstream jobs as workers spend income from jobs upstream, offsite and onsite ("induced jobs" in standard Input-Output nomenclature).[7]

Offsite jobs are widely dispersed in sectors throughout the economy, as well as geographically.[8] 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.[9]

3.3 Rutgers Analysis Estimates

The Rutgers Analysis uses R/ECON (an input-output (I-O) model) to estimate impacts

[6] See footnotes 9 and 10.
[7] See footnotes 9 and 10.
[8] Onsite jobs are tied to project locations; jobs elsewhere (direct offsite, upstream, and downstream) can be located further away, including 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 spending of labor income are highly relevant to the NESE job estimates and will be discussed in Sections 3.4 and 6.
[9] As will be discussed in more detail in Section 3.3 (and specifically footnote 10), Rutgers Analysis 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 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.

of NESE Project construction on both direct and indirect employment (and other economic effects) in the tri-state area (New Jersey, New York and Pennsylvania).[10] The Rutgers Analysis useds non-standard nomenclature to define the economic impacts of the Project. As defined in the Rutgers study, indirect effects include spending of labor income ("induced effects" in standard I-O nomenclature), as well as purchases by suppliers ("indirect effects" in standard I-O nomenclature).[11]

Hence, the employment (job-years) estimates in the Rutgers Analysis, which are labelled as "Indirect" actually include both indirect and induced jobs. And the employment estimates labelled as "Total" (Direct + Indirect) actually include direct, indirect, and induced jobs. For comparability, the employment estimates shown in this report (notably in Table 1) adopt this same (i.e. Rutgers') nomenclature.

Transco estimates capital cost to construct the NESE project totaling $926.5 million (including expenditures both within and outside the tri-state area). The Rutgers Analysis assumes that $255.4 million (27.6%) of these expenditures would be made in the tri-

[10] Rutgers Analysis, p. 3 (italics in original):

> The R/ECON™ Input-Output (I-O) Model developed at the Bloustein School is used to measure the economic and fiscal impacts of infrastructure investments, business operations, and other economic events. The highly detailed model comprises 389 industry sectors and measures the effect of changes in expenditures in one industry on economic activity in all other industries. Thus, the expenditures made in *New Jersey, New York and Pennsylvania* on labor, materials, professional services, and other inputs required for pipeline expansion and enhancements as part of the Northeast Supply Enhancement Project have both *direct* economic effects, as those expenditures become incomes and revenues for workers and businesses, and subsequent *indirect* effects, as those workers and businesses, in turn, spend those dollars on other things – consumer goods, business investment expenditures, which, in turn, become income for other workers and businesses. This income gets further spent, and so on.
>
> The R/ECON™ Input-Output model estimates both the direct economic effects of the initial expenditures (in terms of jobs and income) and the indirect (or multiplier) effects of the subsequent economic activity that occurs following the initial expenditures.

As further explained in the Rutgers Analysis (pp. 40-41), the multiplier effect includes induced effects:

> The multiplier effect has three components—direct, indirect, and induced effects. Because of the pond analogy, it is also sometimes referred to as the *ripple effect*.
>
> - A *direct effect* (the initial drop causing the ripple effects) is the change in purchases due to a change in economic activity.
> - An *indirect effect* is the change in the purchases of suppliers to those economic activities directly experiencing change.
> - An *induced effect* is the change in consumer spending that is generated by changes in labor income within the region as a result of the direct and indirect effects of the economic activity.

See also footnote 9 for a more detailed generic explanation of the categories of effects considered by I-O models.

[11] See footnote 10, especially regarding Rutgers Analysis, pp. 40-41.

state area, with $184.7 million in New Jersey, $18.6 million in New York, and $52.1 million in Pennsylvania (Table 2).[12]

These Total Project In-State Construction and Related Expenditures ($255.4 million) were input to R/ECON (an I-O model) to estimate employment and other economic impacts from NESE Project construction. These In-State NESE expenditures (totaling $255.4 million) include $128.7 million (about half of the total) of Construction Labor Payroll paid to workers residing in the tri-state area (Table 2).[13] The other half of In-State Expenditures ($126.7 million) is mainly Material and Equipment ($93.7 million),[14] with the remaining $33.1 million including:

- Other Payments to Construction Companies (profit and overhead; $12.5 million);[15]
- Easement/Right of Way ($7.7 million); and
- Other (travel costs, consulting, permits and other miscellaneous; $12.9 million).

The Rutgers Analysis estimates that construction of the NESE Project will generate 3,186 job-years in the tri-state area, including 2,411 job-years in New Jersey (Table 1).[16] About 35% of these would be in the construction sector (1,120 job-years in the tri-state area, including 858 job-years in New Jersey):[17]

> The large job totals in the construction (1,120 job-years), manufacturing (298 job-years), and services (1,019 job-years) sectors include the direct construction labor and associated services required for the project, as well as additional

[12] Unless specifically identified as reference to a table from another source (e.g., DEIS, Table 4.8.9-1). references in this report to Tables are to Tables 1-4 provided in Section 1.1 of this report.

[13] Construction Labor Payroll includes all components of worker income, including fringes, insurance, and payroll taxes. More specifically, this is total worker compensation including wages, insurance, payroll taxes, and other fringe benefits and non-wage expenses paid by an employer on behalf of its employees (such as health insurance contributions, employer matching of Social Security, and Medicare taxes).

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. 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, and reimbursement for equipment rental and materials.

[14] See footnote 13.

[15] See footnote 13.

[16] DEIS, Table 4.8.9-1: "A job-year represents one worker employed for 1 year."
Rutgers Analysis, p. 4:

> Employment data are calculated and reported in job-years. One job-year is defined as one job lasting one year. Intuitively, this measurement captures the fact that construction jobs generate economic impacts, including employment, that persist mainly for the length of time that money is spent on the specific project.

[17] Rutgers Analysis, p. 7.

indirect employment. Significant indirect employment effects are also generated across a range of other sectors, including retail trade, transportation, financial activities and wholesaling.

Construction Labor Payroll expenditures are thus a key determinant of the Rutgers Analysis estimated employment, specifically for direct jobs. The Rutgers Analysis assumes a large amount of In-State Construction Labor Payroll ($128.7 million, or about half of all In-State Project Construction expenditures) and estimates a large number of construction jobs generated (1,120 job-years). Hence, the Rutgers Analysis estimates about 8.7 construction job-years per $1 million of Construction Labor Payroll and Construction Payroll of around $115,000 per construction job-year (Table 3).[18]

3.4 TGG Evaluation of the Rutgers Analysis

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

3.4.1 Employment Impacts from Building NESE Are Tiny, One-time and Temporary

Even if the Rutgers Analysis employment impact estimates were realistic (which they are not), employment impacts from the Project would be tiny in the context of the tri-state economies. The Rutgers Analysis estimates 2,411 total job-years (i.e. onsite and offsite) from Project construction in NJ, 276 total job-years in NY, and 499 total job-years in PA (Table 1).[19] Meanwhile, NJ has more than 4 million total jobs, NY has more than 9 million total jobs, and PA has more than 6 million total jobs.[20] Therefore, even with the Rutgers Analysis overstated estimates, the short-term employment benefits from building NESE are less than 0.06% of total state jobs in NJ and less than 0.01% of total state jobs in NY and PA.

Moreover, jobs related to building the Project are one-time and temporary, typically lasting less than 1 year. As explained in the Rutgers Analysis:[21]

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[18] 1120 construction job-years/$128.7 million Construction Labor Payroll=8.7 construction job-years per $1 million Construction Labor Payroll; $128.7 million/1120 construction job-years=$114,910 Construction Payroll per construction job-year.

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

[20] NJ has about 4.5 million workers and 4.3 million jobs; NY has about 9.7 million workers and 9.2 million jobs; PA has about 6.4 million workers and 6.1 million jobs. http://www.bls.gov/eag/eag.nj.htm http://www.bls.gov/eag/eag.ny.htm http://www.bls.gov/eag/eag.pa.htm

[21] Rutgers Analysis, p. 5. As also noted in the Rutgers Analysis (p. 4), "construction jobs generate economic impacts, including employment, that persist mainly for the length of time that money is spent on the specific project." See also footnote 16.

> Because these are one-time capital expenditures, the impacts occur only once. That is, most of the impacts, including additions to income, economic output and employment that result from the expenditures occur at the same time or shortly after the expenditures are made, and do not recur annually.

As explained in the FERC DEIS, actual construction and restoration would occur over a one-year period (first quarter 2019 to first quarter 2020) with activity and jobs concentrated into nine months or less (first quarter 2019 to December 1, 2019, the planned Project in-service date). Most of the employment impacts (total onsite and offsite/spinoff jobs) would take place during the same period.

As shown in the Transco Construction Workforce data, NESE facilities would have construction durations ranging from 5 to 10 months (Table 4). Hence, jobs related to building NESE (including both onsite construction jobs and offsite/spinoff jobs) would be short in duration (each typically lasting less than 1 year).

Even if the Rutgers Analysis employment impact estimates were realistic, employment impacts from the Project would be tiny in the context of the tri-state area economies. But the Rutgers Analysis employment impact estimates are not realistic. The following subsections (3.4.2, 3.4.3, and 3.4.4) examine how the Rutgers Analysis estimates for employment impacts related to Project construction are flawed and overstated. Hence, employment impacts of NESE Project construction would actually be very negligible and temporary in absolute terms, and even more so in the context of the tri-state area economies.

3.4.2 Direct Jobs and Spending Overstated

3.4.2.1 Inconsistent with Transco Construction Workforce Data

The Rutgers Analysis is inconsistent with the Construction Workforce data provided by Transco (and relied upon in the FERC DEIS). The Rutgers Analysis very substantially overestimates employment (job-years) and other economic impacts (GDP, compensation, and tax revenues) for New Jersey, New York, and the overall tri-state area (New Jersey, New York, and Pennsylvania).

The Rutgers Analysis estimates 1,120 construction sector job-years for the tri-state area, with 858 job-years (about 75%) in New Jersey (Table 1).

Based on the Transco Construction Workforce data, NESE would actually result in only about 230-350 direct on-site construction job-years for the local workforce, with only about 90-160 job-years (less than 50%) in New Jersey (Table 4).[22]

The TGG Analysis develops employment estimates which are consistent with the Transco Construction Workforce data. These TGG Analysis employment estimates are then compared with the Rutgers Analysis estimates (Table 1). This comparison is used to assess the Rutgers Analysis estimates and the extent to which the Rutgers employment estimates are overstated (Table 1: TGG Analysis (% of Rutgers Analysis)).

Based on the Transco Construction Workforce data, the TGG Analysis estimates about 230-350 direct on-site construction job-years for the tri-state area. This is only about 25% of the Rutgers Analysis estimate (1,120 construction job-years) (Table 1). Hence, the Rutgers Analysis overstates direct on-site construction job-years by about 75% (three-quarters).

The overstatement is even larger for New Jersey. Based on the Transco Construction Workforce data, the TGG Analysis estimates about 90-160 direct on-site construction job-years for New Jersey, which is only about 15% of the Rutgers Analysis estimate (858 construction job-years) (Table 1). Hence, the Rutgers Analysis overstates New Jersey direct on-site construction job-years by about 85%.

The large discrepancies between the Rutgers Analysis and the Transco Construction Workforce data was noted in FERC Data Request 35:[23]

> Direct employment numbers in the economic impacts study do not match the construction workforce numbers provided in table 5.2-3 of the June 6, 2017 supplemental filing. Rectify or clarify this apparent discrepancy. This may include the calculation used to determine the number of direct "job-years" from the workforce numbers provided.

[22] The Transco Construction Workforce data estimates Direct Onsite Construction jobs in terms of Maximum and Average Workforce, rather than job-years. To facilitate comparison of the Transco Workforce data and the Rutgers Analysis employment estimates (which are in terms of job-years), the TGG Analysis converts the Transco data into job-years. The specifics of this conversion are somewhat technical, so a more complete explanation is provided in the Technical Appendix (Section 6.1 and specifically Section 6.1.2). The key aspects of this conversion are as follows:

- the job-years estimated by TGG are a range to bracket uncertainty;
- for on-shore facilities, job-years are overall similar to the Transco Average Workforce;
- for the offshore Raritan Bay Loop, job years are a range between the Transco Average and Maximum Workforce.

[23] This footnote provides sources for this and the following paragraphs concerning this data request. Transco, Response to Data Request 35 dated July 21, 2017, August 10, 2017 https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14657647; Resource Report 5, March 2017, Tables 5-2-3 and 5-2-4 https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14531678

In response, Transco failed to provide a credible explanation reconciling the results from its economic impact analysis (particularly the 1,120 Construction Job-Years estimated by the Rutgers Analysis) with the estimates for construction jobs in the company's Construction Workforce data. Transco's response claims that these discrepancies relate to updating of the company's Construction Workforce data submitted on June 6, 2017. In fact, there are similar discrepancies between the Rutgers Analysis and the Construction Workforce data originally submitted by Transco.

As will be further explained in Sections 3.4.2.2 and 3.4.2.3, these significant discrepancies are actually due to fundamental flaws in the Rutgers Analysis.

The FERC DEIS has failed to address these significant discrepancies. Instead, in various locations, the FERC DEIS just restates and relies upon the inconsistent information from both the Rutgers Analysis and the Transco Construction Workforce data.

Based on the Rutgers Analysis, the FERC DEIS concludes that the NESE Project would benefit the state and local economies:

> Overall, the Project would result in beneficial economic effects on the state and local economies by creating a short-term stimulus to the affected areas through payroll expenditures, local purchases of consumables and project-specific materials, and sales tax.[24]

But based on the Transco Construction Workforce data, the FERC DEIS concludes that any employment impacts of NESE Project construction (specifically on unemployment rates) would be negligible and temporary:

> Transco estimates that 345 construction workers would be local hires. This would result in a negligible and temporary reduction in the unemployment rates in the Project area for the duration of construction.[25]
>
> […]
>
> Construction of the Project would result in a temporary minor increase in employment during construction, including both local and non-local hires. […] the unemployment rate may decrease, but this too would be temporary […][26]

[24] DEIS, p. 4-259.
[25] DEIS, p. 4-243.
[26] DEIS, p. 4-355.

The FERC DEIS relies upon inconsistent information from the Rutgers Analysis and Transco Construction Workforce data. In turn, DEIS conclusions are inconsistent regarding NESE Project economic impacts. These conclusions are neither well explained, nor well supported.

3.4.2.2 In-State Share of Project Jobs and Spending Overstated

The Rutgers study estimates that 60% of the construction payroll would be paid to workers from the tri-state area. But based on the Transco Construction Workforce data, only about 40% of overall workers (Direct Onsite Construction Labor) would be local hires; about 60% would be non-local/transient workers.[27] Thus, the Rutgers Analysis substantially overestimates the impacts of the Project on direct employment in the tri-state area.

Moreover, based on the Construction Workforce data from Transco, only about 30% of the overall construction payroll would be paid to workers from the tri-state area. Thus, the Rutgers Analysis very substantially overestimates the Project spending in the tri-state area.

The Rutgers Analysis is based on an assumption (provided by Transco) of "approximately 60% of construction labor estimated to be drawn within the region." [28] Likewise, in DEIS Table 4.8.9-2 ("Source: Rutgers, 2017"), 60% of total construction payroll is estimated to be in-state (paid to workers living within the tri-state area), [29] for each facility comprising NESE, including:

- onshore pipeline loops (Madison, Quarryville) 60% in-state, 40% out-of-state
- onshore compressor stations (200, 206) 60% in-state, 40% out-of-state
- offshore pipeline loop (Raritan Bay) 60% in-state, 40% out-of-state.

Hence, out of a total construction payroll of $214.5 million for all facilities, $128.7 million (60%) is estimated to be in-state.

[27] The Transco Construction Workforce data divides the Workforce into "Local" and "Transient," and the FERC DEIS uses the nomenclature "Local" and "Non-Local." Non-local/Transient workers are part of a highly skilled, specialized national transient workforce that sequentially relocates to construct pipelines. See also footnote 42.
[28] Rutgers Analysis, pp. 1, 4.
[29] DEIS, p. 4-259: "Table 4.8.9-2 identifies the estimated in-state and total construction payroll and material and equipment expenditures expected to take place during Project construction. Transco estimates that 60 percent of construction payroll would be paid to workers living within the tri-state area"

Meanwhile, the Transco Construction Workforce data (cited in the DEIS) estimates that the share of local hires will vary substantially depending on type of facility, ranging from 65% down to only 10-20% (Table 4):

- onshore pipeline loops (Madison, Quarryville) 65% local, 35% non-local[30]
- onshore compressor stations (200, 206) 30% local, 70% non-local[31]
- offshore pipeline loop (Raritan Bay)[32] 10-20% local, 80-90% non-local.[33]

Based on the Transco Construction Workforce data, only 38-45% of overall workers (Direct Onsite Construction Labor) would be local hires, and the remainder would be non-local/transient (Table 4).

And only 26-32% of total Construction Payroll would be paid to local hires (Table 2).[34] Hence, the share of overall construction payroll paid to local hires (26-32%, or about 30%) is lower than the share of overall construction jobs for local hires (38-45%, or about 40%).

As will be examined in Section 3.4.2.3 and Table 3, workers on the NESE facilities with a high local hire share (notably onshore pipeline loops, with a 65% local share) are not as highly paid as the more specialized workers on facilities with a low local hire share (compressor stations with a 30% local share and especially the offshore Raritan Bay Loop with a 10-20% local share). Hence, based on the Transco Construction Workforce

[30] Transco, Resource Report 5, March 2017, pp. 5-9—5-10; Supplemental Information to Resource Report 5, June 2017, p 5-2 https://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=14608800: DEIS, Table 4.8.2-4 (p. 4-242).

[31] See footnote 30.

[32] Except for 0.2 miles onshore in NJ, the Raritan Bay Loop (23.5 total miles) is offshore (23.3 miles). Workforce data includes both the offshore and onshore portions. DEIS, Table 4.8.2-3 (p. 4-242):

> The construction workforce for the onshore portion of the Raritan Bay Loop has been included in the workforce numbers for the offshore portion of the Raritan Bay Loop. The onshore and offshore portions of this pipeline loop would be built as a single facility, based out of a contractor yard in Elizabeth City, New Jersey.

[33] Transco, Resource Report 5, March 2017, p. 5-10: "Approximately 10%-20% of the offshore workers are expected to be hired from the Project area." The DEIS fails to provide this range (10-20%), and instead states that Transco expects that 20% of offshore workers would local hires. DEIS p. 2-52:

> Transco expects to use […] up to 300 workers for the offshore construction. Of this total, Transco expects that approximately […] 60 (20 percent) of the offshore workers would be local hires.

[34] In Table 2, TGG Analysis adjusts Rutgers Analysis Construction Payroll for each facility based on local hire share (notably, the ratio of Transco Workforce Data local hire % [10% to 65%, depending upon facility, as shown in Table 4] to 60% [the in-state share assumed in Rutgers Analysis for all facilities]). As explained in the Technical Appendix (Section 6.2), Table 2 also allocates the Raritan Bay Loop Construction Payroll 87.5% to New Jersey and 12.5% to New York; the data reported in the FERC DEIS is based on an allocation of 85% to New Jersey and 15% to New York.

data, about 40% of overall direct construction labor (jobs) would be local hires, but only about 30% of overall Construction Payroll (dollars) would be paid to local hires.

3.4.2.3 Direct Jobs per Dollar Spent Overstated

The Rutgers Analysis uses R/ECON (an input-output (I-O) model) to estimate impacts on employment (and other economic effects).[35] For pipeline projects such as NESE, 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 typically grouped together with many other types of construction.[36] But compared with other types of construction, pipeline projects, and especially projects like NESE, are very specialized, distinctive, and atypical; pipelines result in fewer jobs per dollar spent, but the jobs onsite can be very highly paid.[37]

Simply put, construction labor expenditures on pipeline projects result in a small number of highly-paid Direct Onsite Construction Jobs. However, if pipeline construction labor expenditures are input into an I-O model with a more generic construction sector, the model will estimate a higher number of lower-paid construction jobs (relative to the lower number of higher-paid construction jobs resulting from a typical pipeline project).

The Transco Construction Workforce data are not based on the Rutgers Analysis Input-Output modeling. Instead, Transco estimates Direct Onsite Construction Jobs based on

[35] See footnote 10 for more information on R/ECON and how it was used to estimate impacts for NESE.
[36] The R/ECON model has 383 sectors, but model documentation is not provided on the R/ECON website. The Rutgers Analysis (pp. 44-45) includes a comparison of R/ECON and the IMPLAN I-O model. In the IMPLAN I-O model with 536 sectors, 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). The R/ECON model has 383 sectors, but model documentation is not provided on the R/ECON website.
http://recon.rutgers.edu/recon-i-o-an-economic-impact-model
https://implanhelp.zendesk.com/hc/en-us/articles/115002997573-536-Sectoring-Scheme
https://implanhelp.zendesk.com/hc/article_attachments/115003724594/Construction_Sector_Descriptions_536.xls
[37] For pipeline construction and especially for NESE, payroll costs per worker can be very high, owing to the combination of high hourly wages, long workweeks, and high costs for fringes, insurance and payroll taxes. NESE is a large diameter, high-pressure gas pipeline project. Pipeline construction for projects such as NESE 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 very long workweek. As further discussed in footnote 42, the workweek for NESE would be especially long, with up to 12 hours/day, 6 days/week for onshore workers and 30 days on, 2 weeks off for offshore workers. The construction duration data in Table 4 further reinforces the very short-term nature and the condensed schedule of the NESE construction work.

the extensive process required to develop a pipeline project. This process includes design, engineering, costing, and determining how many workers will be needed at various times throughout the construction period. Companies developing pipeline projects typically provide detailed estimates of Direct Onsite Construction jobs as part of their submissions to FERC. These estimates of Direct Onsite Construction Jobs based on the extensive project development process are generally more accurate than estimates based on input-output modeling.[38]

Consequently, TGG typically gives more weight to detailed estimates of Direct Onsite Construction jobs provided by a pipeline project developer, compared with estimates based on input-output modeling. TGG also uses detailed estimates of Direct Onsite Construction jobs as a reality check to ascertain the realism of I-O modeling estimates.

The Rutgers study estimates that In-State Construction Payroll averages about $115,000 per construction job-year, which is about 8.7 construction job-years per $1 million of Construction Labor Payroll (Table 3).[39]

But based on the Transco Construction Workforce data, Construction Payroll would average about $200,000-236,000 per Construction Job-Year for local hires, which is only about 4.2-5.0 construction job-years per $1 million of Construction Labor Payroll (Table 3).

Moreover, based on the Transco Construction Workforce data, payroll rates vary widely depending on type of facility. Payroll dollars per job-year are lowest for on-shore pipeline loops, higher for compressor stations, and extremely high for the offshore Raritan Bay Loop (Table 3). Likewise, job-years per Payroll dollar are highest for on-shore pipeline loops, lower for compressor stations, and extremely low for the offshore Raritan Bay Loop (Table 3). For the Raritan Bay Loop, payroll dollars per job year would be around $500,000, which is only about 2.0 construction job-years per $1 million of Construction Labor Payroll.[40]

[38] Likewise, Direct Onsite Construction jobs are easier to measure than offsite jobs. As discussed in Section 3.2, 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.
[39] The Rutgers Analysis estimates about $96k compensation per Direct job-year (Table 3). This is based on Direct tri-state area Compensation of $124.2 million/1298 job-years Direct tri-state area Employment ≅ $96,000/job-year. These estimates are for all direct employment (1298 job-years), but are mainly for the construction sector (1120 job-years).
[40] Payroll per job-year is estimated to be in the order of $500k, based on a range of around $450-600k depending upon the conversion of jobs into job-years. Table 3, Table 4, Section 6.1.2.

In turn, this wide variation in payroll rates by type of facility results in a wide variation by state.

In Pennsylvania, Construction Payroll expenditures would be mainly for the Quarryville Loop, with a much smaller spend to expand Compressor Station 200 (Table 2). This mix of facilities results in payroll rates that are overall similar in both the TGG Analysis (based on the Transco Construction Workforce data) and the Rutgers Analysis. Put another way and more simply, the Rutgers Analysis assumptions and estimates appear to be overall realistic for the NESE Project in Pennsylvania.

But in New Jersey, the Rutgers Analysis assumptions and estimates are not realistic. Compared with the facility mix in Pennsylvania, New Jersey has relatively less spending on the onshore pipeline loop (Madison) and relatively more spending to build a new compressor station (206).

However, the most important difference is that much of the spending in New Jersey is for the offshore Raritan Bay Loop. As noted above, Payroll dollars per job-year are extremely high for the Raritan Bay Loop, and job-years per Payroll dollar are extremely low (Table 3).

The Raritan Bay Loop is a particularly specialized and costly type of pipeline construction, requiring a small number of extremely well-paid workers, most of whom would be non-local. The Rutgers Analysis does not produce realistic results for this type of pipeline construction. And with much of the NESE Project spending in New Jersey for the offshore Raritan Bay Loop, the Rutgers Analysis does not produce realistic results for the NESE Project in New Jersey (Table 2, Table 3).

Likewise, the Rutgers Analysis does not produce realistic results for the NESE Project in New York, since all of the NESE Project spend in New York is for offshore Raritan Bay Loop (Table 2, Table 3).

Finally, as noted in Section 3.4.2.2, based on the Transco Construction Workforce data, about 40% of overall direct construction labor (jobs) would be local hires, but only about 30% of overall Construction Payroll (dollars) would be paid to local hires (Table 2, Table 4). The key factor explaining this difference is that the Raritan Bay Loop has both extremely high Construction Payroll dollars per job-year (around $500,000) and extremely low share of local hires (10-20%). Put more simply, the small number of jobs building the Raritan Bay Loop would be very well paid, and most of these very well-paid jobs would go to non-local/transient workers.

3.4.3 Indirect Jobs and Spending Overstated

As a result of overestimating the Project impacts on In-State Direct expenditures and Employment, the Rutgers Analysis also overestimates the impacts on In-State Indirect Employment (and other economic effects).

As explained in Section 3.3, the Rutgers Analysis defines indirect effects to include spending of labor income ("induced effects" in standard I-O nomenclature), as well as purchases by suppliers ("indirect effects" in standard I-O nomenclature).[41] Direct NESE Project expenditures (notably for construction labor) are estimated to result in labor income, much of which is then spent in-state (notably for consumer goods), generating indirect jobs in a wide variety of sectors (including retail trade, Financial Activities, and services).

As explained in Section 3.4.2.2, the Rutgers Analysis estimates that 60% of the construction payroll would be paid to workers living in the tri-state area. But based on the Transco Construction Workforce data, only about 30% would be paid to local workers (Table 2).

And since the local share of the construction payroll is overestimated, the amount of local spending (notably for consumer goods) is also overestimated, resulting in an overestimate of indirect employment (and other economic effects).[42]

The Rutgers Analysis estimates 1,889 indirect job-years for the tri-state area, with 1,427 in New Jersey (Table 1). The TGG Analysis estimates that NESE would actually result in only about 1,100-1,570 indirect job-years for the tri-state area, with only about 760-1,160 in New Jersey (Table 1). Hence, the Rutgers Analysis overstates indirect job-years by about 17-47% for the tri-state area and New Jersey.

As more fully explained in the Technical Appendix (Section 6.3), the TGG Analysis estimates a relatively wide range for indirect job-years, in order to bracket the large

[41] See footnote 10.

[42] Especially for the NESE Project, little if any of the construction payroll for non-local (transient) workers will be spent locally (within the tri-state area). Non-local workers are part of a highly skilled, specialized national transient workforce that sequentially relocates to construct pipelines. Non-local onshore workers would typically have a very long workweek (being on-site 7 AM-7 PM, Monday-Saturday, so up to 12 hours per day, 6 days per week), will not be bringing their families and dependents, and will leave the area once their work on the Project is completed. Non-local workers on the offshore loop would typically live on an offshore vessel during extended construction shifts (30 days on); during breaks (2 weeks off), these workers would return home, flying or driving with little time (and money spent) on-shore within local communities and tri-state area. DEIS, p. 2-32, 2-52, 4-200, 4-238—4-239, 4-243, 4-251, 4-287; Resource Report 5, May 2017, pp. 5-10, 5-12, 5-42—5-43.

uncertainties regarding these employment impacts for the NESE Project. But as further explored in Section 3.4.4, employment impacts will tend to be at the lower end of the range for NESE, given a context of tighter labor market conditions. Hence, it is realistic to assume NESE construction would actually result in employment impacts that are at (or below) the lower end of the estimated range for indirect job-years.

3.4.4 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, New York 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 for employment impacts from spending of labor income in a tight economy. Impacts from spending of labor income are typically the most challenging to meaningfully model, and they are especially difficult to meaningfully model in a context of tighter labor market conditions.

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.

Given a context of tighter labor market conditions, employment impacts will tend to be at the lower end of the range for NESE. Hence, it is realistic to assume NESE construction would actually result in employment impacts that are at (or below) the lower end of the estimated range for direct, indirect, and total job-years.

3.4.5 Total Jobs Overstated

Including direct construction, other direct, and indirect job-years, the Rutgers Analysis estimates 3,186 total job-years for the tri-state area, with 2,411 (about 75%) in New Jersey (Table 1). Based on the Transco Construction Workforce data, the TGG Analysis estimates that NESE would actually result in only about 1,500-2,100 total job-years for

the tri-state area, with only about 980-1,450 (about two-thirds) in New Jersey (Table 1). Hence, the Rutgers Analysis has overstated Total Jobs, for the tri-state area by approximately one-third to one-half, and for New Jersey by approximately 40-60%.

The Rutgers Analysis estimates 276 Total Job-Years in New York and 499 Total Job-Years in Pennsylvania (Table 1). TGG estimates that the Rutgers Analysis has overstated Total Jobs in New York by approximately 45-70%, with little or no overstatement of Total Jobs in Pennsylvania.

As was discussed in Section 3.4.2.3 in relation to direct jobs, the divergent results by state for total jobs stems from the differing results by type of facility, together with the differing mix of facilities by state.

For onshore pipeline loops (Madison and Quarryville), total in-state employment estimated by the TGG Analysis (based on the Transco Construction Workforce data) is similar to (or somewhat higher) than employment estimated by the Rutgers Analysis (Table 1). This reflects the following for the TGG Analysis:

- share of local workers based on the Transco data (65%) is similar to (and somewhat higher) than the share of in-state workers assumed in the Rutgers Analysis (60%) (Table 1, Table 4);
- in-state construction payroll is similar to (and somewhat higher) than the payroll in the Rutgers Analysis (Table 2),
- construction payroll rates (job-years per dollar and dollars per job-year) are roughly similar to those in the Rutgers Analysis (Table 3),[43] and
- indirect jobs are also similar to (and somewhat higher) than in the Rutgers Analysis (Table 1).

For compressor stations (200 and 206), in-state employment estimated by the TGG Analysis (based on the Transco Construction Workforce data) is about 35-44% lower than employment estimated by the Rutgers Analysis. This reflects the following for the TGG Analysis:

- share of local workers based on the Transco data (30%) is only one-half the share of in-state workers assumed in the Rutgers Analysis (60%) (Table 1, Table 4);
- in-state construction payroll is only one-half the payroll in the Rutgers Analysis (Table 2);
- job-years per construction payroll dollar are about half (and payroll dollars per job

[43] More specifically, one end of the range of rates estimated in the TGG Analysis is similar to what is estimated in the Rutgers Analysis.

year about double) those in the Rutgers Analysis (Table 3); and
- indirect jobs are about 15-30% lower than in the Rutgers Analysis (Table 1).

For the offshore Raritan Bay loop, total in-state employment estimated by the TGG Analysis (based on the Transco Construction Workforce data) is about 48-70% lower than employment estimated by the Rutgers Analysis. This reflects the following for the TGG Analysis:

- share of local workers based on the Transco data (10-20%) is only one-sixth to one-third the share of in-state workers assumed in the Rutgers Analysis (60%) (Table 1, Table 4);
- in-state construction payroll is only one-sixth to one-third the payroll in the Rutgers Analysis (Table 2);
- job-years per construction payroll dollar are about 17-24% (one-sixth to one-fourth, and payroll dollars per job year about 4 to 6 times) those in the Rutgers Analysis (Table 3);
- indirect jobs are about 25-60% lower than in the Rutgers Analysis (Table 1).

In turn, this wide variation in payroll rates by type of facility results in a wide variation by state.

In Pennsylvania, construction expenditures would be mainly for the Quarryville Loop, with a much smaller spend to expand Compressor Station 200 (Table 2). This mix of facilities results in total jobs that are overall similar in both the TGG Analysis (based on the Transco Construction Workforce data) and the Rutgers Analysis. Compared with the Rutgers Analysis, the TGG Analysis estimates somewhat more jobs for the Quarryville Loop, but this is offset by estimating somewhat less jobs for Compressor Station 200. Put another way and more simply, the Rutgers Analysis assumptions and estimates appear to be overall realistic for the NESE Project in Pennsylvania.

But in New Jersey, the Rutgers Analysis assumptions and estimates are not realistic. Compared with the facility mix in Pennsylvania, New Jersey has relatively less spending on the onshore pipeline loop (Madison) and relatively more spending to build a new compressor station (206). However, the most important difference is that much of the spending in New Jersey is for the offshore Raritan Bay Loop.

The Rutgers Analysis greatly overstates New Jersey total jobs, for the Raritan Bay Loop by about 50-70%, and for the overall NESE Project facilities by about 40-60% (Table 1). In effect, the Rutgers Analysis estimates employment for the Raritan Bay Loop as if it is a more generic form of pipeline construction. This approach may produce results that

are overall reasonable for the NESE facilities that are more generic, notably the onshore facilities in Pennsylvania. But for the Raritan Bay Loop, and more generally for the NESE Project in New Jersey, the Rutgers Analysis produces estimates that are flawed and greatly inflated.

Likewise, the Rutgers Analysis produces estimates that are flawed and greatly inflated for New York, based on the results for the Raritan Bay Loop, which is the only NESE facility in New York (Table 1).

4 Ongoing Annual Economic Impacts

4.1 Introduction

As explained in Section 3.2, NESE (and other projects) generate economic impacts, including employment, from two types of activities:

- Construction (and Related) Expenditures, and
- Operations and Maintenance Expenditures.

Employment impacts related to Construction Expenditures are the employment impacts related to capital investment to construct the pipeline. Put more simply, these are the temporary jobs related to the construction of the Project.

These temporary jobs, which represent the majority of the jobs relating to the Project expenditures, have been discussed at length in Section 3. The Rutgers Analysis provides estimates of these temporary jobs (including spin-offs). Transco separately provided Construction Workforce data, which estimates the temporary jobs for the construction workforce (Direct Onsite Construction Labor).

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 NESE goes into service.[44] These "permanent" jobs are long-term annual jobs that last over the lifetime of the Project.[45]

These "permanent" jobs are typically small for pipelines, and they are especially tiny for the NESE Project. The Rutgers Analysis does not estimate permanent jobs, but Transco provided estimates of the "permanent" jobs for the operations and maintenance workforce (Direct Onsite Operations Labor).

Transco also provided estimates of property taxes and submerged easement fees that would be paid annually over the lifetime of the Project in New Jersey, New York, and Pennsylvania. These estimates were included in the Rutgers Analysis.

[44] 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.
[45] Natural gas pipeline projects are typically designed and operated to remain in-service for 30 years or more.

4.2 Transco and Rutgers Analysis Estimates

Transco estimated that NESE would result in 2 jobs for the new Compressor Station 206 in New Jersey; other Transco staff would absorb the remainder of the operational and maintenance workload internally, so there would be no other increase in the operations and maintenance workforce (Direct Onsite Operations Labor).[46]

Transco estimated the following property taxes and submerged land easement fees would be paid annually over the lifetime of the Project:[47]

Property Taxes	
New Jersey	$ 1.025 million[48]
New York	$ 0[49]
Pennsylvania	$ 0[50]
Submerged Land Easement Fees	
New Jersey	$ 0.275 million[51]
New York	$ 9.800 million[52]
Totals:	
New Jersey	$ 1.300 million
New York	$ 9.800 million
Tri-State Area (NJ+NY+PA)	$11.000 million

[46] DEIS, p. 4-243, 4-355; Transco, Supplemental Information to Resource Report 5, June 2017, p 5-4:
During the operation phase of the Project, two new workers will be hired to operate and maintain Compressor Station 206; Transco staff will absorb the remainder of the operational and maintenance workload internally.

[47] See footnote 50 for sources.

[48] Madison Loop: $250k Old Bridge Township+$225k Sayreville Borough=$475k Middlesex County; Raritan Bay Loop: $525k Old Bridge; Compressor Station 206: $25k Franklin Township, Somerset County.

[49] The only NESE facility within NY is the offshore Raritan Bay Loop that is subject to Submerged Land Easement Fees, rather than property taxes.

[50] According to Transco, no property taxes would be paid in Pennsylvania relating to NESE. DEIS, p. 4-260; Transco, Supplemental Information to Resource Report 5, June 2017, pp. 5-7—5-8:
In Pennsylvania, however, the underground portions of natural gas transmission pipelines are exempt from relevant property taxes (i.e., the Public Utility Realty Tax and Realty Transfer Tax assessed in Pennsylvania jurisdictions). Local Pennsylvania taxing entities may tax aboveground facilities, but taxes in Chester County assessed on the expansion of Compressor Station 200 are considered negligible and have not been included.

[51] Raritan Bay Loop (New Jersey Waters): submerged land easement fees paid to State of New Jersey.

[52] Raritan Bay Loop (New York Waters): submerged land easement fees paid to State of New York.

These estimates were provided by Transco to Rutgers, and the Rutgers Analysis includes estimates of the property taxes (and submerged easement fees) that would be paid annually over the lifetime of the Project in New Jersey and New York.[53]

4.3 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. Pipeline operations result in very small expenditures and have very little positive impact on the economy.

4.3.1 "Permanent" Jobs

Even compared with other pipelines, the employment impacts from ongoing activities to operate and maintain the NESE Project are especially tiny.

The only increase in the operations and maintenance workforce (Direct Onsite Operations Labor) would be 2 jobs for Compressor Station 206, the new compressor station in New Jersey. Other Transco staff would absorb the remainder of the operational and maintenance workload internally, so there would be no other increase in the operations and maintenance workforce (Direct Onsite Operations Labor).[54]

The NESE Project will be operated by Transco/Williams that operates large pipeline networks in the Northeast and elsewhere. Moreover, NESE includes substantial components, which involve the expansion/modifications of existing facilities (notably, pipeline loops along existing right-of-ways and additional compression at an existing compressor station). Thus, Transco/Williams benefits from economies of scale and scope, such as being able to share employees, contractors, and other inputs between NESE and other operations of the pipeline company. Also, as part of a large pipeline system, based in and operated from Texas, some of the job impacts from NESE may be outside of the tri-state area where the project is located.

The employment impacts from ongoing activities to operate and maintain the NESE Project are infinitesimally small, especially in the context of the New Jersey and tri-state

[53] Rutgers Analysis, pp. 4, 11, 14, 17, 20, 32.
[54] DEIS, p. 4-243, 4-355; Transco, Supplemental Information to Resource Report 5, June 2017, p 5-4 During the operation phase of the Project, two new workers will be hired to operate and maintain Compressor Station 206; Transco staff will absorb the remainder of the operational and maintenance workload internally.

area economies: 2 jobs in New Jersey or less than 0.00005% of total state jobs, and no jobs in New York or Pennsylvania.[55]

As concluded in the FERC DEIS, the addition of 2 permanent jobs is insignificant in terms of economic benefits:[56]

> According to Transco, operation of the Project would result in two new permanent hires to operate and maintain Compressor Station 206. Regardless of whether the hires are local or non-local, the addition of two permanent jobs would be […] insignificant on socioeconomics and related resources.

In addition to Direct Onsite Operating Labor, the Project could result in some other offsite/spin-off jobs.

The R/ECON Input-Output model used in the Rutgers Analysis to estimate temporary jobs (including spin-offs) could have also have been used to estimate "permanent" jobs (including spin-offs). But "permanent" jobs were not considered in the Rutgers Analysis. The Rutgers Analysis was prepared for Transco and specifically for submission to FERC. Transco may have deemed that impacts relating to "permanent" jobs (including spin-offs) were too small to warrant additional analysis.[57]

Other recent studies for Northeastern US pipeline projects (notably those involving Transco) have estimated that (a) permanent jobs (including spin-offs) are tiny (e.g. less than 30), even for projects involving substantial greenfield facilities (notably, pipelines on new right-of-ways and new compressor stations); and (b) offsite/spin-off jobs are similar in number to the operations and maintenance workforce (Direct Onsite Operations Labor), i.e., about 1 offsite/spin-off job for every direct onsite job.[58] On this basis, there would be only about 5 NESE "permanent" jobs (including spin-offs).[59]

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[55] NJ has about 4.5 million workers and 4.3 million jobs, and the economies in PA and especially NY are even larger. See footnote 20.

[56] DEIS, p. 4-355.

[57] The Rutgers Analysis was prepared for Transco and specifically for submission to FERC.

[58] As explained in footnote 5, the TGG PennEast Report reviewed numerous recent job analyses for Northeastern US pipeline projects, including the Atlantic Sunrise and Constitution Projects involving Transco/Williams. As noted in the TGG PennEast Report (p. 37, see also Appendix B of that report):

> 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.

[59] For example, even assuming a multiplier of 1.5 offsite/spin-off jobs for every direct onsite job, NESE would result in only 2 jobs onsite + 3 offsite/spin-off jobs = 5 "permanent" jobs (including spin-offs).

But even if NESE resulted in a very large number of offsite/spin-offs jobs for every direct on-site job in New Jersey, there would still be only a very small number (e.g. less than 30) total permanent jobs (including spin-offs).[60]

Thus, TGG concludes that permanent jobs (including spin-offs) for NESE are infinitesimally small, especially in the context of the New Jersey and tri-state area economies

4.3.2 Property Taxes and Submerged Land Easement Fees

The FERC DEIS identifies property taxes and submerged land easement fees as long-term benefits to counties and localities in New York and New Jersey:[61]

> operation of the Project would result in long-term property tax and submerged land easement fee benefits in the counties and localities in New Jersey and New York in the Project area.

The property taxes related to the NESE Project are tiny, especially in the context of New Jersey and the tri-state areas: about $1 million in New Jersey or less than 0.004% of total state property taxes, and no property taxes in New York or Pennsylvania.[62] Likewise, the submerged land easement fees are quite small, especially in New Jersey and the statewide context: fees of $275,000 paid to State of New Jersey and $9.8 million paid to the State of New York.

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[60] For example, even assuming a very large multiplier (13 offsite/spin-off jobs for every direct onsite job), NESE would still result in only 2 jobs onsite + 26 offsite/spin-off jobs = 28 "permanent" jobs (including spin-offs).

[61] DEIS, p. 4-260.

[62] Total property taxes (County+School+Municipal) in New Jersey were more than $28.83 billion in 2017. The property taxes relating to NESE would be tiny even in the context of the specific counties where taxes would be paid:

- $1.0 million NESE taxes in Middlesex County (Old Bridge Township+Sayreville Borough) is less than 0.040% of total property taxes in Middlesex County ($2.57 billion in 2017); and
- $25k NESE Taxes in Somerset County (Franklin Township) is less than 0.002% of total property taxes in Somerset County ($1.30 billion in 2017).

Likewise, the property taxes relating to NESE would be very small even in the context of the specific localities where taxes would be paid:

- $775k NESE taxes in Old Bridge Township is less than 0.480% of total property taxes ($163.6 million in 2017);
- $225k NESE taxes in Sayreville Borough is less than 0.200% of total property taxes ($114.8 million in 2017); and
- $25k NESE taxes in Franklin Township is about 0.010% of total property taxes ($215.1 million in 2017).

Source of 2017 NJ Property Tax data: 2017 Property Tax Information (as of January 31, 2018), New Jersey Department of Community Affairs, Local Government Services
http://www.state.nj.us/dca/divisions/dlgs/resources/property_docs/17_data/17taxes.xls

It should also be noted that that increased revenues from property taxes (and submerged lands fees) relating to Project operations can be accompanied by increased costs to provide services and other adverse impacts relating to Project operations (including both routine operations and potential accidents).[63] Given the costs, risks and adverse impacts relating to Project operations, the tiny revenues from property taxes (and submerged land easements) would result in even less net benefit to the tri-state area. And with only $1.3 million in property taxes and submerged land fees annually in New Jersey and no revenues in Pennsylvania, there would be especially little (if any) ongoing benefits from NESE operations to offset any ongoing potential costs, risks and adverse impacts.

[63] Put another way, property taxes can be viewed as a fee for services, albeit a fee that may not be closely matched to the cost of services for individual taxpayers.

5 Conclusions

TGG concludes that the Rutgers Analysis has significantly overstated the Total Jobs from building the Northeast Supply Enhancement Project (NESE). (Table 1, Section 3.4.5).

The Rutgers Analysis estimates 2,411 Total Job-Years in New Jersey. TGG concludes that **the Rutgers Analysis has overstated these Total Jobs by approximately 40-60%.**

The Rutgers Analysis estimates 276 Total Job-Years in New York and 499 Total Job-Years in Pennsylvania. TGG concludes that **the Rutgers Analysis has overstated Total Jobs in New York by approximately 45-70%, with little or no overstatement of Total Jobs in Pennsylvania.**

For the tri-state area (New Jersey, New York and Pennsylvania), the Rutgers Analysis estimates 3,186 Total Job-Years. TGG concludes that **the Rutgers Analysis has overstated these Total Jobs by approximately one-third to one-half**, and greatly overstated Construction Jobs (**by approximately 70-80%**).

The Rutgers Analysis estimates of Total Jobs include both onsite construction workers and a wide variety of offsite jobs (spin-offs throughout the supply chain and economy). (Sections 3.3 and 3.4.2.1)

For the construction sector, the Rutgers Analysis estimates 858 Job-Years in New Jersey, 96 Job-Years in New York, and 166 Job-Years in Pennsylvania. TGG concludes that **the Rutgers Analysis has overstated these Construction Jobs by approximately 80-90% in New Jersey and New York, with little or no overstatement in Pennsylvania.**

For the tri-state area, the Rutgers Analysis estimates 1,120 Job-Years in the construction sector. TGG concludes that **the Rutgers Analysis has overstated these Construction Jobs by approximately 70-80%.**

For indirect (offsite) jobs, the Rutgers Analysis estimates 1,889 job-years for the tri-state area, including 1,427 Job-Years in New Jersey. TGG concludes that **the Rutgers Analysis has overstated these Indirect Jobs by approximately 17-47%.**

TGG's concludes that the Rutgers Analysis has significantly overstated jobs from building NESE, based on the following:

- our evaluation of the Rutgers Analysis and the significant discrepancies with

Transco Construction Workforce data (Section 3);

- Transco's failure to provide a credible explanation reconciling the Rutgers Analysis job estimates with the Construction Workforce data (Section 3.4.2.1);
- Rutgers Analysis overstatement of in-state share of direct jobs and spending (Rutgers Analysis assumes 60% of NESE construction workers reside in-state; Transco Construction Workforce data estimates only about 40% local hires) (Section 3.4.2.2);
- Rutgers Analysis failure to provide reliable results for specialized pipeline construction, and especially for the offshore Raritan Bay Loop (Section 3.4.2.3);
- Rutgers Analysis overstatement of indirect jobs and spending (resulting from Rutgers Analysis overstatement of in-state direct jobs and spending) (Section 3.4.3);
- given a context of tighter labor market conditions, impacts from building NESE are likely to be at (or below) the lower end of the estimated range for direct, indirect, and total jobs (Section 3.4.4); and
- our extensive experience and expertise conducting and reviewing studies of employment and other impacts for pipelines and other energy-related activities. (Section 2.2)

As discussed in Section 3, there are significant discrepancies between the Direct Onsite Construction jobs estimated by the Rutgers Analysis (through input-output modelling) and the estimates of the Transco Construction Workforce data. The detailed estimates of Direct Onsite Construction Jobs in the Transco Construction Workforce data are based on the extensive project development process. These estimates are generally more accurate than estimates based on input-output modeling.

The FERC DEIS relies on inconsistent information from the Rutgers Analysis and Transco Construction Workforce data. In turn, DEIS conclusions are inconsistent regarding NESE Project economic impacts. These conclusions are neither well explained, nor well supported (Section 3.4.2.1).

The jobs from building NESE are one-time and temporary. Actual construction and restoration would occur over a one-year period (first quarter 2019 to first quarter 2020). Most of the employment impacts (total onsite and offsite jobs) would take place during the same period. (Section 3.4.1).

Employment impacts from ongoing activities to operate and maintain the pipeline and related facilities are tiny. According to Transco, annual jobs from operations are 2 in total (in New Jersey). **TGG concludes that pipeline operations result in very small expenditures (and employment impacts) and have very little positive impact on the economy, in New Jersey and elsewhere in the tri-state area.** (Section 4)

TGG concludes that even if the Rutgers Analysis' employment impact estimates were realistic, the impact of the Project on the tri-state area economies would be negligible in terms of employment impacts and property taxes. However, as demonstrated in this report, the Rutgers Analysis employment impact estimates are significantly overstated.

Therefore, the impact of NESE on the tri-state area economies is even more negligible than would be concluded based on the Rutgers Analysis estimates.

Hence, there would be little if any local benefits from the Project to offset any costs, risks, and adverse impacts from the Project. (Section 4.3.2)

The key findings of this report are summarized in Tables 1-4 in Section 1.1.

6 Technical Appendix: TGG Analysis of NESE Employment Impacts

6.1 Annualization of Job Estimates (Conversion into Job-Years)

This Section provides a general explanation of the annualization of job estimates as a best practice in employment impact studies (Section 6.1.1). This general explanation is followed by a more specific discussion of annualization of Direct Onsite Construction Labor for the NESE project (conversion of Transco Construction Workforce data into job-years) (Section 6.1.2).

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

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) job-years/person-years, (b) Full-Time Equivalents (FTEs), and (c) average annual jobs.

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 experience of best practices in employment impact studies, the annualization of job estimates is common in pipeline studies and allows for employment impacts to be compared. Job-years is used in the Rutgers Analysis for NESE, and Job-years/person-years and FTEs have been used in employment studies of other Northeastern US natural gas pipeline projects. The Average annual jobs measure was used by the US Department of State in its Final Supplementary Environmental Impact Statement (FSEIS) for Keystone XL.[64]

6.1.2 Annualization of Direct Onsite Construction Workforce for the NESE Project

For each facility comprising the NESE Project, Transco estimates construction duration (months) and Direct Onsite Construction Workforce in terms of both maximum and average workers (Table 4). TGG has reviewed this information carefully because this detail is important for the estimation of employment impacts.

[64] http://keystonepipeline-xl.state.gov/documents/organization/221186.pdf pp. 4.10-13-4.10-15.

As explained in the FERC DEIS, actual construction and restoration for the NESE Project would occur over a one-year period (first quarter 2019-first quarter 2020) with activity and jobs concentrated into nine months or less (first quarter 2019-December 1, 2019 Project in-service). Most of the employment impacts (total onsite and offsite/spinoff jobs) would take place during the same period.

A job-year is defined as one job lasting one year.[65] Construction duration ranges from 5-10 months for various NESE facilities (Table 4). For the overall mix of facilities, construction duration for the local Workforce averages around 7 months (Table 4).[66]

Thus, construction workers are typically employed for less than 1 year on NESE. For short duration projects such as NESE, the number of job-years would typically be less than the number of average workers. A typical conversion would be:

> Job-years =
> Average Workforce*Construction duration (months)/12 months per year

So for example, an Average workforce of 2 workers, with a construction duration of 6 months, would equal 1 job-year.

But as examined in Section 3.4.2.3, pipeline construction workers typically have very long workweeks and very high compensation per worker. The workweek for NESE would be especially long, with up to 12 hours/day, 6 days/week for onshore workers and 30 days on, 2 weeks off for offshore workers. And compensation would be especially high for NESE, notably for workers on compressor stations and particularly for the offshore Raritan Bay Loop.

Hence for NESE, it may be reasonable to assume a higher than usual number of job-years, relative to number of workers and duration. In particular, a job-year could be a high intensity job lasting for less than one year.

The TGG Analysis (notably in Table 4) converts the Transco Construction Workforce Data into job-years based on the following range:

> Job-years (lower estimate) =

[65] See footnote 16.

[66] Average Construction duration varies by state: 7.1 months in NJ; 9.0 months in NY; 7.2 months in PA; and 7.2 months in the tri-state area (Table 4). These averages are for the Local Workforce Job-Years (left-side [typically low end] of range), but averages are similar for other measures of Local Workforce. The facilities with a high local hire share (onshore pipeline loops, estimated to have 65% local workforce) have a shorter duration (5-7 months), compared with the facilities with a low local hire share (compressor stations and offshore pipeline loop, with 30% and 10-20% local share, respectively), which have a longer duration (9-10 months), Hence, Average Construction duration is higher for the Total Construction Workforce (around 7.8 months) and Non-Local Workforce (around 8.3 months).

Average Workforce*Construction Duration (months)/9 months per year

Job-years (higher estimate) =
Maximum Workforce (offshore/Raritan Bay Loop), or
Average Workforce (onshore/all facilities other than Raritan Bay Loop).

This range is intended to:

a) bracket the uncertainties regarding converting NESE Construction Workforce Data into job-years, and
b) be conservative (i.e. tend to overstate, rather than understate, employment impacts for the NESE Project).

This range estimates a number of job-years that typically brackets the Average Workforce (the number of average workers) for each onshore facility and overall (Table 4).

However, for the Raritan Bay Loop, with a construction duration of 9 months, the range of job-years estimated by the TGG Analysis is Average Workforce to Maximum Workforce. This offshore facility has a particularly high intensity of work (30 days on, 2 weeks off) and compensation per worker. Hence, particularly for the offshore Raritan Bay Loop, it may be reasonable to assume a higher than usual number of job-years, relative to number of workers and duration.

6.2 Direct Jobs and Spending

There is a significant inconsistency between (a) Rutgers Analysis estimates for "construction" sector and direct jobs, and (b) Transco Construction Workforce data (Direct Onsite Construction Jobs).

This inconsistency is illustrated in Table 1, comparing the Rutgers Analysis and TGG Analysis (which is based on Transco Construction Workforce data (Table 4)).

The Rutgers Analysis indicates the following:[67]

> The large job totals in the construction (1,120 job-years), manufacturing (298 job-years), and services (1,019 job-years) sectors include the direct construction

[67] Rutgers Analysis, p. 7.

labor and associated services required for the project, as well as additional indirect employment. Significant indirect employment effects are also generated across a range of other sectors, including retail trade, transportation, financial activities and wholesaling.

Even if the 1,120 construction job-years estimated by the Rutgers Analysis are assumed to include some jobs offsite as well as onsite, there is a considerable disjuncture between the Rutgers Analysis estimate of 1,120 construction job-years and the Transco Construction Workforce Data (233-342 Direct Onsite Construction Job-Years). This would imply that there are many more construction jobs offsite than onsite jobs, which is highly unlikely.

As explained in Section 3.4.2.2, the Rutgers Analysis is based on an assumption (provided by Transco) of "approximately 60% of construction labor estimated to be drawn within the region." [68] Meanwhile, the Transco Construction Workforce data estimates that the share of local hires will vary substantially depending on type of facility, ranging from 65% down to only 10-20% (Table 4). Only 38-45% (about 40%) of overall workers (Direct Onsite Construction Labor) would be local hires, and the remainder would be non-local/transient (Table 4).

While it is possible that some non-local/transient workers on the NESE Project could be residents of the tri-state area, it seems unlikely that there will be significant number of such workers.[69] Hence, the TGG Analysis is based on the Transco Construction Workforce data estimates for share of local hires, as indicative of the share of workers residing in-state.

Finally, as noted in footnote 34, Table 2 allocates the Raritan Bay Loop Construction Payroll 87.5% to New Jersey and 12.5% to New York, while the data reported in the FERC DEIS (notably in Table 4.8.9-2) are based on an allocation of 85% to New Jersey and 15% to New York.[70] The data in the FERC DEIS are inconsistent with the data provided in the Rutgers Analysis (pp. 17 and 32) for Payments to Construction Companies. Notably, the FERC DEIS estimate for Construction Payroll in New York ($12.2 million) exceeds the Rutgers Analysis estimate for total Payments to Construction Companies in New York ($10.8 million). Hence, the TGG Analysis

[68] Rutgers Analysis, pp. 1, 4.
[69] For example, construction workers residing in western New York and Pennsylvania would be in-state, but beyond commuting range to NESE construction sites. But the NESE Project would be highly proximate to most population centers and labor supply from the tri-state area (and especially from New Jersey and New York). Hence, it is reasonable to assume that NESE workers who are residents of the tri-state area would be local hires, rather than transient.
[70] These data were provided by Transco, in Response to Data Request 34 dated July 21, 2017, August 10, 2017. https://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=14657647

assumes an allocation of Construction Payroll that is consistent with the Rutgers Analysis.

6.3 Indirect Jobs

For the tri-state area, the Rutgers Analysis estimates 1,120 job-years in the construction sector and 3,186 total job-years. Thus, for every Direct Onsite Construction job-year to build the pipeline, the Rutgers Analysis is estimating that there are almost two (i.e. 1.8) Additional Offsite Jobs generated.[71] Additional Offsite Jobs are defined as other direct offsite construction jobs and upstream jobs providing services and materials, as well as downstream jobs from spending of wages. (See Section 3.1 for a more detailed discussion of the breakdown of Total Jobs.)

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
- spending of labor income (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 spending of labor income).

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

[71] (3186-1120)/1120 = 1.84.

- 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 per job for other jobs, such as from spending of labor income.

States in the Northeastern US, and especially New Jersey and New York, will typically have fewer spinoffs/offsite jobs.

As explained in Section 3.4.2.2 and Table 2, the Rutgers Analysis overstates in-state Construction Payroll and thus total Direct in-state expenditures. In turn, as explained in Section 3.4.3, this results in an overstatement of Indirect spending and jobs.

TGG does not have access to the R/ECON I-O model used in the Rutgers Analysis, nor does TGG have access to the detailed data that was input to that model. As a result, TGG cannot readily determine precise estimates for Indirect jobs, based on a modified Rutgers Analysis with a lower amount of Direct in-state expenditures.

As explained in Table 1, Note [6], the TGG Analysis estimates indirect jobs, by adjusting the Rutgers Analysis estimates of indirect jobs, by the TGG Analysis % of Rutgers (Total Expenditures) (Table 2). To bracket uncertainty, the range is expanded by 1/3 on both the left side [typically low end] and right side [typically high end].

As explained in in Sections 3.4.3 and 3.4.4, employment impacts will tend to be at the lower end of the range for NESE, given a context of tighter labor market conditions. Hence, it is realistic to assume NESE construction would actually result in employment impacts that are at (or below) the lower end of the estimated range for indirect job-years.

Assuming that indirect job-years will be at (or below) the lower end of the estimated range is also supported by consideration of now spending patterns can vary based on compensation per worker. Spending patterns can (and likely would) be different for pipeline workers depending on compensation per worker.[72] Compared with the lower compensated construction workers assumed in the Rutgers Analysis, the more highly compensated workers on NESE (and especially the Raritan Bay Loop) would have characteristics that reduce in-state spin-offs from spending of labor income, including:

- saving a larger share of earnings;

[72] See e.g.,
https://implanhelp.zendesk.com/hc/en-us/community/posts/115006951147-Propsensities-to-consume-and-multipliers
https://www.csun.edu/economicimpact/appendix-economic-impact-methodology

- paying higher taxes, notably at the federal level; and
- different spending patterns, notably relatively less spending on “necessities” such as food and basic housing, and more on luxury goods and travel.

7 Sources and Notes for NESE Project

This Section provides sources and notes for the NESE Project and this report.

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

Most of the sources are documents 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/.

7.2 Northeast Supply Enhancement (NESE) Project

Project Websites:

NESE Project: http://northeastsupplyenhancement.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, NY and PA. 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, Jobs, and Schedule:

FERC Docket CP17-101

All documents and correspondence submitted to or issued by FERC regarding the NESE Project during the Certificate Proceeding can be accessed by referencing FERC Docket CP17-101, the Certificate Proceeding (CP) Docket Number for the NESE Project on FERC's website: http://elibrary.ferc.gov/.