ADAM M. DUMVILLE
Direct Dial: 603.230.4414
Email: adam.dumville@mclane.com
Admitted in NH and MA
11 South Main Street, Suite 500
Concord, NH 03301
T 603.226.0400
F 603.230.4448

MCLANE MIDDLETON

VIA HAND DELIVERY AND ELECTRONIC MAIL

May 19, 2016

New Hampshire Site Evaluation Committee
Pamela G. Monroe, Administrator
21 South Fruit Street, Suite 10
Concord, NH 03301

Re: SEC Docket No. 2015-05: Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH") and New England Power Company d/b/a National Grid ("NEP"): Joint Application for a Certificate of Site and Facility for the Merrimack Valley Reliability Project

Dear Ms. Monroe:

Enclosed for filing in the above-referenced docket, please find the following:

1. Substitution Pre-Filed Testimony for Michael Auseré. Mr. Auseré will no longer be a witness for PSNH. Replacing Mr. Auseré for PSNH is the combined pre-filed testimony of Emilie O'Neil and James Vancho. Ms. O'Neil and Mr. Vancho are adopting Mr. Auseré's testimony. Also, for clarification, PSNH's portion of the line is estimated to cost $37 million. The substitution testimony makes this point clear on page 8 of the combined pre-filed testimony.

2. Substitution Pre-Filed Testimony for Bradley Bentley. Mr. Bentley will no longer be a witness for PSNH. Replacing Mr. Bentley for PSNH is the pre-filed testimony of Robert Andrew. Mr. Andrew is adopting Mr. Bentley's testimony. Mr. John (Jack) Martin and Mr. Andrew will present their pre-filed testimony together. The only addition to their testimony can be found on page 9, which provides: "On August 12, 2015, ISO-NE issued its Greater Boston Area Solutions Report, which officially selected MVRP and a group of other AC transmission upgrades as the preferred solution."

3. Supplemental Pre-Filed Testimony for Alfred Morrissey. Mr. Morrissey's testimony has been updated to include revised Project cost estimates for the NEP portion of the Project (Segment 2). Based upon the revised Project cost estimates, Mr. Morrissey has updated his projected effects of the Project on the local economy and local employment. Attachment B has also been updated to reflect the change in estimated property taxes generated by the construction and operation of the Project. The Applicants are providing a clean and red-lined version of Mr. Morrissey's supplemental testimony.

4. Amended Economic Impact of the Merrimack Valley Reliability Project: REMI Analysis of Construction Spending and Property Taxes. The Economic Impact Report has been updated to include revised Project cost estimates for the NEP portion of the Project (Segment 2) and the effects of the Project on local economy, local employment, and taxes. The Applicants are providing a clean and red-lined version of the Amended Report.

The Applicants are including an original and 15 paper copies of each set of pre-filed testimony and the Amended Report.

Please contact me directly should you have any questions.

Sincerely,

Adam Dumville

Adam M. Dumville

AMD:

cc: Distribution List

Enclosures

STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

SEC Docket No. 2015-05

APPLICATION OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 345 kV TRANSMISSION LINE

JOINT PRE-FILED TESTIMONY OF EMILIE O'NEIL AND JAMES VANCHO ON BEHALF OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

May 17, 2016

Personal Information – Emilie O'Neil

Q. Please state your name and business address.

A. My name is Emilie G. O'Neil. My business address is One NSTAR Way, Westwood, Massachusetts.

Q. By whom are you employed and in what capacity?

A. I am the Director of Corporate Finance and Cash Management for Eversource.

Q. What are your areas of responsibility in this position?

A. My primary responsibilities include cash management, development and implementation of long-term financing plans, lease financings and credit.

Q. Please describe your employment experience and educational background.

A. I joined Boston Edison Company in 1987 in the Corporate Finance and Cash Management group. Over the past 29 years, I have held various positions of increasing responsibility within Boston Edison Company, NSTAR and Eversource. I was promoted to the position of Director, Corporate Finance and Cash Management of NSTAR in 1999. Upon consummation of the Eversource and NSTAR merger in April 2012, I was appointed as Director, Corporate Finance and Cash Management of Eversource and its subsidiaries.

In May 1986, I earned a Master of Business Administration with a concentration in Accounting and Finance from Cornell University. In May 1982, I earned a Bachelor's degree in Economics from Columbia University. For a copy of my resume, please see Attachment A.

Personal Information – James Vancho

Q. Please state your name and business address.

A. My name is James Vancho. My business address is 107 Selden Street, Berlin, Connecticut.

Q. By whom are you employed and in what capacity?

A. I am a Manager for Investment Analysis and Business Development for Eversource.

Q. What are your areas of responsibility in this position?

A. My primary responsibilities include leading the financial review of proposed investments and other significant transactions, supporting the structuring of commercial agreements, identifying financing and structuring alternatives, assessment of business risks, and conducting competitive analysis.

Q. Please describe your employment experience and educational background.

A. I have worked at Eversource since 2001. Over the past15 years, I have held various positions of increasing responsibility within Eversource. I previously held positions of Financial Analyst, Manager in the Corporate Finance Department, and Manager of Corporate Planning. Before being promoted to my current position, I was a Manager of Financial Planning and Analysis where I was responsible for evaluating the financial merits of business initiatives, providing financial expertise on all business issues, and developing analytical tools to provide decision support to senior management.

Prior to joining Eversource attended the University of Rochester and received a Master of Business Administration (Finance) degree in 2001. I also received a Bachelor of Science (Business Management) degree from Sacred Heart University in Fairfield, CT in 1993.

For a copy of my biography, please see Attachment B.

Purpose of Testimony

Q. What is the purpose of your joint testimony?

A. Our joint testimony will demonstrate that Public Service Company of New Hampshire doing business as Eversource Energy (PSNH)[1] has the financial capability to construct and operate the Project, which will consist of a 345 kV line in 17.9 miles of existing ROW in New Hampshire. New England Power Company d/b/a National Grid (NEP) and PSNH will jointly invest nearly $82 million in the Project in New Hampshire. Our testimony will also demonstrate that PSNH has the financial capability to decommission the Project, if necessary.

Q. What is the basis for your position?

A. PSNH's financial capability to construct and operate the Project in continuing compliance with the terms and conditions of a certificate issued by the Site Evaluation Committee is based on the financial strength of PSNH and its parent Eversource and their combined experience financing, constructing, and operating transmission facilities in New England.

Public Service Company of New Hampshire

Q. Please describe PSNH.

A. PSNH's business consists primarily of the generation, delivery and sale of

1 PSNH is a wholly-owned subsidiary of Eversource.

electricity to its residential, commercial and industrial customers. As of December 31, 2014, PSNH furnished retail franchise electric service to approximately 504,000 retail customers in 211 cities and towns in New Hampshire, covering an area of 5,630 square miles. PSNH also owns and operates approximately 1,200 MW of primarily fossil-fueled electric generation plants. PSNH is subject to regulation by the New Hampshire Public Utilities Commission (NHPUC), which has jurisdiction over rates, certain dispositions of property and plant, mergers and consolidations, issuances of securities, standards of service and construction and operation of facilities.[2]

PSNH owns and maintains transmission facilities that are part of an interstate power transmission grid over which electricity is transmitted throughout New England. These transmission facilities are regulated by the Federal Energy Regulatory Commission.

Q. Please describe PSNH's experience in financing energy infrastructure.

A. PSNH has a proven track record of financing large energy projects such as the Project. During the three years ending December 31, 2014, PSNH invested over $646 million[3] in new energy infrastructure. As shown in Appendix D, PSNH financed its investments in new energy infrastructure with a combination of internally generated cash flows, long-term and short-term debt issuances and capital contributions from Eversource. Since 2013, PSNH has issued $325 million in first mortgage bonds.

Long-term debt issued by PSNH must be approved in advance by the NHPUC. During the approval process, the NHPUC evaluates the terms of the proposed issuances as well as the use of proceeds from the issuance. See Appendix D, financial statements of PSNH.

2 Northeast Utilities 2014 Form 10-K, at 6 and 7.
3 Id., at 85 (providing total of 2012-2014 investments in property, plant and equipment).

Eversource

Q. Please provide an overview of Eversource.

A. Eversource is a public utility holding company subject to regulation by FERC under the Public Utility Holding Company Act of 2005. Eversource engages in the energy delivery business through the following regulated wholly-owned utility subsidiaries: The Connecticut Light and Power Company (CL&P), NSTAR Electric Company (NSTAR Electric), PSNH, Western Massachusetts Electric Company (WMECO), NSTAR Gas Company (NSTAR Gas), and Yankee Gas Services Company (Yankee Gas).[4] Eversource's regulated subsidiaries combined serve over 3.6 million electric and gas customers.[5] While Eversource's regulated subsidiaries own both transmission and distribution assets, Eversource manages the transmission and distribution segments as separate businesses. See Appendices Y and Z for the corporate organization chart and a map of the Eversource service territory.

Eversource's electric distribution segment consists of the distribution businesses of CL&P, NSTAR Electric, PSNH and WMECO, which are engaged in the distribution of electricity to retail customers in Connecticut, eastern Massachusetts, New Hampshire and western Massachusetts, respectively, plus the regulated electric generation businesses of PSNH and WMECO. Eversource's gas distribution segment consists of the distribution businesses of NSTAR Gas and Yankee Gas, which are engaged in the distribution of gas to retail customers in eastern Massachusetts and Connecticut, respectively. CL&P, NSTAR Electric, PSNH and WMECO each own and maintain transmission facilities that are part of an interstate power

4 On February 2, 2015, NU and each of its wholly owned utility subsidiaries commenced doing business as Eversource Energy. Effective April 30, 2015, Northeast Utilities changed its name to Eversource Energy.
5 NU 2014 Form 10-K, Selected Consolidated Financial Data, at 27.

transmission grid over which electricity is transmitted throughout New England. Each of Eversource's electric and natural gas utilities that deliver retail service to consumers are regulated by their respective state public utility commission. All interstate electric transmission assets are regulated by the FERC. The Project will also be subject to the regulation of the FERC.

Eversource is ranked number 359 on the 2014 Fortune 500 list of largest U.S. companies with an equity market capitalization of approximately $15.5 billion.[6] Eversource's common stock trades on the New York Stock Exchange. Eversource has corporate credit ratings of A, Baa1 and BBB+ from Standard & Poors, Moody's, and Fitch's, respectively. Eversource is the highest ranked U.S. utility holding company by Standard & Poors. PSNH also holds corporate credit ratings of A, Baa1 and BBB+ from Standard & Poors, Moody's, and Fitch's, respectively. See also, Appendix D, financial statements of Eversource.

Q. Why is Eversource's financial strength important to the financial capability of PSNH to construct and operate the Project?

A. PSNH initially finances construction projects with internally generated cash and short-term borrowings from Eversource. As short-term debt accumulates, it is refinanced with long-term debt issued in the capital markets. While PSNH expects that most of its future funding needs will come from a combination of internally generated funds from operations and long-term and short-term debt issuances, PSNH also, from time to time, receives capital contributions from its parent, Eversource. These capital contributions allow PSNH to maintain an appropriate level of common equity to total capitalization, which helps ensure that PSNH will maintain its strong

6 On April 30, 2015, Eversource's closing price was $48.76 with 317.4 million shares outstanding.

credit ratings that allow ongoing access to the capital markets at favorable rates.

Construction of the Project

Q. What is the total expected cost of the Project to PSNH?

A. Pending regulatory approvals, the Project would begin construction in 2016 and be put in service in 2017. PSNH expects its total investment in the Project to be approximately $37 million.

Q. What insurance will PSNH carry?

A. PSNH and its construction contractors carry adequate insurance to provide coverage against liability or damage resulting from the construction and/or operation of the Project. Types of insurance and coverage amounts will be comparable to other projects of the same size and character currently operated by PSNH and all other Eversource companies and consistent with "good utility practice." All premiums and other costs of property, liability or other insurance obtained by PSNH are a cost of service recoverable under rates approved by the FERC.

Operation of the Project

Q. Please describe PSNH's sources of capital once the Project is in-service.

A. Once the Project commences operation, PSNH will begin receiving monthly cash revenue through the regional network service rate. These revenues will provide ample cash flows to satisfy its obligations to debt and equity investors and meet its working capital needs.

The Project will be regulated by FERC. It has been FERC's policy to permit utilities to establish transmission service rates through a formula.[7] The formula rate recovers a return on investment plus associated income taxes, depreciation expense, operation and maintenance

7 Staff's Guidance on Formula Rate Update, July 17. 2014, www.ferc.gov/industries/electric

expenses, administrative and general expenses, municipal tax expense and other expenses associated with the Project. The formula rate calculates costs on a prospective basis and then trues up such projected costs to actual costs in order to permit PSNH to recover the annual revenue requirements associated with the Project.

Q. What other sources of capital will be available to PSNH.

A. PSNH is currently authorized by the NHPUC to incur short-term borrowings of approximately $306 million. Additionally, PSNH has two forms of short-term liquidity: PSNH can borrow up to $300 million with an inter-company loan from Eversource; and PSNH also has a $300 million line of credit with a syndicate of banks.

Decommissioning of the Project

Q. Please describe the plan to decommission the Project.

A. PSNH does not anticipate the need to decommission the Project. Such lines are typically rebuilt, as needed, and continue in service indefinitely. However, if at some time in the future it is determined that the Project needs to be decommissioned, the Company will begin collecting future decommissioning costs through the FERC-approved transmission tariff.

Conclusion

Q. In your opinion, will PSNH have the requisite financial capability to construct and operate the Project?

A. Yes, PSNH currently has and will continue to have that financial capability. PSNH also has the financial capability to decommission the Project, if necessary.

Q. Does this conclude your joint testimony?

A. Yes, it does.

ATTACHMENT A

Emilie G. O'Neil

E-mail: emilie.oneil@eversource.com

Professional Experience:

2012 to Present	Eversource Director, Corporate Finance & Cash Management	Boston, MA
1999 to 2012	NSTAR Director, Corporate Finance & Cash Management Assistant Treasurer of BEC Funding II, LLC and CEC Funding, LLC	Boston, MA
1987 to 1999	Boston Edison Company Manager, Corporate Finance Treasurer of the Boston Edison Foundation Senior Financial Analyst (1990-1991) Financial Analyst (1989-1990) Associate Financial Analyst (1987-1989)	Boston, MA

Primary Responsibilities:

1. Implement long-term financing plans for the Holding Company as well as for its subsidiaries.

   Testified in the Company's state regulatory financing proceedings. The two largest included a $ 1.1 billion authorization as well as a $725 million stranded cost authorization.

   Coordinate the issuance and redemption of company securities with Senior Management, the Board of Directors, the Trustees, Transfer Agent, SEC, Lawyers, Printers, Rating Agencies and the Investment Community.

   Establish stock buy-back program and debt tender programs.

   Maintain on-going relations with the Rating Agencies.

2. Analyze financing alternatives and capital markets. Perform capital structure analysis and recommend appropriate dividend and financing strategies.

3. Develop and implement Securitization Financing.

   A) File financing plan with state regulator.
   B) Serve as expert witness.
   C) Secure all regulatory approvals (SEC, IRS, and state regulator).

D) Coordinate structure and terms with investment bankers, Mass Agencies, lawyers, rating agencies, printers, state regulator and SEC.
E) Develop rating agency presentation.
F) Perform an active role in road show.

4. Develop and manage access to short-term capital markets.

A) Establish and maintain relations with commercial banks and commercial paper dealers.
B) Establish, monitor and revise bank lines of credit.
C) Evaluate short-term financing alternatives.
D) Establish and maintain means to invest excess short-term cash.

5. Ensure effective utilization of corporate cash on daily basis.

A) Monitor and analyze corporate cash balances.
B) Initiate electronic transfer of Company funds.
C) Manage short-term debt and investment portfolio.
D) Coordinate the issuance of commercial paper and bank loans.
E) Maintain appropriate records and reporting systems.

6. Ensure Company compliance with SEC, trustee and security holder's regulations and requirements.

A) Ensure that the Company meets its financial and other obligations with respect to outstanding securities.
B) Maintain liaison with bond trustee, interest and dividend disbursing agents, and stock transfer agent.
C) Coordinate interest, dividends, principal and other payments as required.
D) Prepare compliance reports pursuant to Company financing agreements.

7. Analyze and implement Lease Financing as a long-term financing alternative.

A) Conduct lease vs. buy analyses.
B) Determine most economic structure for both tax and accounting considerations.
C) Send out and evaluate RFP's.
D) Negotiate pricing and terms with lessors.
E) Draft and review legal documentation.
F) Effect the successful placement of desired leases.

G) Coordinate communication between Company operating departments and lessors.
H) Assist operating departments in administration of lease program.

8. Manage the Credit functions.

9. Perform the annual dividend study.

10. Perform financial consulting to various areas and miscellaneous financial analyses.

11. Corporate Cash Accounting Administration.

A) Coordinate all corporate cash disbursements and receipts as well as posting these transactions to the Company's general ledger system.
B) Perform all bank reconciliations; research variances and resolve as necessary.

1986-1987	Peat, Marwick, Mitchell & Co.	Boston, MA
	Tax Consultant, Tax Department Prepared Partnership, Trust, Corporate and Individual tax returns. Performed tax research.	
1982-1984	Marine Midland Bank	New York, NY
	Designed econometric models in the context of country risk analysis.	

Education:

Cornell University, Ithaca, NY
M.B.A with a concentration in Accounting and Finance,
May 1986

Barnard College/Columbia University, New York, NY
A.B. in Economics, May 1982
Phi Beta Kappa
Magna Cum Laude

References: Furnished upon request.

James (Jim) Vancho Biography

Jim has worked for Eversource since 2001. He is currently Manager-Investment Analysis and Business Development, and is responsible for leading the financial review of proposed investments and other significant transactions, supporting the structuring of commercial agreements, identifying financing and structuring alternatives, assessment of business risks, and conducting competitive analysis.

From 2008 to 2015, Jim was Manager- Financial Planning and Analysis and was responsible for evaluating the financial merits of business initiatives, providing financial expertise on all business issues, and developing analytical tools to provide decision support to senior management.

From 2007 to 2008, Jim was Manager of Corporate Planning. In that role, he was responsible for managing Eversource's enterprise planning process, including the development of the company's annual operating plan and long-term strategic plan.

Upon joining Eversource in 2001 until 2006, Jim served in roles of increasing responsibility from Financial Analyst to Manager in the company's Corporate Finance department. As Manager, he supported the Assistant Treasurer in raising the funds necessary to support the capital and operating needs of all of the system companies, including project debt, securitizations, bank revolving credit facilities, accounts receivable financing programs, secured and unsecured capital market debt offerings, and lease financing.

Prior to joining Eversource, Jim attended the University of Rochester and received a Master of Business Administration (Finance) degree in 2001. He also received a Bachelor of Science (Business Management) degree from Sacred Heart University in Fairfield, CT in 1993.

STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

SEC Docket No. 2015-05

APPLICATION OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 345 kV TRANSMISSION LINE

JOINT PRE-FILED TESTIMONY OF JOHN W. MARTIN AND ROBERT D. ANDREW ON BEHALF OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

May 17, 2016

Personal Background – John W. Martin

Q. Please state your name, title, and business address.

A. My name is John W. Martin. I am employed as a Consulting Engineer in the Transmission Planning Department of the National Grid USA Service Company, Inc., d/b/a National Grid (National Grid). National Grid provides engineering and other services to New England Power Company d/b/a National Grid (NEP), which is a joint applicant in this proceeding. NEP is an affiliate company of National Grid and owns and operates transmission facilities in New England. My business address is 40 Sylvan Road, Waltham, Massachusetts.

Q. Briefly summarize your educational background and work experience.

A. I am a graduate of the Massachusetts Institute of Technology, holding a Bachelor of Science degree in Electrical Engineering. I am also a graduate of Northeastern University, holding a Master of Science degree in Electrical Engineering. I am a Senior Member of the IEEE and a member of the IEEE Power and Energy Society. I have over thirty-five years of experience in power system planning, design and analysis. I am a Registered Professional Engineer in the Commonwealth of Massachusetts.

I have been a Consulting Engineer in the Transmission Planning Department since June of 2013; prior to that I was a Principal Engineer in the department since April of 1998 and a Senior Engineer since the department's inception in June of 1993. I was also an Engineer in the predecessor Transmission and Supply Planning Department, beginning in June of 1989, and a Senior Engineer in that department, beginning in June of 1992. During this time, I have been responsible for and participated in many of NEP's transmission planning studies. I have represented NEP on many New England Power Pool (NEPOOL), ISO-NE, and NPCC bodies related to transmission planning,

including the NEPOOL Transmission Task Force, the ISO-NE Transmission Working Group, the NEPOOL Reliability Committee, the NPCC Task Force on System Studies, the NPCC Task Force on Coordination of Planning, and two additional NPCC Working Groups. Prior to joining the New England Power Service Company (the predecessor company of the National Grid USA Service Company, Inc.), I was employed as a system planning engineer at Stone & Webster Engineering Corporation for eight years.

My resume is attached as Attachment A.

Q. Have you previously testified before the Site Evaluation Committee?

A. No, I have not.

Q. What is your role in the Project?

A. As National Grid's Transmission Planning Engineer in the ISO-NE-led Greater Boston Working Group, I am responsible on NEP's behalf for transmission system planning, including determination of need for reinforcement of the transmission system, evaluation of alternative solutions, and selection of the most satisfactory solution.

Personal Background – Robert D. Andrew

Q. Please state your name, title, and business address.

A. My name is Robert D. Andrew. I am employed by Eversource Energy Service Company as a Director, System Planning. My business address is One NSTAR Way, Westwood, MA 02090. Eversource Energy Service Company provides centralized services to the Eversource Energy operating subsidiaries, including Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH").

Q. Briefly summarize your educational background and work experience.

A. I hold a Bachelor of Science in Electrical Engineering Degree with Concentration in Electric Power Systems from Northeastern University and also a Master of Science in Electrical Engineering with Concentration in Electric Power Systems from Northeastern University.

I have worked in the electric power field for more than 35 years. Starting in 1979 as a Distribution Engineer for PSNH, I then spent 12 years working in the generation area followed by another ten years as a Transmission system operator and Manager of Transmission System Operations in the Greater Boston area. Finally the last five years have been spent in the System Planning area. My resume is attached as Attachment B.

A. **Q. Have you previously testified before the Site Evaluation Committee?**

A. No, I have not.

Q. What is your role in the Project?

A. Among my primary responsibilities is ensuring that, as various projects interconnect to the existing transmission system, the Eversource Energy transmission system will continue to operate reliably and that transmission system reliability is maintained within specified criteria prescribed by the Independent System Operator - New England ("ISO-NE") and consistent with broader criteria prescribed by North American Electric Reliability Corporation ("NERC") Reliability Standard TPL-001, which is available on the NERC website, www.nerc.com. These transmission system reliability criteria are aimed primarily at maintaining bulk power system voltages and assuring that transmission lines are not overloaded. Any entity proposing to connect a project to the transmission system must follow ISO-NE Planning

Procedures. The types of projects that typically seek approval to connect to the transmission system vary, and include: generator interconnections, distribution substations, elective transmission projects, and transmission reliability projects.

Transmission System Planning ensures the transmission system is designed to meet all NERC, NPCC and ISO-NE reliability criteria. If thermal and voltage issues are not addressed, transmission equipment could overload, line clearances above ground could sag to hazardous levels, or voltage levels could be outside of acceptable operating ranges under certain system conditions. Impacts could range from unsafe conditions to equipment damages to line and power outages.

Joint Testimony

Q. What is the purpose of your testimony?

A. The purpose of our testimony is to describe the impact on system stability and reliability for MVRP, which will provide a new 345 kV transmission line between PSNH's Scobie Pond 345 kV Substation in Londonderry, NH and NEP's Tewksbury 22A Substation in Tewksbury, MA. In support of the Applicants' joint application for a Certificate of Site and Facility, we will also address the reliability of the transmission system in the Project area, the need the Project addresses, and why the Project is the cost-effective solution to meet the need.

Background on Regional Electric Grid

Q. Please provide a general overview of the regional electric grid, and in particular, the Southern New Hampshire and Northeast Massachusetts area of the grid.

A. The regional electric grid is a network of transmission lines and equipment operating at voltage levels of 345 kV, 230 kV, 115 kV and 69 kV, which supply substations that ultimately supply

customer load. A wide variety of power generators (nuclear, fossil fuel, wind, etc.) are connected to this grid. The power is generated at a low voltage and stepped up by a transformer to the high voltage grid and transmitted over long distances to distribution substations. At the distribution substation, the power transmitted at high voltage is stepped down by a transformer to a lower voltage and distributed via lines that run along streets for ultimate delivery to homes and businesses.

MVRP is designed to resolve certain identified performance needs affecting the transmission system that serves southern New Hampshire and northeastern Massachusetts. Five 345 kV transmission lines form a loop that supplies this area:

- The 394 Line from NHT's Seabrook Substation in Seabrook, NH to NEP's Ward Hill Substation in Haverhill, MA;
- The 397 Line between NEP's Ward Hill Substation and Tewksbury 22A Substation in Tewksbury, MA;
- The 337 Line between NEP's Tewksbury 22A Substation and Sandy Pond Substation in Ayer, MA;
- The 326 Line between NEP's Sandy Pond Substation and PSNH's Scobie Pond 345 kV Substation in Londonderry, NH; and
- The 363 Line between PSNH's Scobie Pond 345 kV and Seabrook Substations.

Three other transmission lines cross between these two zones:

- The 115 kV Y-151 Line from PSNH's Power Street Substation in Hudson, NH to NEP's Tewksbury 22 Substation in Tewksbury, MA; and

- The 230 kV N-214 and O-215 Lines from the North Litchfield Switchyard in Litchfield, NH to NEP's Tewksbury 22 Substation in Tewksbury, MA.[1]

Q. Please provide a general explanation why transmission upgrades are necessary in this region.

A. A Needs Assessment study, consisting primarily of power flow simulations, was performed with results and report submitted to the ISO-NE Planning Advisory Committee (PAC). This Needs Assessment identified the potential for thermal overloads and over/under voltage issues on regional transmission system equipment. These issues need to be addressed by transmission upgrades to avoid risks of equipment damage, line and power outages, and threats to public safety.

MVRP addresses thermal overloads on the 115 kV and 345 kV ties between Massachusetts and New Hampshire and on the connecting 115 kV and 230 kV transmission lines and also addresses voltage issues in Southern New Hampshire. These lines exceed their capabilities if certain other transmission line(s) are out of service ("contingencies"). Under numerous contingencies, these lines overload even at pre-2013 peak load levels. At minimum load levels, these same contingencies result in high voltage conditions at multiple area substations. In short, the existing ties currently do not provide sufficient capacity to reliably serve southern New Hampshire and northeastern Massachusetts either at peak or at minimum load conditions.

Q. Please provide a general overview of the ISO-New England study process.

A. There are four key steps to the ISO-NE study process. First, a working group is formed and a needs study scope is prepared. This document, which lists the study assumptions to be used in

1 The 450 kV 451 and 452 HVDC lines cross the Massachusetts/New Hampshire border on the 326 Line ROW. However, electrically these lines function as a generation injection at Sandy Pond; they do not transfer power between the New Hampshire and NEMA/Boston load zones.

the power flow analysis, is vetted by the ISO-NE PAC to ensure that inputs from stakeholders (e.g., state regulators and consumer advocates) are considered. Second, the working group undertakes detailed power flow analyses and develops a needs assessment documenting specific reliability concerns within the study area. This needs assessment is presented to the ISO-NE PAC. As a third step, the working group undertakes additional detailed power flow analysis to identify and evaluate alternative transmission system upgrades that could address the system needs, and to select a preferred solution. This work is documented in a solutions study, which also is presented to the ISO-NE PAC. Finally, the project proponent(s) undertake additional technical analysis for each project to demonstrate that operation of the proposed upgrade would have no adverse impacts on transmission system operation. This analysis is documented in a Proposed Plan Application (PPA), which is presented to ISO-NE planning committees and ultimately accepted by ISO-NE.

Impact on System Stability and Reliability and System / Electrical Benefits

Q. Please describe the Greater Boston Area Study process to date.

A. In 2008, a Working Group, led by ISO-NE and consisting of members from ISO-NE, Northeast Utilities, National Grid, and NSTAR, was formed to study the Greater Boston area transmission system. The Working Group established a study area that included all of the Northeastern Massachusetts (NEMA) load zone and portions of the New Hampshire, Southeastern Massachusetts (SEMA) and Western Central Massachusetts (WCMA) load zones (the "Greater Boston Area"). Geographically, the study area encompasses southern New Hampshire and northeastern Massachusetts, including the City of Boston and its inner and outer suburbs to the north, west and south.

The Working Group presented its initial assessment of area transmission system needs in its July 2010 Greater Boston Area Transmission Needs Assessment (the "2010 Needs Assessment").

The study initially focused on 2013 summer peak load conditions based on the ISO-NE forecast of Capacity, Energy, Load and Transmission. Also taken into account for the load forecast was the effect of energy efficiency (e.g., compact fluorescent lights, high efficiency appliances) and voluntary load reductions. Different combinations of system conditions were analyzed, including generation dispatch and unavailability of transmission equipment.

This needs assessment was updated a number of times during the study process to account for significant system changes including revisions in assumptions for load growth, energy efficiency, generator delists, generator additions and retirements, and other factors that could affect the demands placed on the area transmission system. An Updated Needs Assessment was issued in January 2015. ISO presented its recommended solution set to the ISO-NE PAC in February 2015. On August 12, 2015, ISO-NE issued its Greater Boston Area Solutions Report, which officially selected MVRP and a group of other AC transmission upgrades as the preferred solution.

Q. Please describe the conclusions of the Updated Needs Assessment as they relate to the 115 kV and 345 kV ties between New Hampshire and Massachusetts.

A. As documented in the Updated Needs Assessment, there is insufficient capacity on the 115 kV and 345 kV ties between New Hampshire and Massachusetts to reliably serve area electric customers. At times when electric loads are at summer peak levels and certain area generation is unavailable, the loss of either a single transmission circuit or a combination of two circuits could load the 115 kV and 345 kV ties beyond their emergency thermal ratings.[2] At times when electric loads are

2 Transmission circuit ratings are based on the amount of heating that the wire can tolerate before it sags to an unsafe height. Circuits must be designed so that the amount of sag (height above the ground) is within the applicable safety codes.

low, the loss of either a single transmission circuit or a combination of two circuits could increase system voltages to a point at which electrical equipment is negatively affected.

Q. Are these conclusions consistent with the results of other ISO-NE transmission planning studies?

A. Yes. The ISO-NE "New Hampshire/Vermont Transmission System 2023 Needs Assessment Report" (New Hampshire/Vermont Needs Assessment) documented potential thermal overloads on the two specific 345 kV transmission lines (the 326 line between PSNH's Scobie Pond 345 kV Substation in Londonderry, NH and NEP's Sandy Pond Substation in Ayer, MA, as well as on the 394 line between New Hampshire Transmission's Seabrook Station in Seabrook, NH and NEP's Ward Hill Substation in Haverhill, MA). This report also found that several 345 kV buses in southern New Hampshire could have unacceptably high voltages under certain contingencies during light load conditions with minimal generation on line.

Q. Please describe how the MVRP will address the conditions documented in the *Updated Needs Assessment* and the *New Hampshire/Vermont Needs Assessment*.

A. MVRP addresses these needs by providing a new 345 kV transmission path between southern New Hampshire and northern Massachusetts. The additional capacity provided by the new line will prevent the existing 115 kV and 345 kV ties, and connecting 115 kV and 230 kV lines, from overloading under certain contingencies. The connection also prevents many of the high voltage concerns at light load levels.

Q. Please explain how the MVRP was chosen as the preferred solution to address the need for additional capacity between New Hampshire and Massachusetts.

A. ISO-NE considered two plans for addressing the regional transmission system needs identified in the Greater Boston Area study. One of these plans included as a central element a submarine high-voltage, direct current (HVDC) cable. This plan was termed the "HVDC Plan." The other plan was comprised entirely of AC transmission projects. This plan was termed the "AC Plan."

The AC and HVDC Plans each were presented to the ISO-NE PAC. The PAC presentation compared the two plans based on estimated cost and a range of non-cost factors. The final selection of the AC Plan, which included the MVRP, was due primarily to the fact that it was approximately $250 million less costly than the competing HVDC Plan. The AC Plan was also found to be superior to the HVDC Plan with respect to construction outage requirements, interface impacts, system losses, expansion capabilities, lifetime maintenance requirements, and incremental cost for potential generator retirements.

Q. Please summarize the overall benefits the MVRP will provide with respect to system stability and reliability.

A. Construction of MVRP will improve the overall reliability of the transmission system serving southern New Hampshire and northeastern Massachusetts by improving its ability to withstand system disturbances caused by severe weather, equipment failures, and potentially volatile electric market conditions (i.e., unavailability of generation). The transmission system becomes more robust in its ability to adapt and maintain electric service to customers.

MVRP directly provides these system benefits by adding a new 345 kV transmission circuit in a heavily-used corridor and upgrading the existing 115 kV Y-151 transmission circuit. This additional transmission capacity will reduce power flows on existing circuits, including circuits in southern New Hampshire, and thereby increase the margin before the emergency thermal rating is reached.

Construction of MVRP also will address unacceptably high voltages found at 345 kV buses in southern New Hampshire under certain contingencies. Such high voltages, above manufacturers' equipment ratings, could potentially damage electrical equipment.

Finally, by providing additional capacity between northern and southern New England, MVRP will create additional flexibility within the transmission system, allowing utilities to serve electric customers reliably and efficiently as the structure of the regional electric grid changes over time.

Q. Does this conclude your pre-filed testimony?

A. Yes.

JOHN W. MARTIN
National Grid
40 Sylvan Road, Waltham, MA 02451

Professional Experience

2009 – present: National Grid USA Service Company, Waltham, MA
- 2013 – present: Consulting Engineer, Transmission Planning
- 2009 – 2013: Principal Engineer, Transmission Planning

2000 – 2009: National Grid USA Service Company, Westborough, MA
- 2000 – 2009: Principal Engineer, Transmission Planning

1989 – 2000: New England Power Service Company, Westborough, MA
- 1998 – 2000: Principal Engineer, Transmission Planning
- 1992 – 1998: Senior Engineer, Transmission Planning / Transmission System Engineering
- 1989 – 1992: Engineer, Transmission and Supply Planning

1980 – 1988: Stone & Webster Engineering Corporation, Boston, MA
- 1986 – 1988: Educational leave of absence – Ph.D. program (ABD)
- 1985 – 1986: System Planning Engineer, Consulting Division
- 1982 – 1985: Staff Engineer, Electrical Division
- 1980 – 1982: Support Engineer, Electrical Division

Roles and Responsibilities

Major responsibilities at National Grid have included:

- Transmission studies including modeling, powerflow and short-circuit analysis of existing systems, evaluation of alternative transmission arrangements, coordination of conceptual transmission and substation engineering, economic analysis of alternative expansion plans, and development of recommendations for expansion of company's transmission system. Projects have included several expansions of large metropolitan area north of Boston, additional supply to Nantucket, integration of new 500 MW generating plant in RI, testimony before state siting authorities, and presentations to regional reliability review committees.
- Monitoring compliance to NEPOOL/ ISO-NE load power factor requirements. Established methods for data acquisition, analysis, and reporting for over 40 transmission customers on monthly and annual surveys
- Review and update of transmission equipment rating methodologies
- Review and maintenance of company's facilities in regional powerflow models
- Maintenance of load data application for planning purposes, including recommendation of metering changes
- Mentoring younger engineers

Additional responsibilities have included roles representing company at several New England and regional reliability based groups including:

NEPOOL Reliability Committee – 2010-present: represent National Grid USA at Area-wide body for the reliability coordination of planning and operation of the New England (NE) bulk power system. Participation includes review of planned modifications and additions to the NE system, modifications to New England reliability standards, planning and operating procedures for ISO-NE, and review of regional cost allocations for pool-supported projects.

Northeast Power Coordinating Council (NPCC) Task Force on Coordination of Planning (TFCP) – 2013-present: represent National Grid USA at regional body for coordination of planning of the interconnected bulk power system. Participation includes review of modifications to reliability standards for Northeast US & Canada bulk power system and development of documents pertaining to regional reliability criteria.

NPCC Working Group on Review of NPCC Basic Criteria (CP-11) – 2008-2013: represent National Grid USA at regional body for review of basic criteria for design and operation of the bulk power system. Review NPCC bulk power system element identification and basic planning and operation standards.

NPCC Working Group on Resource and Transmission Adequacy (CP-8) – 2003-2013: represent National Grid USA at regional body for review of adequacy of generation resources and interconnection ties in Northeast US bulk power system. Review each Control Area's planned additions and modifications against resource reliability criteria; review assumed use of interconnection tie benefits.

NPCC Task Force on System Studies (TFSS) – 2002-2008: represent National Grid USA at regional body for coordination of transmission system studies of the reliability of the interconnected bulk power system. Participation includes review of impact of planned transmission and generation additions or modifications on reliability of Northeast US bulk power system.

NEPOOL Transmission Task Force / ISO-NE Transmission Working Group -1990 – 2000: represented New England Power Company at New England peer review bodies for the coordination and technical review of all NEPOOL member utilities' transmission expansion plans.

Registrations

Registered Professional Engineer, Commonwealth of Massachusetts, 1987-present.

Memberships

IEEE - Senior Member - 2001-present; Member 1979-2001
Member, Power & Energy/Power Engineering Society (PES), 1979-present

Boston Section PES: Chapter Treasurer 2010-present, Scholarship Committee 1994-1999

Member, IEEE Standards Association, 2001-present

Education

2010: WORCESTER POLYTECHNIC UNIVERSITY, Worcester, MA
Power System Protection & Dynamics, Post Graduate Program

1986 - 1989: CASE WESTERN RESERVE UNIVERSITY, Cleveland, OH
Ph.D. Candidate, Systems Engineering. Laboratory teaching assistant in introductory control systems course. Research topic – Fault Diagnosis in Electric Power Systems.

1981 - 1984: NORTHEASTERN UNIVERSITY, Boston, MA
M.S. Electrical Engineering (Power Option), June 1984.

1976 - 1980: MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
B.S. Electrical Engineering, June 1980.
Senior thesis – Transient Stability Analysis of the MIT-EPSEL Model Power System.

Personal Background

Born and raised in metropolitan Boston area.

Robert D. Andrew

Education

- **Northeastern University, Master of Science in Electrical Engineering, 1983**

- **Northeastern University, Bachelor of Science in Electrical Engineering, 1979**

Professional Experience

1983 – Present Eversource Energy (Northeast Utilities (NSTAR Electric (Boston Edison Company)))

Director, System Planning (Eversource and NSTAR Electric): 2010 to Present
Accountable for ensuring optimal performance of electric transmission and distribution system assets. Responsibilities include;

- Implement best practices to achieve efficient and effective planning practices.
- Collaboration with others on preliminary and final project designs.
- Participate in the ISO-NE Planning Process including;
    - Area Study Groups
    - Tariff section I.3.9 analyses
    - Transmission Cost Allocation processes
    - Generator Interconnection Studies
- Develop and execute electric system improvement plans for the transmission system and major substation facilities.

Manager, Bulk Power System Operations (NSTAR Electric): 2004 to 2010
Responsible for the safe, reliable and economic operation of the NSTAR Electric Transmission System. Major duties include:

- Preparation and presentation of evidence of compliance with NERC “TOP” Reliability Standards during NPCC On-site Audit. Received “compliant” rating for all audited standards/requirements.
- Create/implement the Procedures and Training required for NSTAR to become a Local Control Center under ISO New England.
- Manage, select, train, coach and develop Control Room staff
- Manage Transmission System daily operating tasks, including facility outages needed to construct upgrades to facilities
- Responsible Operations Manager for the upgrade of the SCADA System and addition of EMS Applications.
- Implemented use of the Common Information Model (CIM) to update the electric system model used by EMS software applications.

Senior Planning Engineer (NSTAR Electric): 2001 to 2004
Responsible for the development of changes to the NSTAR Electric Transmission System to address:

- Overload conditions during normal or contingency conditions
- Improper voltage levels during all operating conditions

Provide assistance to Dispatchers to improve operation of the transmission system including:

- Loadflow analysis supporting outage applications
- Revise SCADA screens to improve the display of system parameters
- Creation of Operating Guides and training to address contingencies and extreme operating conditions

NSTAR's representative on the ISO-NE Voltage Task Force.

Lead Engineer – Asset Strategy Distribution (NSTAR Electric and Boston Edison): 1997 to 2001
Provided innovative ideas and leadership on Teams tasked with developing post-merger plans for SCADA, GIS and Communication Systems. Responsible for the Y2K compliance of all Distribution System equipment and review of Y2K Contingency Plans for technical accuracy and operational issues. Identified and implemented "PI" software allowing desktop access to electric system status information via the SCADA System.

Senior Dispatching Supervisor (Boston Edison): 1996 to 1997
Responsible for the safe and reliable operation of Boston Edison's electric system. Applied SCADA technology to change the methods for implementing Voltage Reduction, Load Shedding and Transformer Load Tap Changer control eliminating over $150K/year in maintenance expenses. Boston Edison's alternate member on the REMVEC Operating Committee and Team Leader for the original issue of the Power System Restoration Plan. Initiated efforts to automate relay testing via the SCADA System and to automate restoration of distribution circuits via SCADA controlled operation of RADSEC devices.

Bulk Power Supply System Controller (Boston Edison): 1993 to 1996
Responsible for the safe and reliable operation of the NSTAR Electric transmission system including:

- Switching and tagging activities
- Review and approval of outage applications in support of maintenance and construction activities
- Coordination of operating activities with NEPEX, REMVEC and other Utilities
- Loadflow analyses supporting outage applications and changing operating conditions

Senior Instrumentation and Controls Engineer (Boston Edison): 1983 to 1993
Technical lead engineer for NRC Audits of Pilgrim Station's environmental qualification program and Instrument Set Point Bases, both audits resulted in no adverse findings. Member of various Multi-Discipline Assessment Teams tasked with root cause analysis and corrective action on major plant systems such as the main turbine control system. Responsible for Project Management and Contract Management for numerous changes to plant design and equipment.

1981 – 1983 Stone and Webster Engineering Corporation

Engineer – Electric Power Group
Responsible for the Environmental Qualification of electric equipment for the Millstone 3 Plant. Effort included a staff of four and an estimated budget of 12 million dollars.

1979 – 1981 Public Service Company of New Hampshire -Distribution Engineer

STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

SEC Docket No. 2015-05

APPLICATION OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 345 kV TRANSMISSION LINE

SUPPLEMENTAL PRE-FILED TESTIMONY OF ALFRED P. MORRISSEY ON BEHALF OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

MAY 17, 2016

Personal Background

Q. Please state your name, title, and business address.

A. My name is Alfred P. Morrissey. My title is Corporate Economist in National Grid's Analytics, Modeling and Forecasting Department. My business address is 40 Sylvan Road, Waltham, MA 02451.

Q. Briefly summarize your educational background and work experience.

A. I graduated from the University of Massachusetts at Amherst in 1978 with a BA degree in Economics. In 1981, I received a Master of Arts degree in Economics and in 1984, a Doctor of Philosophy degree in Economics, both from the University of Notre Dame. I have 31 years work experience in the electric utility industry.

I began my work career in 1983 as an Energy Analyst in the System Planning Department at the American Electric Power (AEP) company in Columbus, OH. While at AEP, I coauthored an article, published in IEEE Transactions on Power Systems (1988), on estimating the economic impact of a new industrial plant (or plant closing) on local employment, wages and electrical load. I also taught evening courses in economics at the Ohio State University. In 1988, I resigned my position at AEP and joined Eastern Utilities Associates (EUA) in West Bridgewater, MA as Load Forecast Analyst and later as Supervisor of Load Forecasting. Since EUA's merger with National Grid in 2000, I have continued to do load forecasting, economic analysis and, more recently, economic impact analysis of various National Grid programs and initiatives, including energy efficiency programs, gas expansion proposals, electric and gas capital spending plans and transmission project proposals. Please see Attachment A for my resume.

Q. Have you previously testified before the New Hampshire Site Evaluation Committee?

A. No, I have not.

Q. What is the purpose of your supplemental testimony?

A. NEP recently revised its Project cost estimate. The purpose of my supplemental testimony, therefore, is provide the Committee with updated information regarding the beneficial economic impact of the Project on the New Hampshire economy, the impact of those benefits on New Hampshire employment, income and gross state product, and to provide an estimate on property taxes that will be generated by the Project in the Towns of Pelham, Hudson, and Windham.

Q. Is there an Amended Study Report that accompanies your testimony?

A. Yes, the amended report is entitled, "Economic Impact of the Merrimack Valley Reliability Project, REMI Analysis of Construction Spending and Property Taxes," (Study Report) and is attached hereto..

Economic Impact Estimation Methodology

Q. How did you estimate the economic impacts of the Merrimack Valley Reliability Project that are expected during the construction phase of the Project?

A. I used the policy forecasting model by REMI.[1] Projected economic impacts were determined by taking the difference between a base case with no NH/MA transmission project and the case with the Merrimack Valley Reliability Project.

1 REMI is owned by Regional Economics Models, Incorporated and leased to its clients. Model description, documentation, applications and client lists can be found at www.remi.com.

Q. What is the REMI policy forecasting model?

A. REMI is a regional economic model based on public data and peer-reviewed methodology. National Grid leases a 160-sector version of the REMI model covering the State of New Hampshire and National Grid's Massachusetts service territory. REMI is used extensively in planning studies, with over 150 US and international clients, including federal, regional, state and local government planning agencies; energy consultants; universities; non-profit research institutions; utilities and other private sector firms. The REMI model is a complete macroeconomic representation of the New Hampshire and Massachusetts economies. By entering projections about the amount, timing and type of the Merrimack Valley Reliability Project investments, REMI provides estimates of their economic impact in New Hampshire and Massachusetts.

Q. Please summarize the investment spending amounts considered for the REMI analysis of the Project.

A. These are shown in Figure 1 (APM-1) in the Amended Study Report. Total planned spending on the Project is approximately $125 million from 2014 to 2018, with $72 million for the New Hampshire portion and $53 million for the Massachusetts portion. Of the New Hampshire portion, $50.5 million is planned for construction of the Project while $21.4 million is for materials and equipment. For Massachusetts, $39.9 million is for construction and $1 million is for materials and equipment. Labor accounts for 70% of investment spending in New Hampshire and 75% in Massachusetts.

Q. How are these Project expenditures allocated to industries in REMI?

A. Figure 2 (APM-2) in the Amended Study Report shows the allocation of Project spending to industries in REMI.[2] All spending during the 2014 to 2015 planning sub phase is allocated to the professional, scientific and technical services industry. This includes engineering, design, planning, procurement, real estate, legal, permitting, and other professional services. No significant construction activity takes place during the planning sub phase and no materials are purchased.

Going forward, spending on professional services is expected to remain constant at $6.7 million per year, which is approximately equal to the 2015 levels, falling to zero in 2018 as the project quickly winds down. . The remaining amount of labor spending, $68.4 million, is allocated to the power and communication structures construction industry in REMI with 5.0% allocated to waste management and remediation services, based on prior transmission project experience.

Spending on materials and equipment begins in 2016. The majority of this, $25.9 million or 75% is entered into REMI as an exogenous increase in investment demand for electric transmission, distribution and industrial apparatus. This has a relatively small impact on local economic activity because this category consists largely of equipment purchased from outside of the state. The remaining amount of materials spending, totaling $8.6 million, is allocated to more local industries such as crushed rock and concrete. This is input into REMI as an increase in final demand in the local cement, concrete product, lime, gypsum and other nonmetallic product manufacturing industry.

[2] In preparing this update, I discovered an input error in the REMI economic impact analysis used for the original testimony and study report. Specifically, NEP mistakenly allocated 50% of Project spending on materials to electric apparatus and 50% to concrete and other materials. NEP meant to allocate 75% of total materials spending to electrical apparatus and 25% to concrete and other materials. Correcting this allocation resulted in a decrease of 36 annual jobs, or 582, down from the original estimate of 618.

Q. How does investment spending impact the local economy during the planning and construction phase of the Project?

A. Transmission project spending creates jobs in construction, engineering, professional services and other industries as well as secondary jobs in the local service sector. The total economic impact consists of the direct, indirect and induced impacts. Direct impacts are tied directly to the Project, for example, the number of electrical contractors hired to install new transmission equipment. Indirect impacts are felt in the local supply chain, that is, industries providing goods and services for the Project. Induced impacts result from the spending of the direct and indirect workers and are felt mainly in the local service sector, for example, increased retail activity and hiring.

Q. Does REMI estimate the direct, indirect and induced impacts of transmission project spending?

A. Yes, REMI estimates the total impact of the spending, including the direct, indirect and induced impacts, also known as "multiplier effects." In addition, REMI contains regional purchase coefficients (RPCs) that estimate how much transmission project spending stays local and how much leaks out of the region to other suppliers. For example, spending on project labor has a much larger local economic impact or multiplier than spending on equipment because of higher RPCs. Spending on specialized electrical equipment such as transformers, breakers and cable, has low RPCs because these items tend to be purchased from outside the region.

Q. Why is investment spending on the Massachusetts portion of the Merrimack Valley Reliability Project included in the analysis?

A. Because of their close proximity, there are linkages between the Massachusetts and New Hampshire economies. As a result, the Massachusetts portion of the MVRP impacts both the Massachusetts and New Hampshire economies. For example, some labor for the Massachusetts portion of the MVRP may be supplied from New Hampshire, especially since the MVRP takes place in Essex and Middlesex counties which border southern New Hampshire. The REMI model includes estimates of the strength of these linkages. Overall, REMI estimates that project spending in Massachusetts will support 26 annual jobs in New Hampshire.

Employment Impact

Q. Please summarize the construction phase employment impacts of the Merrimack Valley Reliability Project.

A. Figure 3 (APM-3) in the Amended Study Report shows total employment impacts during the construction phase. Spending on construction and materials is expected to generate over 1,000 job years in New Hampshire and Massachusetts, or 200 jobs per year on average from 2014 through 2018 (a "job year" is equal to one job for a period of one year). Over 500 job years are supported in New Hampshire and over 450 job years in Massachusetts.

Q. Please provide details on the estimated number of jobs associated with the Project during the construction phase for New Hampshire specifically.

A. Figure 3 (APM-3) in the Amended Study Report shows that the Project is expected to support a total of 545 job years in New Hampshire over the five year construction period. That amounts to an average of 109 jobs per year in New Hampshire from 2014 to 2018. Figure 4 (APM-4) in the

Amended Study Report illustrates the year-by-year employment impact. This is expected to be greatest in 2017, when construction spending is at its highest, supporting 318 annual jobs. Most jobs are expected to be created in southern New Hampshire, in Hillsboro and Rockingham counties where the spending takes place, based on REMI analyses carried out for regions with county-level detail.

Q. How are these jobs distributed across New Hampshire industries?

A. Figure 5 (APM-5) in the Amended Study Report shows employment impacts by New Hampshire industry. The largest impact is in construction, which accounts for 200 annual jobs or 37% of the total employment impact. However, a wide range of other industries also benefit. For example, professional services, which tends to be higher paying than construction, accounts for 103 annual jobs, or 19% of the total. This includes engineering, management, planning, design, legal, and other professional services. REMI also estimates a significant impact to New Hampshire manufacturing due to suppliers of local materials such as concrete. There are also significant impacts in the finance, insurance and real estate industry and in remediation and waste management services due to the nature of the transmission project spending. Finally, there are significant impacts to retail trade and other services, which include health, education, government and recreation. These reflect the induced economic impacts of project spending, that is, the impact of the above workers spending on local goods and services.

Other Economic Impacts

Q. Please summarize the estimated increase in real New Hampshire GDP, personal income and tax revenue associated with the Project during the construction phase.

A. As shown on Figure 3 (APM-3) in the Amended Study Report, REMI estimates that the Project will raise real GDP in New Hampshire by $62.8 million during the construction period, or

$12.6 million per year; and raise real personal income by $32.8 million, or $6.6 million per year. Finally, the Project is expected to raise state tax revenues by $1.2 million during the construction period. This is based on state tax revenues from all sources as a percent of personal income, and the increase in personal income projected by REMI.

Q. Please summarize the New Hampshire employment, GDP, personal income and state tax revenue impacts per million dollars of total New Hampshire Project spending.

A. Each one million dollars of New Hampshire Project spending is expected to support 7.6 annual jobs; raise New Hampshire GDP by $872,106; raise personal income by $455,316; and raise state tax revenues by $16,847. These multipliers are obtained by dividing total job years, GDP, personal income and state tax revenue over the 2014 to 2018 planning and construction period by total New Hampshire Project spending. Note that these estimates are in line with other transmission project economic impact studies.[3]

Ongoing Economic Benefits

Q. Once construction of the proposed Project is complete, will there be ongoing economic benefits associated with the operation and maintenance of the proposed Project?

A. Yes, the Project is expected to raise annual property tax payments to local governments in New Hampshire by $1,258,050 the first year it is put in service.

3 Study Report Bibliography: Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving (June 2014), London Economics (June 9, 2014) and University of Minnesota Duluth, Labovitch School of Business (November 2010).

Q. How did you estimate the economic impact of these property tax payments?

A. The analysis assumes that the increased property tax revenues will be spent by local governments. REMI estimates that a $1,258,050 increase in local government spending in New Hampshire will lead to the creation of 27 annual jobs, including direct, indirect and induced effects of the spending. Figure 7 (APM-6) in the Amended Study Report shows the projected annual impact.

Q. Besides increased property tax revenue, will there be other ongoing economic benefits associated with the operation and maintenance of the proposed Merrimack Valley Reliability Project?

A. No, other ongoing economic benefits associated with operation and maintenance are anticipated to be minimal. The new transmission line will utilize existing right-of-ways that already require maintenance without the presence of the Project. Therefore, incremental operation and maintenance spending and associated economic benefits are expected to be insignificant.

Property Tax Estimates

Q. How were the first year property tax impacts used in the above REMI analysis estimated?

A. Eversource and National Grid developed estimates of first year property tax impacts to local New Hampshire governments based on the expected value of the new equipment placed into service and local property tax rates. The development of Eversource's estimated property tax payments is laid out in the pre-filed testimony of Dr. Lisa K. Shapiro. For the REMI analysis, I took the mid-point of Dr. Shapiro's estimated range of property tax payments to two local communities and two counties, totaling $678,850. National Grid's Real Estate Services and Property Tax Department estimated first year property tax impacts attributable to National Grid's portion of the Project. These impacts, affecting

three New Hampshire communities, total $579,200. The sum of Eversource and National Grid's first year property tax impacts, $678,850 and $579,200, respectively, equals the $1,258,050 first year property tax impact used in the above REMI analysis.

Q. Please describe how National Grid's Real Estate Services and Property Tax Department estimated first year property tax impacts in New Hampshire for National Grid's portion of the Project?

A. The Project team provided National Grid's Real Estate Services and Property Tax Department with information on the total cost of the Project, and the allocated costs to affected communities in National Grid's portion of the Project. This allocated cost was the basis for estimating the taxable value in the first full year in each community. Data on tax rates, expenditures, and tax bases were taken from the New Hampshire Department of Revenue Administration reports. Actual taxes paid by the Project would depend on the total cost and fair market value of the Project property in each community, government spending, other sources of revenue, and the tax base, after construction.

Q. Please provide an overview of the costs of the Project within each of the proposed host communities?

A. Three New Hampshire communities are impacted by National Grid's portion of the Project; Pelham, Hudson and Windham. Attachment B shows that the Project is estimated to cost National Grid $21,556,237 in Pelham, $3,121,268 in Hudson, and $8,689,228 in Windham. These costs, which are expected to result in a net increase in plant-in-service by the same amount for each town, are compared to the most recent town valuation.

Q. Please summarize National Grid's estimated Project property tax payments in the first year after construction to local New Hampshire communities?

A. Attachment B shows that Project tax payments are estimated at $376,800 for Pelham; $54,500 for Hudson; and $147,900 to Windham.

Q. Does that conclude your testimony?

A. Yes.

ATTACHMENT A

National Grid
40 Sylvan Road
Waltham, MA 02451-1120

781-907-3561
alfred.morrissyjr@us.ngrid.com

Alfred P. Morrissey, Jr

EDUCATION

PhD, MA, Economics, University of Notre Dame, 1984 and 1982 (3.78 GPA)

- Doctoral thesis, An Econometric Analysis of Home Energy Expenditures and Need, won "Joan Robinson Outstanding Dissertation Award"
- Passed PhD qualifying exam in microeconomics "With Distinction"
- Concentrated in econometrics, mathematical economics and economic theory
- Research Assistantship in Social Science Research and Training Lab
- Taught courses in economics and statistics

BA, Economics, University of Massachusetts at Amherst, 1978 (3.48 GPA)

- Course work included multiple statistics courses; regression analysis; honors econometrics; differential, integral and multivariable calculus; linear algebra; mathematical economics and theory.

PROFESSIONAL EXPERIENCE

Corporate Economist – Analytics, Modeling and Forecasting, National Grid, 2011-2015

- Economic impact analysis of various National Grid programs and initiatives, including energy efficiency, gas expansion, electric and gas capital spending and transmission project proposals
- Electric and gas load forecasting analysis and support
- Monthly analysis of economic conditions and energy markets

Lead Analyst, Electric Load Forecasting, National Grid, 2003-2011

- Responsible for all New England and New York company electric load forecasts
- Developed forecasting models, databases, monthly reports and variance analysis (PC SAS based)
- Defended electric forecasts as Witness in Niagara Mohawk and Narragansett Electric rate cases and in other regulatory proceedings in Massachusetts and New Hampshire

Principal Analyst, Meter Data Services, National Grid, 2000-2002

- Managed project to bring supplier load estimation system in-house
- Led New England Meter Data Services team during Niagara Mohawk integration

Supervisor, Load Forecasting, Eastern Utilities Associates (EUA), 1988-2000

- Managed EUA's Load Forecasting Section.

National Grid
40 Sylvan Road
Waltham, MA 02451-1120

781-907-3561
alfred.morrissyjr@us.ngrid.com

Energy Analyst, Load Forecasting and Analysis, American Electric Power, 1983-1988

- Analysis and forecasting of economic conditions and electric load for major electric utilities covering a seven state region.
- Econometric modeling and computer applications
- Preparation of written reports and presentations of results to upper management and outside organizations.

Lecturer, Ohio State University, Columbus, OH, 1984-1985

- Taught evening courses in microeconomics and macroeconomics

NATIONAL GRID WORKING GROUPS

Grid Modernization Benefit Cost Analysis Working Group
- Multi-department working group charged with estimating costs and benefits of Massachusetts Department of Public Utilities Grid Modernization objectives

Non-Wires Alternatives Working Group
- Multi-department working group to study non-wires alternatives to system planning (DG, DR, EE, Smart Grid) and recommend policy.

Monthly Income Meeting Working Group
- Multi-department group met monthly to discuss factors impact monthly electric income results, including volumes, weather, over/under, rate adjustments and accounting.

PROFESSIONAL AFFILIATIONS

ISO-NE Load Forecasting Committee (current member and Chair from 2009-2010)

New England Economic Partnership (current member and Board Member from 2003-2005)

PUBLICATIONS

"Estimating the Total Impact of New Industrial Plant on Total Electrical Energy Requirements," with N. N. VanToai, IEEE Transactions, August, 1988 and presented at the IEEE Summer Meeting (Load Forecasting Session), 1987 paper 87 SM 488-0.

Numerous working papers, planning reports and presentations.

nationalgrid

Property Tax Impact Estimate

Date: 5/17/2016

Date Requested: 4/29/2016

Company Name:

Project Name: Merrimack Valley Reliablity Project

Project Location:

State: **NH**

Town/Village [List if three (3) or fewer, else Multiple]: Hudson

Capital cost details:

Total Planned Capital Spending:	$ 3,121,268
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 3,121,268
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 54,500
5-year Cumulative Tax effect	$ 287,300

nationalgrid

Property Tax Impact Estimate

Date: 5/17/2016

Date Requested: 4/29/2016

Company Name:

Project Name: Merrimack Valley Reliablity Project

Project Location:

State: **NH**

Town/Village [List if three (3) or fewer, else Multiple]: Pelham

Capital cost details:

Total Planned Capital Spending:	$ 21,556,237
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 21,556,237
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 376,800
5-year Cumulative Tax effect	$ 1,855,500

nationalgrid

Property Tax Impact Estimate

Date: 5/17/2016

Date Requested: 4/29/2016

Company Name:

Project Name: Merrimack Valley Reliablity Project

Project Location:

State: **NH**

Town/Village [List if three (3) or fewer, else Multiple]: Windham

Capital cost details:

Total Planned Capital Spending:	$ 8,689,228
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 8,689,228
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 147,900
5-year Cumulative Tax effect	$ 750,900

STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

SEC Docket No. 2015-05

APPLICATION OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 345 kV TRANSMISSION LINE

SUPPLEMENTAL PRE-FILED TESTIMONY OF ALFRED P. MORRISSEY ON BEHALF OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Personal Background

Q. Please state your name, title, and business address.

A. My name is Alfred P. Morrissey. My title is Corporate Economist in National Grid's Analytics, Modeling and Forecasting Department. My business address is 40 Sylvan Road, Waltham, MA 02451.

Q. Briefly summarize your educational background and work experience.

A. I graduated from the University of Massachusetts at Amherst in 1978 with a BA degree in Economics. In 1981, I received a Master of Arts degree in Economics and in 1984, a Doctor of Philosophy degree in Economics, both from the University of Notre Dame. I have 31 years work experience in the electric utility industry.

I began my work career in 1983 as an Energy Analyst in the System Planning Department at the American Electric Power (AEP) company in Columbus, OH. While at AEP, I coauthored an article, published in IEEE Transactions on Power Systems (1988), on estimating the economic impact of a new industrial plant (or plant closing) on local employment, wages and electrical load. I also taught evening courses in economics at the Ohio State University. In 1988, I resigned my position at AEP and joined Eastern Utilities Associates (EUA) in West Bridgewater, MA as Load Forecast Analyst and later as Supervisor of Load Forecasting. Since EUA's merger with National Grid in 2000, I have continued to do load forecasting, economic analysis and, more recently, economic impact analysis of various National Grid programs and initiatives, including energy efficiency programs, gas expansion proposals, electric and gas capital spending plans and transmission project proposals. Please see Attachment A for my resume.

Q. Have you previously testified before the New Hampshire Site Evaluation Committee?

A. No, I have not.

Q. What is the purpose of your supplemental testimony?

A. NEP recently revised its Project cost estimate. The purpose of my supplemental testimony, therefore, is provide the Committee with updated information regarding the beneficial economic impact of the Project on the New Hampshire economy, the impact of those benefits on New Hampshire employment, income and gross state product, and to provide an estimate on property taxes that will be generated by the Project in the Towns of Pelham, Hudson, and Windham.

Q. Is there an Amended Study Report that accompanies your testimony?

A. Yes, the amended report is entitled, "Economic Impact of the Merrimack Valley Reliability Project, REMI Analysis of Construction Spending and Property Taxes," (Study Report) and is ~~included in the Application as Appendix A~~Jattached hereto..

Economic Impact Estimation Methodology

Q. How did you estimate the economic impacts of the Merrimack Valley Reliability Project that are expected during the construction phase of the Project?

A. I used the policy forecasting model by REMI.[1] Projected economic impacts were determined by taking the difference between a base case with no NH/MA transmission project and the case with the Merrimack Valley Reliability Project.

Q. What is the REMI policy forecasting model?

1 REMI is owned by Regional Economics Models, Incorporated and leased to its clients. Model description, documentation, applications and client lists can be found at www.remi.com.

A. REMI is a regional economic model based on public data and peer-reviewed methodology. National Grid leases a 160-sector version of the REMI model covering the State of New Hampshire and National Grid's Massachusetts service territory. REMI is used extensively in planning studies, with over 150 US and international clients, including federal, regional, state and local government planning agencies; energy consultants; universities; non-profit research institutions; utilities and other private sector firms. The REMI model is a complete macroeconomic representation of the New Hampshire and Massachusetts economies. By entering projections about the amount, timing and type of the Merrimack Valley Reliability Project investments, REMI provides estimates of their economic impact in New Hampshire and Massachusetts.

Q. Please summarize the investment spending amounts considered for the REMI analysis of the Project.

A. These are shown in Figure 1 (APM-1) in the Amended Study Report. Total planned spending on the Project is approximately $12~~3~~5 million from 2014 to 201~~7~~8, with $~~82~~72 million for the New Hampshire portion and $~~41~~53 million for the Massachusetts portion. Of the New Hampshire portion, $~~60.7~~50.5 million is planned for construction of the Project while $~~21.1~~21.4 million is for materials and equipment. For Massachusetts, $~~30.6~~39.9 million is for construction and $~~10.6~~1 million is for materials and equipment. Labor accounts for ~~approximately 74%~~70% of investment spending in ~~both states~~ New Hampshire and 75% in Massachusetts.

Q. How are these Project expenditures allocated to industries in REMI?

A. Figure 2 (APM-2) in the Amended Study Report shows the allocation of Project spending to industries in REMI.[2] All spending during the 2014 to 2015 planning sub phase is allocated to the professional, scientific and technical services industry. This includes engineering, design, planning, procurement, real estate, legal, permitting, and other professional services. No significant construction activity takes place during the planning sub phase and no materials are purchased.

Going forward, spending on professional services is expected to remain constant at $6.7 million per year, which is approximately equal to the 2015 levels, falling to zero in 2018 as the project quickly winds down. ~~the 2015 amount of spending on professional services, $4.3 million, continues through 2016 to 2017 as construction phase begins and spending ramps up sharply~~. The remaining amount of labor spending, $68.4~~77.0~~ million, is allocated to the power and communication structures construction industry in REMI with 5.0% allocated to waste management and remediation services, based on prior transmission project experience.

Spending on materials and equipment begins in 201~~7~~6. The majority of this, $~~23.8~~25.9 million or 75% is entered into REMI as an exogenous increase in investment demand for electric transmission, distribution and industrial apparatus. This has a relatively small impact on local economic activity because this category consists largely of equipment purchased from outside of the state. The remaining amount of materials spending, totaling $~~7.9~~8.6 million, is allocated to more local industries such as

[2] In preparing this update, I discovered an input error in the REMI economic impact analysis used for the original testimony and study report. Specifically, NEP mistakenly allocated 50% of Project spending on materials to electric apparatus and 50% to concrete and other materials. NEP meant to allocate 75% of total materials spending to electrical apparatus and 25% to concrete and other materials. Correcting this allocation resulted in a decrease of 36 annual jobs, or 582, down from the original estimate of 618.

crushed rock and concrete. This is input into REMI as an increase in final demand in the local cement, concrete product, lime, gypsum and other nonmetallic product manufacturing industry.

Q. How does investment spending impact the local economy during the planning and construction phase of the Project?

A. Transmission project spending creates jobs in construction, engineering, professional services and other industries as well as secondary jobs in the local service sector. The total economic impact consists of the direct, indirect and induced impacts. Direct impacts are tied directly to the Project, for example, the number of electrical contractors hired to install new transmission equipment. Indirect impacts are felt in the local supply chain, that is, industries providing goods and services for the Project. Induced impacts result from the spending of the direct and indirect workers and are felt mainly in the local service sector, for example, increased retail activity and hiring.

Q. Does REMI estimate the direct, indirect and induced impacts of transmission project spending?

A. Yes, REMI estimates the total impact of the spending, including the direct, indirect and induced impacts, also known as "multiplier effects." In addition, REMI contains regional purchase coefficients (RPCs) that estimate how much transmission project spending stays local and how much leaks out of the region to other suppliers. For example, spending on project labor has a much larger local economic impact or multiplier than spending on equipment because of higher RPCs. Spending on specialized electrical equipment such as transformers, breakers and cable, has low RPCs because these items tend to be purchased from outside the region.

Q. Why is investment spending on the Massachusetts portion of the Merrimack Valley Reliability Project included in the analysis?

A. Because of their close proximity, there are linkages between the Massachusetts and New Hampshire economies. As a result, the Massachusetts portion of the MVRP impacts both the Massachusetts and New Hampshire economies. For example, some labor for the Massachusetts portion of the MVRP may be supplied from New Hampshire, especially since the MVRP takes place in Essex and Middlesex counties which border southern New Hampshire. The REMI model includes estimates of the strength of these linkages. Overall, REMI estimates that project spending in Massachusetts will support 26 annual jobs in New Hampshire.

Employment Impact

Q. Please summarize the construction phase employment impacts of the Merrimack Valley Reliability Project.

A. Figure 3 (APM-3) in the Amended Study Report shows total employment impacts during the construction phase. Spending on construction and materials is expected to generate over 1,000 job years in New Hampshire and Massachusetts, or 2~~5~~00 jobs per year on average from 2014 through 201~~7~~8 (a "job year" is equal to one ~~full-time~~ job for a period of one year). Over ~~6~~500 job years are supported in New Hampshire and over ~~approximately~~ 4~~0~~50 job years in Massachusetts.

Q. Please provide details on the estimated number of jobs associated with the Project during the construction phase for New Hampshire specifically.

A. Figure 3 (APM-3) in the Amended Study Report shows that the Project is expected to support a total of ~~618~~545 job years in New Hampshire over the ~~four~~five -year construction period. That amounts to an average of 1~~55~~09 jobs per year in New Hampshire from 2014 to 201~~7~~8. Figure 4 (APM-

4) in the Amended Study Report illustrates the year-by-year employment impact. This is expected to be greatest in 2017, when construction spending is at its highest, supporting ~~415~~318 annual jobs. Most jobs are expected to be created in southern New Hampshire, in Hillsboro and Rockingham counties where the spending takes place, based on REMI analyses carried out for regions with county-level detail.

Q. How are these jobs distributed across New Hampshire industries?

A. Figure 5 (APM-5) in the Amended Study Report shows employment impacts by New Hampshire industry. The largest impact is in construction, which accounts for ~~231~~200 annual jobs or 37% of the total employment impact. However, a wide range of other industries also benefit. For example, professional services, which tends to be higher paying than construction, accounts for ~~98~~103 annual jobs, or 1~~6~~9% of the total. This includes engineering, management, planning, design, legal, and other professional services. REMI also estimates a significant impact to New Hampshire manufacturing due to suppliers of local materials such as concrete. There are also significant impacts in the finance, insurance and real estate industry and in remediation and waste management services due to the nature of the transmission project spending. Finally, there are significant impacts to retail trade and other services, which include health, education, government and recreation. These reflect the induced economic impacts of project spending, that is, the impact of the above workers spending on local goods and services.

Other Economic Impacts

Q. Please summarize the estimated increase in real New Hampshire GDP, personal income and tax revenue associated with the Project during the construction phase.

A. As shown on Figure 3 (APM-3) in the Amended Study Report, REMI estimates that the Project will raise real GDP in New Hampshire by $~~73.5~~62.8 million during the construction period, or $1~~8.4~~2.6 million per year; and raise real personal income by $~~35.1~~32.8 million, or $~~8.8~~6.6 million per year. Finally, the Project is expected to raise state tax revenues by $1.~~3~~2 million during the construction period. This is based on state tax revenues from all sources as a percent of personal income, and the increase in personal income projected by REMI.

Q. Please summarize the New Hampshire employment, GDP, personal income and state tax revenue impacts per million dollars of total New Hampshire Project spending.

A. Each one million dollars of New Hampshire Project spending is expected to support 7.6 annual jobs; raise~~s~~ New Hampshire GDP by $~~899,250~~872,106; raise~~s~~ personal income by $~~429,433~~455,316; and raise~~s~~ state tax revenues by $~~15,888~~16,847. These multipliers are obtained by dividing total job years, GDP, personal income and state tax revenue over the 2014 to 201~~7~~8 planning and construction period by total New Hampshire Project spending. Note that these estimates are in line with other transmission project economic impact studies.[3]

Ongoing Economic Benefits

Q. Once construction of the proposed Project is complete, will there be ongoing economic benefits associated with the operation and maintenance of the proposed Project?

A. Yes, the Project is expected to raise annual property tax payments to local governments in New Hampshire by $~~1,557,550~~1,258,050 the first year it is put in service.

3 Study Report Bibliography: Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving (June 2014), London Economics (June 9, 2014) and University of Minnesota Duluth, Labovitch School of Business (November 2010).

Q. How did you estimate the economic impact of these property tax payments?

A. The analysis assumes that the increased property tax revenues will be spent by local governments. REMI estimates that a $~~1,557,550~~1,258,050 increase in local government spending in New Hampshire will lead to the creation of ~~34~~27 annual jobs, including direct, indirect and induced effects of the spending. Figure 7 (APM-6) in the Amended Study Report shows the projected annual impact.

Q. Besides increased property tax revenue, will there be other ongoing economic benefits associated with the operation and maintenance of the proposed Merrimack Valley Reliability Project?

A. No, other ongoing economic benefits associated with operation and maintenance are anticipated to be minimal. The new transmission line will utilize existing right-of-ways that already require maintenance without the presence of the Project. Therefore, incremental operation and maintenance spending and associated economic benefits are expected to be insignificant.

Property Tax Estimates

Q. How were the first year property tax impacts used in the above REMI analysis estimated?

A. Eversource and National Grid developed estimates of first year property tax impacts to local New Hampshire governments based on the expected value of the new equipment placed into service and local property tax rates. The development of Eversource's estimated property tax payments is laid out in the pre-filed testimony of Dr. Lisa K. Shapiro. For the REMI analysis, I took the mid-point of Dr. Shapiro's estimated range of property tax payments to two local communities and two counties, totaling $678,850. National Grid's Real Estate Services and Property Tax Department estimated first

year property tax impacts attributable to National Grid's portion of the Project. These impacts, affecting three New Hampshire communities, total $~~878,700~~579,200. The sum of Eversource and National Grid's first year property tax impacts, $678,850 and $~~878,700~~579,200, respectively, equals the $~~1,557,550~~1,258,050 first year property tax impact used in the above REMI analysis.

Q. Please describe how National Grid's Real Estate Services and Property Tax Department estimated first year property tax impacts in New Hampshire for National Grid's portion of the Project?

A. The Project team provided National Grid's Real Estate Services and Property Tax Department with information on the total cost of the Project, and the allocated costs to affected communities in National Grid's portion of the Project. This allocated cost was the basis for estimating the taxable value in the first full year in each community. Data on tax rates, expenditures, and tax bases were taken from the New Hampshire Department of Revenue Administration reports. Actual taxes paid by the Project would depend on the total cost and fair market value of the Project property in each community, government spending, other sources of revenue, and the tax base, after construction.

Q. Please provide an overview of the costs of the Project within each of the proposed host communities?

A. Three New Hampshire communities are impacted by National Grid's portion of the Project; Pelham, Hudson and Windham. Attachment B shows that the Project is estimated to cost National Grid $~~28,993,118~~21,556,237 in Pelham, $~~4,198,102~~3,121,268 in Hudson, and $~~11,687,004~~8,689,228 in Windham. These costs, which are expected to result in a net increase in plant-in-service by the same amount for each town, are compared to the most recent town valuation.

Q. Please summarize National Grid's estimated Project property tax payments in the first year after construction to local New Hampshire communities?

A. Attachment B shows that Project tax payments are estimated at $~~571,700~~376,800 for Pelham; $~~71,200~~54,500 for Hudson; and $~~235,800~~147,900 to Windham.

Q. Does that conclude your testimony?

A. Yes.

Economic Impact of the Merrimack Valley Reliability Project

REMI Analysis of Construction Spending and Property Taxes

Alfred P. Morrissey
Corporate Economist
National Grid Analytics, Modeling and Forecasting Department

May 2016

Introduction

Eversource and National Grid plan to invest an estimated $125 million on construction of the Merrimack Valley Reliability Project, including $72 for the New Hampshire portion of the project and $53 million for Massachusetts. These investments will create hundreds of jobs and boost local income, gross domestic product (GDP) and tax revenues in the two States. During the planning and construction phase, through 2018, the investments will have an immediate impact on jobs, incomes and local GDP. Over the long-term, the investments will provide permanent economic gains due to on-going O&M spending and the Project's impact on efficiency, reliability and the ability to accommodate load growth.

Methodology

The Project team used the policy forecasting model by Regional Economic Models, Incorporated (REMI) to estimate these economic impacts.[1] REMI is used extensively in planning studies, with over 150 US and international clients, including federal, regional, state and local government planning agencies; energy consultants; universities; non-profit research institutions; and utilities. National Grid leases a 160 industry, 65 region version of the model covering the State of New Hampshire and all Massachusetts counties.

REMI Model Overview

The REMI model is a complete representation of the macroeconomic structure of the New Hampshire and Massachusetts regional economies. By entering assumptions about the amount, timing and type of transmission project expenditures, REMI projects their economic impact in New Hampshire and Massachusetts.

REMI includes an input-output model that captures the industry structure of the region and linkages between industries. As transmission project spending raises demand in various industries throughout the economy, REMI quantifies the impact on related industries, locally and outside of the region. In this way, REMI estimates the total economic impact of the transmission project spending.

The total economic impact consists of three parts, direct, indirect and induced impacts. Direct impacts are tied directly to the project, for example, the number of electrical contractors hired to install new transmission equipment. Indirect impacts are felt in the local supply chain, that is, industries providing goods and services for the project. Induced impacts result from the spending of the direct and indirect workers and are felt mainly in the local service sector, for example, increased retail activity and hiring. The indirect and induced impacts of construction project spending are sometimes referred to as "multiplier effects".

[1] REMI is owned by Regional Economic Models, Incorporated and leased to its clients. The Project team used the REMI PI+ model (v1.6) for New Hampshire and Massachusetts for this study. Model documentation and description of methodology can be found at http://www.remi.com.

Stand-alone input-output models are static in that they assume prices, wage rates and other input costs are constant over time.[2] REMI integrates its input-output model with a general equilibrium model that accounts for the impact of transmission project spending on these costs and how labor markets, businesses and consumers respond. Equilibrium is reached when supply equals demand after the transmission spending shock. REMI employs econometric methods to estimate the response of consumers and businesses to changes in prices, wage rates and other factor costs.

The share of local markets that a local industry captures is known as its regional purchase coefficient (RPC). For example, in the case of transmission project spending, RPCs for the various industries affected determine how much transmission project spending stays local and how much leaks out of the region to other suppliers. REMI estimates industry RPCs based on an economic geography model that takes into account the local industrial base, transportation costs, industry clustering, agglomeration effects and overall regional competitiveness. These factors influence interregional trade flows and the ability of local firms to meet local demand.

Project Expenditures

Figure 1 shows projected investment spending during the 2014–2018 planning and construction phase of the Project. Spending is broken down by state, county and type of expenditure, labor versus materials.

Of the total $124.6 million in project spending, $90.0 million is allocated to labor and $34.6 million to materials. For New Hampshire, which accounts for 58% of total spending, $50.5 million is allocated to labor and $21.4 to materials. For Massachusetts, $39.5 million is allocated to labor and $13.1 million to materials. The share of total spending devoted to labor is approximately 70% for New Hampshire and 75% for Massachusetts.

All New Hampshire spending occurs in Hillsboro and Rockingham counties and this is where the economic impact is expected to be greatest. However, county-level detail is not available in the REMI model for the New Hampshire region. Therefore, spending for Hillsboro and Rockingham counties is aggregated to the New Hampshire level before being input to REMI. As a result, study results are only available for the state of New Hampshire as a whole.

[2] Two other widely used input-output models are IMPLAN (www.implan.com) and RIMS II (www.bea.gov/regional/rims). For a comparison of the REMI, IMPLAN and RIMS II models, see Rickman and Schwer (1993), Lynch (2000) and McNeil (2013).

Figure 1 – Project Spending by State, County and Category ($ Million)

	2014	*2015*	*2016*	*2017*	*2018*	Total
Labor: Planning thru Construction						
Hillsboro NH	$0.4	$1.7	$3.7	$15.1	$0.8	$21.7
Rockingham NH	$0.8	$1.7	$5.0	$21.1	$0.3	$28.9
NH Labor Total	**$1.1**	**$3.4**	**$8.7**	**$36.2**	**$1.1**	**$50.5**
Essex MA	$0.0	$0.3	$0.2	$3.0	$0.2	$3.7
Middlesex MA	$0.2	$3.1	$4.6	$26.2	$1.6	$35.7
MA Labor Total	**$0.3**	**$3.4**	**$4.8**	**$29.2**	**$1.8**	**$39.5**
Total Project Labor	**$1.4**	**$6.8**	**$13.5**	**$65.4**	**$2.9**	**$90.0**
Materials and Equipment						
Hillsboro NH	$0.0	$0.0	$8.3	$1.3	$0.0	$9.6
Rockingham NH	$0.0	$0.0	$5.0	$6.9	$0.0	$11.9
NH Materials Total	**$0.0**	**$0.0**	**$13.3**	**$8.2**	**$0.0**	**$21.4**
Essex MA	$0.0	$0.0	$1.4	$0.0	$0.0	$1.4
Middlesex MA	$0.0	$0.0	$11.7	$0.0	$0.0	$11.7
MA Materials Total	**$0.0**	**$0.0**	**$13.1**	**$0.0**	**$0.0**	**$13.1**
Total Project Materials	**$0.0**	**$0.0**	**$26.4**	**$8.2**	**$0.0**	**$34.6**
Total Project Spending						
Hillsboro NH	$0.4	$1.7	$12.0	$16.4	$0.8	$31.2
Rockingham NH	$0.8	$1.7	$10.0	$28.0	$0.3	$40.7
NH Project Total	**$1.1**	**$3.4**	**$21.9**	**$44.4**	**$1.1**	**$72.0**
Essex MA	$0.0	$0.3	$1.6	$3.0	$0.2	$5.1
Middlesex MA	$0.2	$3.1	$16.3	$26.2	$1.6	$47.4
MA Project Total	**$0.3**	**$3.4**	**$17.9**	**$29.2**	**$1.8**	**$52.6**
Project Grand Total	**$1.4**	**$6.8**	**$39.9**	**$73.6**	**$2.9**	**$124.6**

Source: Eversource and National Grid current spending projections.

Construction Phase Benefits

Transmission project spending creates jobs in construction, engineering, professional services and other industries as well as secondary jobs in the local service sector. The total economic impact consists of the direct, indirect and induced impacts discussed above. Changes in demand affecting industries that are highly interconnected to the regional economy tend to have a greater local economic impact than those for industries that are not closely linked to the regional economy. RPCs determine how much transmission project spending stays local and how much leaks out of the region to other suppliers. Spending on project labor has the largest economic impact because of higher RPCs. Spending on specialized transmission equipment such as transformers, breakers, cable, etc. has very little economic impact because of low RPCs. These items are purchased from outside the region, limiting any local impact to warehousing and distribution.

Allocation of Expenditures to Industries

Figure 2 shows the allocation of project spending to industries in REMI. All spending during the 2014 to 2015 planning sub phase is allocated to the professional, scientific and technical services industry. This includes engineering, design, planning, procurement, real estate, legal, permitting, and other professional services. No significant construction activity takes place during the planning sub phase and no materials are yet purchased.

Going forward, spending on professional services is expected to remain constant at $6.7 million per year, which is approximately equal to 2015 levels, falling to zero in 2018 as the project quickly winds down. The remaining amount of labor spending, $68.4 million, is allocated to the power and communication structures construction industry with 5.0% allocated to waste management and remediation services, based on prior transmission project experience.

Figure 2 – Allocation of Project Spending to Industries in REMI ($ Million)

Industry	***2014***	***2015***	***2016***	***2017***	***2018***	Total
Professional Services						
New Hampshire	$1.1	$3.4	$3.4	$3.4	$0.0	$11.4
Essex MA	$0.0	$0.3	$0.2	$0.2	$0.0	$0.7
Middlesex MA	$0.2	$3.1	$3.1	$3.1	$0.0	$9.5
Total	$1.4	$6.8	$6.7	$6.7	$0.0	**$21.6**
Power and Communication Structures Construction						
New Hampshire	$0.0	$0.0	$4.8	$31.0	$1.0	$36.8
Essex MA	$0.0	$0.0	$0.0	$2.7	$0.2	$2.9
Middlesex MA	$0.0	$0.0	$1.3	$21.8	$1.5	$24.6
Total	$0.0	$0.0	$6.1	$55.5	$2.7	**$64.3**
Waste Management and Remediation Services						
New Hampshire	$0.0	$0.0	$0.4	$1.8	$0.1	$2.3
Essex MA	$0.0	$0.0	$0.0	$0.2	$0.0	$0.2
Middlesex MA	$0.0	$0.0	$0.2	$1.3	$0.1	$1.6
Total	$0.0	$0.0	$0.7	$3.3	$0.1	**$4.1**
Electrical Apparatus						
New Hampshire	$0.0	$0.0	$9.9	$6.1	$0.0	$16.1
Essex MA	$0.0	$0.0	$1.1	$0.0	$0.0	$1.1
Middlesex MA	$0.0	$0.0	$8.8	$0.0	$0.0	$8.8
Total	$0.0	$0.0	$19.8	$6.1	$0.0	**$25.9**
Concrete and Other Materials						
New Hampshire	$0.0	$0.0	$3.3	$2.0	$0.0	$5.4
Essex MA	$0.0	$0.0	$0.4	$0.0	$0.0	$0.4
Middlesex MA	$0.0	$0.0	$2.9	$0.0	$0.0	$2.9
Total	$0.0	$0.0	$6.6	$2.0	$0.0	**$8.6**
Grand Total	**$1.4**	**$6.8**	**$39.9**	**$73.6**	**$2.9**	**$124.6**

Spending on materials and equipment begins in 2016. The majority of this, $25.9 million or 75% is entered into REMI as an exogenous increase in investment demand for electric transmission, distribution and industrial apparatus. This has a relatively small impact on local jobs, income, GDP and tax revenue because this category consists largely of equipment purchased from outside of the state.

The remaining amount of materials spending, totaling $8.6 million, is allocated to more local industries such as crushed rock and concrete. This is input into REMI as an increase in final demand in the local cement, concrete product, lime, gypsum and other nonmetallic product manufacturing industry.

Construction Phase Impact Study Results

Economic impact results are summarized in Figure 3. These are total economic impacts including the direct, indirect and induced effects discussed above. Spending on construction and materials is expected to support over 1,000 annual jobs in New Hampshire and Massachusetts over the next four years, or 200 jobs per year on average from 2014 through 2018.[3] Over 500 annual jobs are supported in New Hampshire and over 450 annual jobs in Massachusetts.

Figure 3 – Summary of Economic Impacts during Construction Phase by State

Calendar Year	*2014*	*2015*	*2016*	*2017*	*2018*	**Total**
Total						
Employment (job years)	21	91	282	564	51	**1,009**
Regional GDP ($2015m)	$2.1	$9.6	$32.4	$77.4	$5.7	**$127.3**
Personal Income ($2015m)	$1.2	$5.5	$17.8	$36.4	$6.5	**$67.4**
State Tax Revenue ($2015m)	$0.1	$0.3	$0.9	$1.8	$0.3	**$3.4**
New Hampshire						
Total Employment (jobs)	16	49	138	318	24	**545**
Regional GDP ($2015m)	$1.5	$4.5	$14.9	$39.8	$2.1	**$62.8**
Personal Income ($2015m)	$0.8	$2.7	$8.2	$18.5	$2.6	**$32.8**
State Tax Revenue ($2015m)	$0.0	$0.1	$0.3	$0.7	$0.1	**$1.2**
Massachusetts						
Total Employment (jobs)	6	42	144	246	27	**465**
Regional GDP ($2015m)	$0.7	$5.1	$17.5	$37.6	$3.6	**$64.5**
Personal Income ($2015m)	$0.3	$2.8	$9.6	$17.9	$3.9	**$34.6**
State Tax Revenue ($2015m)	$0.0	$0.2	$0.6	$1.1	$0.3	**$2.2**

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Investment spending is expected raise real GDP by $62.8 million in New Hampshire and $64.5 million in Massachusetts during the five-year planning and construction phase.

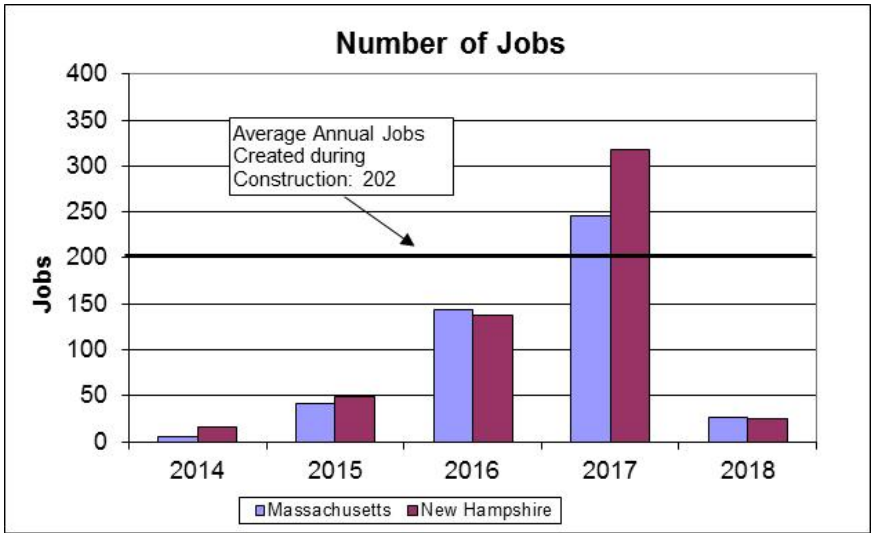
[3] The total number of annual jobs supported over the 2014 to 2017 construction period is also referred to as "job years." A job year is equal to one job for a period of one year.

The impact on real personal income is $32.8 million in New Hampshire and $34.6 million in Massachusetts.

The increase in economic activity is also expected to generate more state tax revenue. This is estimated using 2013 state tax revenues from all sources as a percent of personal income.[4] This yields an effective tax rate on personal income of 3.7% for New Hampshire and a 6.4% for Massachusetts. Applying these percentages to the increase in personal income projected by REMI yields the state tax revenue impacts shown in Figure 3. State tax revenue impacts total $1.2 million for New Hampshire and $2.2 million for Massachusetts during the planning and construction phase.

Employment impacts are greatest in 2017 when construction spending is at its highest. For example, the number of annual jobs supported rises to 564 in 2017 compared to an average of 202 jobs per year during the entire 2014-2018 construction phase. This is illustrated on Figure 4.

Figure 4 – Job Impacts by State



Because of their close proximity, Massachusetts project spending is expected to impact both the Massachusetts and New Hampshire economies, and vice versa. For example, some labor for the Massachusetts portion of the project may be supplied from New Hampshire, especially since the project takes place in Essex and Middlesex counties, which border southern New Hampshire. Because of these economic linkages, REMI estimates that Massachusetts project spending accounts for 26 annual jobs in New Hampshire

[4] Federation of Tax Administrators, 2013 State Tax Revenues and % of Personal Income. See: http://www.taxadmin.org/fta/rate/13taxbur.html.

Employment Impacts by Industry

Figure 5 summarizes employment impacts by major industry and state. In both states, the greatest employment impact is in the construction industry. However, a wide range of other industries also benefit from project spending. For example, the professional services industry, which tends to be higher paying, accounts of 19% of the total number of jobs supported in each state. This includes engineering, management, planning, design, legal and other professional services. In both states, there is a significant impact to local manufacturing. This is due to suppliers of local materials such as concrete. There are also significant impacts to retail trade and other services, which include health, education, government and recreation. These reflect the induced economic impacts of project spending.

Figure 5 – Employment Impacts by Industry and State

	2014	*2015*	*2016*	*2017*	*2018*	Total
New Hampshire						
Construction	2	6	33	141	18	200
Manufacturing	0	0	21	17	0	38
Wholesale Trade	0	0	2	4	0	6
Retail Trade	1	4	11	23	1	39
Transportation and Warehousing	0	0	1	2	0	3
Finance, Insurance, Real Estate	1	4	7	12	1	25
Professional Services	8	24	30	40	1	103
Administrative and Waste Mgt	0	1	5	14	0	20
Accommodation and Food Services	0	1	4	8	1	15
Other Services	3	8	24	58	2	95
Mining and Utilities	0	0	1	1	0	1
Total New Hampshire	**16**	**49**	**138**	**318**	**24**	**545**
Massachusetts						
Construction	0	3	15	73	12	104
Manufacturing	0	1	37	10	0	49
Wholesale Trade	0	1	3	6	0	10
Retail Trade	0	3	9	15	2	28
Transportation and Warehousing	0	0	2	3	0	6
Finance, Insurance, Real Estate	1	4	9	17	1	32
Professional Services	2	18	27	38	2	87
Administrative and Waste Mgt	0	2	8	20	1	31
Accommodation and Food Services	0	2	5	9	2	18
Other Services	1	9	28	54	6	99
Mining and Utilities	0	0	0	0	0	0
Total Massachusetts	**6**	**42**	**144**	**246**	**27**	**465**

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Impacts Per $ Million Spending

Figure 6 shows employment, GDP, personal income and state tax revenue impacts per million dollars of total project spending by state. REMI estimates that each $1.0 million in annual New Hampshire project spending will support 7.6 annual jobs in the State while each $1.0 million of annual spending in Massachusetts will support 8.8 annual jobs in that State. These estimates are in line with other transmission project economic impact studies.[5] Project spending tends to have a relatively greater impact in Massachusetts than New Hampshire because RPCs tend to increase with the size of the region.

Figure 6 – Economic Impacts per $1.0 Million of Project Spending by State

	New Hampshire	Massachusetts
Job Years	7.6	8.8
GDP	$872,106	$1,226,931
Personal Income	$455,316	$657,757
State Tax Revenue	$16,847	$42,096

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Economic Impact of Property Taxes

Increased operations and maintenance (O&M) spending after the Project is placed into service will also have a positive economic impact, primarily due to increased property tax payments to the affected New Hampshire and Massachusetts towns. Other increases in O&M spending are expected to be minimal because the new transmission line is being constructed along existing rights of way that will need to be maintained anyway.

Unlike the construction phase economic benefits, which are temporary, the economic impact of higher property tax revenues to the affected towns is long-term. Increased property tax payments were estimated by National Grid and Eversource based on the expected value of the new equipment placed into service and local property tax rates. First year property tax impacts to affected counties and towns are estimated at $1,258,050 for New Hampshire and $698,375 for Massachusetts.

These property tax revenues are entered into REMI as an increase in local government spending order to estimate their potential economic impact. REMI estimates that a $1,258,050 annual increase in local government spending in New Hampshire will lead to

[5] See for example Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving (June 2014), London Economics (June 9, 2014) and University of Minnesota Duluth, Labovitch School of Business (November 2010).

the creation of 27 annual jobs, including direct, indirect and induced jobs. A $698,375 annual increase in local government spending in Massachusetts will lead to the creation of 11 annual jobs. Like the property tax revenues themselves, these impacts are expected to gradually diminish over time as the equipment depreciates. Figure 7 summarizes the projected first year annual economic impact due to increased property tax revenue to local governments.

Figure 7 – Impact of Increased Property Tax Revenue

	New Hampshire	Massachusetts
Increased Property Tax Revenue	$1,258,050	$698,375
Annual Jobs Created	27	11
Personal Income ($2015)	$1,556,200	$969,000

Source: National Grid and Eversource estimated increase in property tax payments to affected towns and REMI regional economic model.

Other Long-Term Economic Impacts

Other long-term benefits of the Project include the potential for lower market electricity prices; higher efficiency and reliability; and the ability to accommodate load growth. All of these benefits have permanent economic impacts as well. However, these are not addressed here.

For example, reduced electricity costs for businesses increase regional competitiveness, leading to more sales and hiring. On the residential side, lower electricity costs increase local purchasing power and spending, leading to an overall increase in local economic activity.

Many of the long-term benefits of the Project result from accommodating load growth and avoiding job losses and other negative economic impacts that would result if reliability were not maintained. Maintaining electric reliability is also valuable because power outages are costly to businesses and consumers. Like any business cost, outages reduce regional competitiveness, spending and hiring, resulting in job and income losses.

Bibliography

"Estimating the Total Impact of New Industrial Plant on Total Electrical Energy Requirements," Alfred P. Morrissey and Norman N. VanToai, IEEE Transactions, August, 1988 and presented at the IEEE Summer Meeting (Load Forecasting Session), 1987 paper 87 SM 488-0.

Regional Economic Models, Inc. REMI PI+ v1.6 model documentation and explanation of methodology, www.remi.com.

Minnesota IMPLAN Group, Inc., model information: www.implan.com

RIMS II model information and user guide: www.bea.gov/regional /rims

A Systematic Comparison of the REMI and IMPLAN Models: the Case of Southern Nevada," Dan S. Rickman and R. Keith Schwer, The Review of Regional Studies, Fall 1993.

"Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN and REMI," Dr. Tim Lynch, Florida State University. Prepared for US Department of Transportation, October 2000.

"IMPLAN, RIMS-II and REMI Economic Impact Models, Comparisons in Context of EB-5 Analysis," John Neill, Vice President, AKRF, Inc., www.akrf.com, May 2013.

"Estimating Trade Flow Parameters (Industry Betas and Sigmas), Frederick Treyz, Ph.D., Nicolas Mata, Sherri Lawrence, Regional Economic Models, Inc., May 2010. Available at: www.remi.com.

"Economic Impact Analysis of PSE&G's Capital Expenditure Program," Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving. Edward J. Bloustein School of Planning and Public Policy, Rutgers, The State University of New Jersey, June 2014. Available at: www.pseg.com.

"Analysis of the Macroeconomic Impacts of the Proposed New England Clean Power Link Project, Using the Regional Economic Models, Inc. ("REMI") PI+ Model,", London Economics International (contact Julia Frayer and Victor Chung), June 9, 2014. Available at: www.necplink.com/docs/announcements/Analysis_of_the_Macroeconomic_Impacts_of_NECPL_Project.pdf.

"The Economic Impact of Constructing Five Electric Power Lines in Minnesota, North Dakota, South Dakota and Wisconsin," University of Minnesota Duluth, Labovitch School of Business and Economics (Project Contact, Randy Fordice), November 2010. Available at: www.capx2020.com.

"Updated Analysis of the Macroeconomic Impact of the Proposed Champlain Hudson Power Express Project in New York, Using the Regional Economic Models, Inc. ("REMI") PI+ Model, ," London Economics International (contact Julia Frayer and Cherrylin Trinidad), June 6, 2012.

"Employment and Economic Impacts of Transmission Line Construction in Montana," Barbara Wagner, Senior Economist, Research and Analysis Bureau, Montana Department of Labor and Industry, July 30, 2010. Available at: www.ourfactsyourfuture.org.

"Transmission Line Jobs and Economic Development Impact (JEDI) Model User Reference Guide," Marshall Goldberg, MRG and Associates, and David Keyser, National Renewable Energy Laboratory, October 2013. Available at: www.nrel.gov/publications.

Economic Impact of the Merrimack Valley Reliability Project

REMI Analysis of Construction Spending and Property Taxes

Alfred P. Morrissey
Corporate Economist
National Grid Analytics, Modeling and Forecasting Department

~~**June 2015**~~
May 2016

Introduction

Eversource and National Grid plan to invest an estimated $~~123~~125 million on construction of the Merrimack Valley Reliability Project, including $~~82~~72 for the New Hampshire portion of the project and $~~41~~53 million for Massachusetts. These investments will create hundreds of jobs and boost local income, gross domestic product (GDP) and tax revenues in the two States. During the planning and construction phase, through ~~2017~~2018, the investments will have an immediate impact on jobs, incomes and local GDP. Over the long-term, the investments will provide permanent economic gains due to on-going O&M spending and the Project's impact on efficiency, reliability and the ability to accommodate load growth.

Methodology

The Project team used the policy forecasting model by Regional Economic Models, Incorporated (REMI) to estimate these economic impacts.[1] REMI is used extensively in planning studies, with over 150 US and international clients, including federal, regional, state and local government planning agencies; energy consultants; universities; non-profit research institutions; and utilities. National Grid leases a 160 industry, 65 region version of the model covering the State of New Hampshire and all Massachusetts counties.

REMI Model Overview

The REMI model is a complete representation of the macroeconomic structure of the New Hampshire and Massachusetts regional economies. By entering assumptions about the amount, timing and type of transmission project expenditures, REMI projects their economic impact in New Hampshire and Massachusetts.

REMI includes an input-output model that captures the industry structure of the region and linkages between industries. As transmission project spending raises demand in various industries throughout the economy, REMI quantifies the impact on related industries, locally and outside of the region. In this way, REMI estimates the total economic impact of the transmission project spending.

The total economic impact consists of three parts, direct, indirect and induced impacts. Direct impacts are tied directly to the project, for example, the number of electrical contractors hired to install new transmission equipment. Indirect impacts are felt in the local supply chain, that is, industries providing goods and services for the project. Induced impacts result from the spending of the direct and indirect workers and are felt mainly in the local service sector, for example, increased retail activity and hiring. The

[1] REMI is owned by Regional Economic Models, Incorporated and leased to its clients. The Project team used the REMI PI+ model (v1.6) for New Hampshire and Massachusetts for this study. Model documentation and description of methodology can be found at http://www.remi.com.

indirect and induced impacts of construction project spending are sometimes referred to as "multiplier effects".

Stand-alone input-output models are static in that they assume prices, wage rates and other input costs are constant over time.[2] REMI integrates its input-output model with a general equilibrium model that accounts for the impact of transmission project spending on these costs and how labor markets, businesses and consumers respond. Equilibrium is reached when supply equals demand after the transmission spending shock. REMI employs econometric methods to estimate the response of consumers and businesses to changes in prices, wage rates and other factor costs.

The share of local markets that a local industry captures is known as its regional purchase coefficient (RPC). For example, in the case of transmission project spending, RPCs for the various industries affected determine how much transmission project spending stays local and how much leaks out of the region to other suppliers. REMI estimates industry RPCs based on an economic geography model that takes into account the local industrial base, transportation costs, industry clustering, agglomeration effects and overall regional competitiveness. These factors influence interregional trade flows and the ability of local firms to meet local demand.

Project Expenditures

Figure 1 shows projected investment spending during the 2014~~–2017~~2018 planning and construction phase of the Project. Spending is broken down by state, county and type of expenditure, labor versus materials.

Of the total $~~122.9~~124.6 million in project spending, $~~91.2~~90.0 million is allocated to labor and $~~31.7~~34.6 million to materials. For New Hampshire, which accounts for ~~66~~58% of total spending, $~~60.7~~50.5 million is allocated to labor and $21.~~1~~4 to materials. For Massachusetts, $~~30.6~~39.5 million is allocated to labor and $~~10.6~~13.1 million to materials. The share of total spending devoted to labor is approximately ~~74~~70% for ~~both states~~New Hampshire and 75% for Massachusetts.

All New Hampshire spending occurs in Hillsboro and Rockingham counties and this is where the economic impact is expected to be greatest. However, county-level detail is not available in the REMI model for the New Hampshire region. Therefore, spending for Hillsboro and Rockingham counties is aggregated to the New Hampshire level before being input to REMI. As a result, study results are only available for the state of New Hampshire as a whole.

[2] Two other widely used input-output models are IMPLAN (www.implan.com) and RIMS II (www.bea.gov/regional/rims). For a comparison of the REMI, IMPLAN and RIMS II models, see Rickman and Schwer (1993), Lynch (2000) and McNeil (2013).

Figure 1 – Project Spending by State, County and Category ($ Million)

	2014	*2015*	*2016*	*2017*	*2018*	Total
Labor: Planning thru Construction						
Hillsboro NH	$0.4	$1.47	$3.7	$715.1	$20.50.8	$29.321.7
Rockingham NH	$0.8	$1.67	$5.0	$621.1	$0.3	$22 28.9	$31 .4
NH Labor Total	**$1.1**	**$3.04**	**$8.7**	**$1336.2**	**$43 .41.1**	**$60.750.5**
Essex MA	$0.0	$0.3	$0.2	$13.0	$0.2.8	$4.03.7
Middlesex MA	$0.2	$13.1	$4.6.1	$19 .1	$26 .52	$1.6	$35.7
MA Labor Total	**$0.3**	**$1.3.4**	**$7.14.8**	**$21 .92 9.2**	**$30 .61.8**	**$39.5**
Total Project Labor	**$1.4**	**$4.36.8**	**$20.313.5**	**$65 .24**	**$91 .2.9**	**$90.0**
Materials and Equipment						
Hillsboro NH	$0.0	$0.0	$2.28.3	$7. 1.3	$0.0	$9.46
Rockingham NH	$0.0	$0.0	$2.85.0	$86 .9	$0.0	$11.79
NH Materials Total	**$0.0**	**$0.0**	**$5.013.3**	**$16 .18.2**	**$0.0**	**$21.14**
Essex MA	$0.0	$0.0	$0.31.4	$0. 90	$0.0	$1.24
Middlesex MA	$0.0	$0. 0	$1. 8	$11.7.6	$9. 40. 0	$0.0	$11.7
MA Materials Total	**$0.0**	**$0.0**	**$213.1**	**$8. 60. 0**	**$10 .60. 0**	**$13.1**
Total Project Materials	**$0.0**	**$0.0**	**$7.126.4**	**$8.2**	**$0.0**	**$24 34.6**	**$31 .7**
Total Project Spending						

Formatted Table
Inserted Cells
Inserted Cells
Inserted Cells
Deleted Cells
Inserted Cells
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Inserted Cells
Deleted Cells
Inserted Cells
Inserted Cells
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Inserted Cells
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Deleted Cells
Inserted Cells
Formatted
Formatted
Formatted
Formatted
Formatted
Inserted Cells
Inserted Cells
Deleted Cells
Formatted
Inserted Cells

Hillsboro NH			$0.4	$1.~~4~~7		$12.0	$~~9~~1 6.4	$~~2~~7 ~~.6~~0. 8	$~~3~~8.~~7~~31.2
Rockingham NH			$0.8	$1.~~6~~7		$~~8.9~~10.0	$~~3~~1 ~~.8~~2 8.0	$~~4~~3 ~~.1~~0. 3	$40.7
NH Project Total			**$1.1**	**$3.~~0~~4**		**$~~18.2~~21.9**	**$~~5~~9 44. 4**	**$~~8~~1 .~~7~~1. 1**	**$72.0**
Essex MA	$0. 0		$~~0.2~~	$~~1~~0.3		$1.6	$3. ~~7~~0	$0. 2	$5.~~3~~1
Middlesex MA			$0.2	$~~1~~3.1		$~~7.8~~16.3	$26 .~~7~~2	$~~3~~5 ~~.9~~1. 6	$47.4
MA Project Total			**$0.3**	**$~~1.~~3.4**		**$17 .9**~~.2~~	**$~~30 .4~~41 29. 2**	**$1. 8**	**$52.6**
Project Grand Total	**$1. 4**	**$~~4. 3~~**	**$~~27 .4~~**	**$~~896~~.8**		**$~~122~~39.9**	**$~~7~~3 .6**	**$2. 9**	**$124.6**

Source: Eversource and National Grid current spending projections.

Inserted Cells
Inserted Cells
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Deleted Cells
Inserted Cells
Inserted Cells
Inserted Cells
Deleted Cells
Formatted: Font: Bold
Inserted Cells
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Formatted: Font: Bold
Deleted Cells
Deleted Cells
Inserted Cells
Formatted: Left, Indent: Left: 0"

Construction Phase Benefits

Transmission project spending creates jobs in construction, engineering, professional services and other industries as well as secondary jobs in the local service sector. The total economic impact consists of the direct, indirect and induced impacts discussed above. Changes in demand affecting industries that are highly interconnected to the regional economy tend to have a greater local economic impact than those for industries that are not closely linked to the regional economy. RPCs determine how much transmission project spending stays local and how much leaks out of the region to other suppliers. Spending on project labor has the largest economic impact because of higher RPCs. Spending on specialized transmission equipment such as transformers, breakers, cable, etc. has very little economic impact because of low RPCs. These items are purchased from outside the region, limiting any local impact to warehousing and distribution.

Allocation of Expenditures to Industries

Figure 2 shows the allocation of project spending to industries in REMI. All spending during the 2014 to 2015 planning sub phase is allocated to the professional, scientific and technical services industry. This includes engineering, design, planning, procurement,

real estate, legal, permitting, and other professional services. No significant construction activity takes place during the planning sub phase and no materials are yet purchased.

Going forward, ~~the 2015 amount of~~ spending on professional services~~, $4.3~~ is expected to remain constant at $6.7 million~~, continues through 2016 to 2017~~ per year, which is approximately equal to 2015 levels, falling to zero in 2018 as ~~construction begins and spending ramps up.~~the project quickly winds down. The remaining amount of labor spending, $~~77.0~~68.4 million, is allocated to the power and communication structures construction industry with 5.0% allocated to waste management and remediation services, based on prior transmission project experience.

Figure 2 – Allocation of Project Spending to Industries in REMI ($ Million)

Industry	*2014*	*2015*	*2016*	*2017*	*2018*	Total
Professional Services						
New Hampshire	$1.1	$3.~~04~~	$3.~~04~~	$3.~~04~~	$~~10~~0.0	$11.4
Essex MA	$0.0	$0.~~2~~3	$0.2	$0.2	$0.~~60~~	$0.7
Middlesex MA	$0.2	$~~1~~3.1	$~~1~~3.1	$~~1~~3.1	$~~3.60.~~0	$9.5
Total	$1.4	$~~4.3~~6.8	$~~4.3~~6.7	$~~4.36.~~7	$~~14.20.~~0	**$21.6**
Power and Communication Structures Construction						
New Hampshire	$0.0	$0.0	$~~9.6~~4.8	$~~38.2~~31.0	$~~1.~~0	$~~47~~36.8
Essex MA	$0.0	$0.0	$0.~~80~~	$2.~~47~~	$~~30~~.2	$2.9
Middlesex MA	$0.0	$0.0	$~~4.61.~~3 ~~$17.0~~	$21.~~68~~	$1.5	$24.6
Total	$0.0	$0.0	$~~15.0~~6.1	$~~57.7~~55.5	$~~72~~2.7	**$64.3**
Waste Management and Remediation Services						
New Hampshire	$0.0	$0.0	$0.~~74~~	$1.8	$0.1	$2.~~2~~3 ~~$2.8~~

Inserted Cells
Formatted Table
Inserted Cells
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Inserted Cells
Inserted Cells
Deleted Cells
Inserted Cells
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Inserted Cells
Inserted Cells
Deleted Cells

Essex MA	$0.0		$0.0	$0.~~1~~0	$0.~~1~~2	$0.0	$0.2
Middlesex MA	$0.0		$0.0	$0.~~3~~2	$1.~~0~~3	$0.1	$1.~~3~~6
Total	$0.0		$0.0	$~~1~~0.7	$3.3	$0.1	**$4.~~3~~1**
Electrical Apparatus							
New Hampshire	$0.0		$0.0	$~~3.8~~9.9	$~~1~~2.06.1	$~~15~~.80	$16.1
Essex MA	$0.0		$0.0	$~~0.2~~1.1	$0.~~7~~0	$0.~~9~~0	$1.1
Middlesex MA	$0.0		$0.0	$~~1.3~~8.8	$~~5.7~~0.0	$~~7.1~~0.0	$8.8
Total	$0.0	$0.0	~~$5.3~~	~~$18.5~~	$~~23~~19.8	$~~6~~.1	$0.0	**$25.9**
Concrete and Other Materials							
New Hampshire	$0.0		$0.0	$~~1~~3.3	$~~4~~2.0	$0.0	$5.~~3~~4
Essex MA	$0.0		$0.0	$0.~~1~~4	$0.~~2~~0	$0.~~3~~0	$0.4
Middlesex MA	$0.0	$0.0	~~$0.4~~	$~~1~~2.9	$0.0	$0.0	$2.~~4~~9
Total	$0.0	$0.0	~~$1.8~~	$6.~~2~~6	$~~7.~~92.0	$0.0	**~~$8.6~~**
Grand Total	**$1.4**	**~~$4.3~~**	**~~$27.4~~**	**$~~89~~6.8**	**$~~122~~39.9**	**~~$7~~3.6**	**$2.9**	**$124.6**

Inserted Cells

Deleted Cells

Deleted Cells

Formatted: Font: Not Bold

Formatted: Font: Not Bold

Inserted Cells

Inserted Cells

Inserted Cells

Inserted Cells

Deleted Cells

Inserted Cells

Inserted Cells

Formatted: Font: Not Bold

Inserted Cells

Formatted: Font: Not Bold

Deleted Cells

Deleted Cells

Inserted Cells

Inserted Cells

Spending on materials and equipment begins in ~~2017~~2016. The majority of this, $~~23.8~~25.9 million or 75% is entered into REMI as an exogenous increase in investment demand for electric transmission, distribution and industrial apparatus. This has a relatively small impact on local jobs, income, GDP and tax revenue because this category consists largely of equipment purchased from outside of the state.

The remaining amount of materials spending, totaling $~~7.9~~8.6 million, is allocated to more local industries such as crushed rock and concrete. This is input into REMI as an increase in final demand in the local cement, concrete product, lime, gypsum and other nonmetallic product manufacturing industry.

Construction Phase Impact Study Results

Economic impact results are summarized in Figure 3. These are total economic impacts including the direct, indirect and induced effects discussed above. Spending on construction and materials is expected to support over 1,000 annual jobs in New Hampshire and Massachusetts over the next four years, or ~~250~~200 jobs per year on average from 2014 through ~~2017~~2018.[3] Over ~~600~~500 annual jobs are supported in New Hampshire and ~~approximately 400~~over 450 annual jobs in Massachusetts.

Figure 3 – Summary of Economic Impacts during Construction Phase by State

Calendar Year	*2014*	*2015*	*2016*	*2017*	*2018*	**Total**
Total						
Employment (job years)	21	~~61~~91	~~238~~28 2	~~693~~5 64	51	**1,~~013~~009**
Regional GDP ($2015m)	$2.1	$~~9.6.2~~	$~~29.1~~3 2.4	$~~90.3~~ 77.4	$5.7	**$127.~~6~~3**
Personal Income ($2015m)	$1.2	$~~3.6~~5. 5	$~~14.2~~1 7.8	$~~43.1~~ 36.4	$~~62.0~~6. 5	**~~$67.4~~**
State Tax Revenue ($2015m)	$0.1	$0.~~2~~3	$0.~~7~~9	$~~2.~~1. 8	$0.3	**$3.~~0~~4**

Formatted Table
Inserted Cells
Inserted Cells
Inserted Cells
Formatted: Font: Not Bold
Inserted Cells
Formatted: Font: Not Bold
Inserted Cells

[3] The total number of annual jobs supported over the 2014 to 2017 construction period is also referred to as "job years." A job year is equal to one job for a period of one year.

New Hampshire						
Total Employment (jobs)	16	~~42~~49	~~145~~13 8	~~415~~3 18	**~~618~~**24	**545**
Regional GDP ($2015m)	$1.5	~~$4.5~~	~~$3~~14.9	~~$16.6~~ 39.8	~~$51.62.~~ 1	**~~$73.562.~~ 8**
Personal Income ($2015m)	$0.8	$2.~~2~~7	$8.~~1~~2	~~$24.0~~ 18.5	~~$35.12.~~ 6	**~~$32.8~~**
State Tax Revenue ($2015m)	$0.0	$0.1	$0.3	$0.~~9~~7	~~$0.1~~	**$1.~~3~~2**
Massachusetts						
Total Employment (jobs)	6	~~20~~42	~~93~~144	~~278~~2 46	**~~396~~**27	**465**
Regional GDP ($2015m)	$0.7	~~$2.35.~~ 1	~~$12.41~~ 7.5	~~$38.7~~ 37.6	~~$54.13.~~ 6	**~~$64.5~~**
Personal Income ($2015m)	$0.3	~~$1.32.~~ 8	~~$9.6.1~~	~~$19.2~~ 17.9	~~$263~~.9	**~~$34.6~~**
State Tax Revenue ($2015m)	$0.0	~~$0.1~~2	~~$0.4~~6	$1.~~2~~1	~~$1.70~~.3	**~~$2.2~~**

Inserted Cells
Formatted: Font: Not Bold
Inserted Cells
Formatted: Font: Not Bold
Inserted Cells
Formatted: Font: Not Bold
Inserted Cells
Inserted Cells
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Formatted: Font: Not Bold
Formatted: Font: Not Bold

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Investment spending is expected raise real GDP by $~~73.5~~62.8 million in New Hampshire and $~~54.1~~64.5 million in Massachusetts during the ~~four~~five-year planning and construction phase. The impact on real personal income is $~~35.1~~32.8 million in New Hampshire and $~~26.9~~34.6 million in Massachusetts.

The increase in economic activity is also expected to generate more state tax revenue. This is estimated using 2013 state tax revenues from all sources as a percent of personal income.[4] This yields an effective tax rate on personal income of 3.7% for New Hampshire and a 6.4% for Massachusetts. Applying these percentages to the increase in personal income projected by REMI yields the state tax revenue impacts shown in Figure

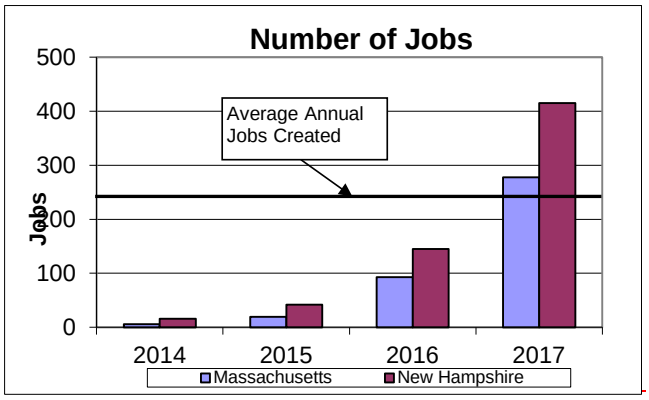
[4] Federation of Tax Administrators, 2013 State Tax Revenues and % of Personal Income. See: http://www.taxadmin.org/fta/rate/13taxbur.html.

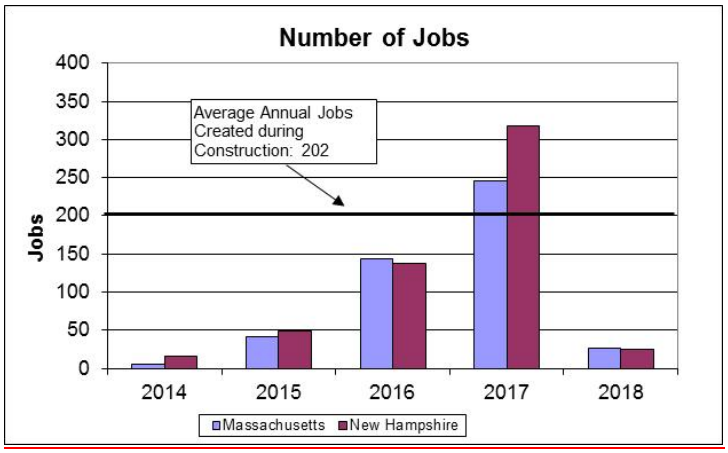
3. State tax revenue impacts total $1.~~3~~2 million for New Hampshire and $~~1.7~~2.2 million for Massachusetts during the planning and construction phase.

Employment impacts are greatest in 2017 when construction spending is at its highest. For example, the number of annual jobs supported rises to ~~693~~564 in 2017 compared to an average of ~~253~~202 jobs per year during the entire 2014-~~2017~~2018 construction phase. This is illustrated on Figure 4.

Figure 4 – Job Impacts by State

Formatted: Centered, Indent: Left: 0"





Because of their close proximity, Massachusetts project spending is expected to impact both the Massachusetts and New Hampshire economies, and vice versa. For example, some labor for the Massachusetts portion of the project may be supplied from New Hampshire, especially since the project takes place in Essex and Middlesex counties, which border southern New Hampshire. Because of these economic linkages, REMI estimates that Massachusetts project spending accounts for ~~18~~26 annual jobs in New

Hampshire~~. For Massachusetts, New Hampshire project spending adds 84 annual jobs to the total.~~

Employment Impacts by Industry

Figure 5 summarizes employment impacts by major industry and state. In both states, the greatest employment impact is in the construction industry. However, a wide range of other industries also benefit from project spending. For example, the professional services industry, which tends to be higher paying, accounts of ~~15% to 16~~19% of the total number of jobs supported in each state. This includes engineering, management, planning, design, legal and other professional services. In both states, there is a significant impact to local manufacturing. This is due to suppliers of local materials such as concrete. There are also significant impacts to retail trade and other services, which include health, education, government and recreation. These reflect the induced economic impacts of project spending.

Figure 5 – Employment Impacts by Industry and State

	2014	*2015*	*2016*	*2017*	*2018*	Total
New Hampshire						
Construction	2	56	5033	1751 41	23118	200
Manufacturing	0	0	1321	4217	550	38
Wholesale Trade	0	0	2	54	70	6
Retail Trade	1	34	1011	3023	441	39
Transportation and Warehousing	0	0	1	32	50	3
Finance, Insurance, Real Estate	1	4	7	1512	271	25
Professional Services	8	2124	2730	4240	981	103
Administrative and Waste Mgt	0	1	65	1714	240	20
Accommodation and Food Services	0	1	4	118	161	15
Other Services	23	68	2524	7358	1062	95
Mining and Utilities	0	0	1	21	40	1
Total New Hampshire	**16**	**4249**	**1451 38**	**4153 18**	**61824**	**545**
Massachusetts						
Construction	0	23	1915	6473	8512	104
Manufacturing	0	01	1237	4310	560	49
Wholesale Trade	0	01	23	76	90	10
Retail Trade	0	13	69	1715	242	28
Transportation and Warehousing	0	0	12	53	0	6
Finance, Insurance, Real Estate	1	24	79	2117	311	32
Professional Services	2	818	1527	3438	582	87
Administrative and Waste Mgt	0	12	78	20	291	31
Accommodation and Food Services	0	12	35	109	152	18
Other Services	1	49	1928	5754	816	99
Mining and Utilities	0	0	0	10	20	0

Inserted Cells
Formatted Table
Formatted
Inserted Cells
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted
Formatted

Total Massachusetts	**6**	**2042**	**9314**	**2782**	**39627**	**465**

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Impacts Per $ Million Spending

Figure 6 shows employment, GDP, personal income and state tax revenue impacts per million dollars of total project spending by state. REMI estimates that each $1.0 million in annual New Hampshire project spending will support 7.6 annual jobs in the State while each $1.0 million of annual spending in Massachusetts will support 9.68.8 annual jobs in that State. These estimates are in line with other transmission project economic impact studies.[5] Project spending tends to have a relatively greater impact in Massachusetts than New Hampshire because RPCs tend to increase with the size of the region.

Figure 6 – Economic Impacts per $1.0 Million of Project Spending by State

	New Hampshire	Massachusetts
Job Years	7.6	9.68.8
GDP	$899,250872,106	$1,313,026226,931
Personal Income	$429,403455,316	$653,855657,757
State Tax Revenue	$15,88816,847	$41,84742,096

Source: REMI regional economic model and National Grid/Eversource spending projections for Merrimack Valley Reliability Project.

Economic Impact of Property Taxes

Increased operations and maintenance (O&M) spending after the Project is placed into service will also have a positive economic impact, primarily due to increased property tax payments to the affected New Hampshire and Massachusetts towns. Other increases in O&M spending are expected to be minimal because the new transmission line is being constructed along existing rights of way that will need to be maintained anyway.

[5] See for example Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving (June 2014), London Economics (June 9, 2014) and University of Minnesota Duluth, Labovitch School of Business (November 2010).

Unlike the construction phase economic benefits, which are temporary, the economic impact of higher property tax revenues to the affected towns is long-term. Increased property tax payments were estimated by National Grid and Eversource based on the expected value of the new equipment placed into service and local property tax rates. First year property tax impacts to affected counties and towns are estimated at $1,~~557,550~~258,050 for New Hampshire and $~~794,300~~698,375 for Massachusetts.

These property tax revenues are entered into REMI as an increase in local government spending order to estimate their potential economic impact. REMI estimates that a $1,~~557,550~~258,050 annual increase in local government spending in New Hampshire will lead to the creation of ~~34~~27 annual jobs, including direct, indirect and induced jobs. A $~~794,300~~698,375 annual increase in local government spending in Massachusetts will lead to the creation of ~~13~~11 annual jobs. Like the property tax revenues themselves, these impacts are expected to gradually diminish over time as the equipment depreciates. Figure 7 summarizes the projected first year annual economic impact due to increased property tax revenue to local governments.

Figure 7 – Impact of Increased Property Tax Revenue

	New Hampshire	Massachusetts
Increased Property Tax Revenue	$1,~~557,550~~258,050	$~~794,300~~698,375
Annual Jobs Created	~~34~~27	~~13~~11
Personal Income ($2015)	$1,~~800,000~~556,200	$~~844~~969,000

Source: National Grid and Eversource estimated increase in property tax payments to affected towns and REMI regional economic model.

Other Long-Term Economic Impacts

Other long-term benefits of the Project include the potential for lower market electricity prices; higher efficiency and reliability; and the ability to accommodate load growth. All of these benefits have permanent economic impacts as well. However, these are not addressed here.

For example, reduced electricity costs for businesses increase regional competitiveness, leading to more sales and hiring. On the residential side, lower electricity costs increase local purchasing power and spending, leading to an overall increase in local economic activity.

Many of the long-term benefits of the Project result from accommodating load growth and avoiding job losses and other negative economic impacts that would result if reliability were not maintained. Maintaining electric reliability is also valuable because power outages are costly to businesses and consumers. Like any business cost, outages reduce regional competitiveness, spending and hiring, resulting in job and income losses.

Formatted: Centered

Bibliography

"Estimating the Total Impact of New Industrial Plant on Total Electrical Energy Requirements," Alfred P. Morrissey and Norman N. VanToai, IEEE Transactions, August, 1988 and presented at the IEEE Summer Meeting (Load Forecasting Session), 1987 paper 87 SM 488-0.

Regional Economic Models, Inc. REMI PI+ v1.6 model documentation and explanation of methodology, www.remi.com.

Minnesota IMPLAN Group, Inc., model information: www.implan.com

RIMS II model information and user guide: www.bea.gov/regional /rims

A Systematic Comparison of the REMI and IMPLAN Models: the Case of Southern Nevada," Dan S. Rickman and R. Keith Schwer, The Review of Regional Studies, Fall 1993.

"Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN and REMI," Dr. Tim Lynch, Florida State University. Prepared for US Department of Transportation, October 2000.

"IMPLAN, RIMS-II and REMI Economic Impact Models, Comparisons in Context of EB-5 Analysis," John Neill, Vice President, AKRF, Inc., www.akrf.com, May 2013.

"Estimating Trade Flow Parameters (Industry Betas and Sigmas), Frederick Treyz, Ph.D., Nicolas Mata, Sherri Lawrence, Regional Economic Models, Inc., May 2010. Available at: www.remi.com.

"Economic Impact Analysis of PSE&G's Capital Expenditure Program," Dr. Joseph J. Seneca, Dr. Michael L. Lahr, and Will Irving. Edward J. Bloustein School of Planning

and Public Policy, Rutgers, The State University of New Jersey, June 2014. Available at: www.pseg.com.

"Analysis of the Macroeconomic Impacts of the Proposed New England Clean Power Link Project, Using the Regional Economic Models, Inc. ("REMI") PI+ Model,", London Economics International (contact Julia Frayer and Victor Chung), June 9, 2014. Available at: www.necplink.com/docs/announcements/Analysis_of_the_Macroeconomic_Impacts_of_NECPL_Project.pdf.

"The Economic Impact of Constructing Five Electric Power Lines in Minnesota, North Dakota, South Dakota and Wisconsin," University of Minnesota Duluth, Labovitch School of Business and Economics (Project Contact, Randy Fordice), November 2010. Available at: www.capx2020.com.

"Updated Analysis of the Macroeconomic Impact of the Proposed Champlain Hudson Power Express Project in New York, Using the Regional Economic Models, Inc. ("REMI") PI+ Model, ," London Economics International (contact Julia Frayer and Cherrylin Trinidad), June 6, 2012.

"Employment and Economic Impacts of Transmission Line Construction in Montana," Barbara Wagner, Senior Economist, Research and Analysis Bureau, Montana Department of Labor and Industry, July 30, 2010. Available at: www.ourfactsyourfuture.org.

"Transmission Line Jobs and Economic Development Impact (JEDI) Model User Reference Guide," Marshall Goldberg, MRG and Associates, and David Keyser, National Renewable Energy Laboratory, October 2013. Available at: www.nrel.gov/publications.