Pre-Filed Testimony

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 BRADLEY P. BENTLEY AND JOHN W. MARTIN ON BEHALF OF NEW ENGLAND POWER COMPANY AND PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Personal Background – Bradley P. Bentley

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

A. My name is Bradley P. Bentley. My title is Director Transmission System Planning. I work for Eversource Energy Service Company, which is a wholly-owned subsidiary of Eversource Energy (Eversource) and my business address is 56 Prospect Street, Hartford, CT 06103.

Q. Briefly summarize your educational background and work experience.

A. I have a Master of Science (MS) degree in Electrical Engineering from The Ohio State University in Columbus, Ohio, a Bachelor of Science (BS) degree in Electrical Engineering from Clarkson University in Potsdam, NY. I have a Master in Business Administration from the University of Connecticut. I am also a registered Professional Engineer in the State of Ohio.

I have worked in the electrical engineering field for 24 years for various utilities including American Electric Power in Columbus, OH, GridAmerica in Cleveland, OH, and San Diego Gas & Electric in San Diego, CA, before joining Eversource in 2008. I have experience in nuclear generation, transmission operations, energy marketing and trading, and transmission system planning. I have been employed by Eversource as the Director Transmission System Planning for the last seven years and am responsible for planning the company's transmission system in NH, Western MA, and CT.

For the past seven years, I have represented Eversource as a member, and for the last two years as Chairman, of the NPCC Task Force on Coordination of Planning. I have also represented Eversource on the NPCC Reliability Coordinating Committee during this time.

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 the Director of Transmission System Planning for Eversource, I oversee the work of the transmission planning engineers who are responsible for identifying the need for reinforcement of the transmission system, evaluation of alternative solutions to meet that need, and the selection of the most cost-effective solution that meets the reliability need.

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.

<u>Personal Background – John W. Martin</u>

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 almost 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 B.

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.

<u>Joint Testimony</u>

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.

<u>Background on Regional Electric Grid</u>

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.

<u>Impact on System Stability and Reliability and System / Electrical Benefits</u>

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, and is expected to release its Greater Boston Area Solutions Report in July 2015.

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 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 the high voltage concern at light load levels.

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.

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.

ATTACHMENT A.

RESUME OF BRADLEY P. BENTLEY

BRADLEY BENTLEY, P.E.

56 Prospect St.
Hartford, CT
860-728-4603 E-mail: bradley.bentley@eversource.com

Summary

Twenty three year career working in major utility companies throughout the U.S. with experience testifying before various state public utility commissions and regulators. Extensive knowledge of successful investor owned utilities regulatory, financial and operational structures and practices.

Professional Experience

Eversource Energy, Hartford, CT 2008 - Current

A major U.S. electric and gas utility with more than 3.6 million customers in CT, MA, and NH

Director Transmission System Planning, Transmission Department

Responsible for Directing the functions of the Transmission System Planning Group

- Direct and oversee the development and approval of major transmission plans and projects throughout the Eversource system
- Experience testifying before and working with various regulatory agencies in CT, MA, ME and NH on transmission projects, integrated resource plans, energy security & reliability reviews
- Manage regional studies required for transmission projects that access and integrate large renewable resources with the Independent System Operator of New England (ISO-NE)
- Coordinate transmission and reliability plans with distribution companies, multiple municipalities in CT and NH, large customers and regional entities
- Chairman of the Task Force for Coordinated Planning and Eversource representative on the Reliability Coordinating Committee for the Northeast Power Coordinating Council (NPCC)
- Responsible for completion of transmission planning studies to comply with Federal mandates

San Diego Gas & Electric (SDG&E), San Diego, CA 2005 – 2008

A major U.S. electric and gas utility with more than 3 million customers in CA

Transmission Planning Manager, Transmission Planning Department

Responsible for managing Internal Grid Assessment Team and External Team

- Direct completion of SDG&E’s Annual Grid Assessment for transmission & substation projects
- Manage technical and financial approval process for planning projects
- Collaborate with Transmission Engineering, Substation Engineering, and Protection and Control to finalize design, cost, and scheduling for transmission and substation projects
- Prepare transmission reliability testimony for SDG&E’s $1.3 billion 500 kV transmission project
- Manage coordination with Grid Operations in resolving operational and planning issues
- Thorough knowledge of FERC/NERC Mandatory Reliability Standards, Large Generator Interconnection Process and developing Renewable Portfolio Standards

Team Lead, Transmission Planning Department

- Led planning studies coordinating transmission projects with neighboring utilities in the WECC
- Directed import capability studies for SDG&E due to transmission and generation additions
- Led the review of regional planning studies of large generation and transmission projects
- Responsible for participation in California ISO Resource Adequacy proceedings and California Energy Commission’s Long Term Procurement Plan proceeding

GridAmerica LLC, Cleveland, OH 2003 – 2005

An Independent Transmission Company founded by National Grid that focused on providing superior electric transmission service in the Midwest ISO (MISO)

Transmission Planning Engineer, Investment Planning Department
Identified investment improvements for First Energy, Northern Indiana Public Service, and Ameren

- Completed transmission reliability and power transfer studies utilizing PSS/E and MUST
- Team lead for development of transmission investment and congestion analysis using PROMOD
- Chairman of the Transmission Model Building Working Group at the MISO
- Participated in MISO Planning Subcommittee, Expansion Planning Group, and user groups
- Assisted Operations in AFC calculations, transmission service requests and outage planning
- Familiar with Generator Interconnection studies, Financial Transmission Rights analysis and Midwest power market

American Electric Power (AEP), Columbus, OH 1991 - 2002
A major U.S. electric utility with more than 5 million customers in 11 states

Natural Gas Trader, AEP Energy Services, (2000 – 2002)
Financial Basis / Physical Gas Trader responsible for financial performance of trading positions

- Created computer models to analyze and predict market prices, and manage trading position risk
- Managed risk for and evaluated pipeline transportation and gas storage contracts

Energy Market Analyst, AEP Energy Services, (1999 – 2000)
Generated Eastern U.S. and ERCOT power market analysis for power traders

- Created generation outage applications for traders to analyze market volatility
- Lead analyst of nuclear power plant issues throughout U.S.

Transmission Planning Engineer, System Planning Department, (1996 – 1999)
Responsible for transmission planning activities in Ohio, Indiana and Michigan

- Completed area planning studies using PSS/E and short circuit studies using ASPEN
- Proposed projects and implemented recommendations to improve reliability
- Coordinated projects and negotiated contracts between AEP and Electric Cooperatives

Instrumentation and Controls (I&C) Engineer, Nuclear Engineering Department, (1992 – 1996)

- Modernized obsolete and malfunctioning I&C systems to improve performance and costs
- Familiar with design processes, testing procedures, and startup of power plant control systems

Electronic Support Intern Engineer, Systems Operations Division, (1991)

- Programmed computer applications for monitoring AEP's power generating plants' performance

Education & Licenses

University of Connecticut, Storrs, CT
Master of Business Administration (MBA)

The Ohio State University, Columbus, OH
Master of Science, Electrical Engineering (MSEE)

Clarkson University, Potsdam, NY
Bachelor of Science, Electrical Engineering (BSEE)

Professional Engineer, Ohio Professional Engineering license since 1997

ATTACHMENT B.

RESUME OF JOHN W. MARTIN

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.

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

PRE-FILED TESTIMONY OF BRIAN McNEILL
ON BEHALF OF
NEW ENGLAND POWER COMPANY

Personal Background

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

A. My name is Brian McNeill. I am a Vice President and Chief Financial Officer for New England Power Company (NEP) and Director of Finance, FERC Jurisdiction and Business Development. My business address is One MetroTech Center, Brooklyn, New York 11201.

Q. What are your areas of responsibility?

A. In my current role, I am responsible for the overall financial performance of National Grid's FERC Jurisdiction, which is a business segment comprised of 10 main operating companies generating $1 billion of revenue on $2.4 billion of assets. In this role, I work with National Grid's Treasury team to arrange appropriate financing to fund the investments and working capital needs of the businesses.

Q. Briefly summarize your educational background and work experience.

A. I received my BS in Finance from Fordham University in 1991 and a MBA in Finance and International Business from Fordham University in 1995. I have also completed numerous executive education classes at the University of Chicago, Harvard University and the University of Pennsylvania.

I have worked at National Grid and predecessor companies for 24 years in progressive leadership positions. Previous positions have focused on business performance, financial partnering, internal controls, business planning, financial strategy, mergers and acquisitions and business integration, treasury and pension management, rate case development and marketing management. A current copy of my resumé is provided as Attachment A.

Q. Have you previously testified before the New Hampshire Site Evaluation Committee (NH SEC)?

A. No, I have not.

Q. Please describe the purpose of your testimony.

A. The purpose of my testimony is to demonstrate that NEP has the financial capability to construct and operate NEP's segment of the New Hampshire portion of MVRP, which involves the construction of an approximately 24.4-mile long 345 kV line located in existing rights-of-way in New Hampshire and Massachusetts as well as the reconductoring of the existing Y-151 line. The portion of MVRP located in New Hampshire is known as the "Project." NEP will be responsible for constructing, operating and maintaining approximately 8.1 miles of the Project in New Hampshire. My testimony will also provide the necessary assurances for a decommissioning plan.

In this regard, NEP's financial capability to construct and operate the Project in continuing compliance with the terms and conditions of a certificate issued by the SEC is based on the financial strength of NEP and its parent, National Grid USA, and their combined experience financing, constructing and operating transmission facilities in New England. I have provided audited financial statements for NEP and National Grid USA for the periods ending March 31st 2012-2014 in Appendix C to the Application.

<u>New England Power Company</u>

Q. Please generally describe NEP's business.

A. NEP is a wholly-owned subsidiary of National Grid USA, which is one of the largest electric transmission operators in New England. National Grid owns and operates 8,600 miles of interstate electric transmission lines and associated facilities throughout the Northeast United States.

NEP owns and operates over 2,300 miles of these interstate electric transmission lines, approximately 400 miles of which are located in New Hampshire, with the remainder located throughout Massachusetts and Vermont. These transmission facilities are regulated by FERC. NEP's business does not involve the generation or retail distribution of electricity in New Hampshire. *See* Appendix W and X for a copy of NEP's corporate organization chart and service territory map.

<u>NEP's Financial Capability to Construct and Operate the Project</u>

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

A. NEP has extensive experience with, and a proven track record of, siting and operating large energy facilities like the Project. During the three years ending December 2014, NEP invested over $500 million in new energy infrastructure.

A recent example of a similar transmission project that has been successfully financed and constructed is the Interstate Reliability Project (IRP). For IRP, NEP collaborated with Northeast Utilities (now Eversource Energy) and The Narragansett Electric Company to construct the IRP, a three-state transmission project that involved, among other things, the construction of a new overhead 345 kV transmission line in Massachusetts, Rhode Island and Connecticut. NEP financed and constructed the Massachusetts portion of the line, which was estimated to cost approximately $108 million.

Q. What is the expected overall cost of the Project and how will the costs be divided between the companies?

A. The estimated overall cost of the Project will be approximately $82 million. Of that $82 million, approximately $46 million is associated with NEP's New Hampshire portion and approximately $36 million is associated with PSNH's portion. Each company is responsible for its own

Project design, engineering and construction costs. The joint permitting and siting costs, however, will be divided among the companies generally in proportion to their respective ownership of the new line.

Q. Please describe NEP's sources of capital during construction.

A. NEP's sources of funding during construction include cash flows from operations, short-term borrowings from the internal money pool and, if necessary, equity contributions from its parent company. NEP will also periodically consider issuing long-term debt depending on the capital market conditions and capital structure of the business. NEP is rated "A3/P2" by Moody's and "A-/A2" by S&P, which are investment-grade ratings assigned to the best quality and lowest risk issuers to indicate a very strong capacity to meet financial commitments. This credit rating provides NEP with access to the full spectrum of public and private debt markets.

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

A. The Project will be funded in a similar way to the initial development. In addition, NEP may obtain limited or non-recourse financing at or after the Project's commercial operation date, if appropriate. Once the Project commences operation, NEP 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. Additionally, NEP will continue to have access to short-term borrowing.

Q. Why is National Grid USA's financial strength important to the financial capability of NEP to construct and operate the line?

A. NEP initially finances construction projects with internally generated cash and short-term borrowings from National Grid North America. The Company will evaluate and maintain an optimal capital structure. While NEP expects that most of its future funding needs will come from a combination of internally generated funds from operations and long- and short-term debt issuances, NEP also, from time to time, receives capital contributions from its parent, National Grid USA. These capital contributions allow NEP to maintain an appropriate level of common equity to total capitalization, which helps ensure that NEP will maintain its strong investment grade credit ratings that allow ready access to the credit markets at low borrowing rates.

Q. Will NEP carry adequate insurance during construction and while the Project is in operation?

A. Yes. During the construction phase of the Project, NEP will require all contractors to carry various types of coverage and limits for the duration of construction. Upon commercial operation of the Project, the assets will be covered under National Grid's All Risk Property program, subject to policy deductibles. Third-party liability will be covered under National Grid's Excess Liability Program subject to a self-insured retention of $3.0 million per occurrence.

Q. What sources of capital will be available from NEP to assure a decommissioning plan for the Project?

A. NEP does not anticipate the need to decommission the line. 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.

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

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

Q. Does this conclude your testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF BRIAN MCNEILL

BRIAN MCNEILL

Brian McNeill currently serves as Director of Finance, FERC and Business Development. In this role he provides financial and performance oversight for the FERC businesses with $2.3B in assets. In addition, he is the Finance contact working with the Business Development team on origination and execution of development projects in the US. Most of the existing projects are gas and electric transmission and generation related.

Brian has been with National Grid for 24 years and has held progressive leadership positions in Marketing & Sales, Regulatory, Treasury, M&A, Integrations, Corporate Finance and Business Planning, Business Partnering and Operations.

He graduated from Fordham University with an MBA in Finance and International Business and a BS in Finance. He has also completed numerous executive educations courses at University of Pennsylvania, Harvard University, University of Chicago, American Management Association, AGA and other institutions.

April 2015

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

PRE-FILED TESTIMONY OF MICHAEL J. AUSERÉ
ON BEHALF OF
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Personal Information

Q. Please state your name and business address.

A. My name is Michael J. Auseré. My business address is 107 Selden Street, Berlin, CT 06037.

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

A. I am the Vice President of Energy Planning & Economics. I am employed by Eversource Energy Service Company.[1] Eversource Energy Service Company is a wholly-owned subsidiary of Eversource Energy (Eversource),[2] a public utility holding company system. Eversource Energy Service Company provides centralized services such as accounting, finance, treasury, legal, purchasing and administrative functions to Eversource's subsidiaries.

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

A. My responsibilities include business development, market analysis and project analysis for Eversource and its subsidiaries. I report to the Executive Vice President of Enterprise Energy Strategy & Business Development.

Q. Please describe your employment experience and educational background.

A. Prior to my current position, I was the Vice President of Financial Planning & Analysis at Eversource. I was responsible for corporate financial forecasting, planning and analysis and transaction support for Eversource and its subsidiaries.

I came to Eversource in 2009 from Energy Future Holdings (EFH) in Dallas, Texas where I served as Vice President of Planning and Analysis for its electric generation and

1 Effective July 1, 2015, Northeast Utilities Service Company changed its name to Eversource Energy Service Company.
2 Effective April 30, 2015, Northeast Utilities changed its name to Eversource Energy.

wholesale marketing and trading businesses. Prior to that position, I was Vice President and Controller for EFH's retail and wholesale marketing and trading businesses. Before joining EFH in 2000, I spent eight years with PricewaterhouseCoopers in work that was heavily focused on the energy sector. My assignments included lead manager of the worldwide audit of ExxonMobil.

I graduated from the University of Texas at Austin with a Bachelor of Business Administration in Accounting and a Master in Professional Accounting. See biography at Attachment A.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. My testimony will demonstrate that Public Service Company of New Hampshire doing business as Eversource Energy (PSNH)[3] 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. My 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

3 PSNH is a wholly-owned subsidiary of Eversource.

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 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.[4]

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[5] 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-

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

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.

<u>Eversource</u>

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).[6] Eversource's regulated subsidiaries combined serve over 3.6 million electric and gas customers.[7] 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

6 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.
7 NU 2014 Form 10-K, Selected Consolidated Financial Data, at 27.

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 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.[8] 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

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

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 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 $36 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. 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.

The Project will be regulated by FERC. It has been FERC's policy to permit utilities to establish transmission service rates through a formula.[9] The formula rate recovers a return on investment plus associated income taxes, depreciation expense, operation and maintenance 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.

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.

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

<u>Conclusion</u>

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 testimony?

A. Yes, it does.

ATTACHMENT A

RESUME OF MICHAEL J. AUSERÉ

EVERSOURCE Energy

Michael J. Auseré is Vice President – Energy Planning & Economics for Eversource Energy (formerly Northeast Utilities). Michael's responsibilities include business development and project analysis for Eversource and its subsidiaries. Prior to his current role, Michael was the Vice President – Financial Planning & Analysis and was responsible for corporate financial forecasting, planning and analysis and transaction support for Eversource and its subsidiaries.

Michael joined Eversource in 2009 from Energy Future Holdings (EFH) in Dallas, Texas, where he was Vice President of Planning and Analysis for EFH's electricity generation and wholesale marketing and trading businesses. Michael also previously served as Vice President and Controller for EFH's retail and wholesale marketing and trading businesses. Formerly known as TXU Corporation, EFH is the largest power generator in Texas.

Prior to joining EFH in 2000, Michael spent eight years with PricewaterhouseCoopers in work that was heavily focused on the energy sector. His assignments included lead manager on the worldwide audit of ExxonMobil.

Michael is a Dallas native and a Certified Public Accountant who graduated from the University of Texas in Austin with a Bachelor of Business Administration in Accounting and a Master in Professional Accounting.

February 2015

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
BRYAN HUDOCK AND DAVID PLANTE
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

<u>Personal Background – Bryan Hudock</u>

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

A. My name is Bryan Hudock. I am a Lead Project Manager for New England Power Company d/b/a National Grid (NEP). My business address is 40 Sylvan Road, Waltham, MA, 02451.

Q. Briefly summarize your educational background and work experience.

A. I have a BS degree in Systems Engineering from the United States Naval Academy. I have an MS Degree in Electrical and Computer Engineering from Worcester Polytechnic Institute. I am a certified Project Management Professional with over 10 years of experience managing a variety of complex projects. I have been in my present position as a National Grid project manager since 2012 responsible for a number of projects involving capital investment in electric transmission and distribution assets. From 2010 to 2012, I was a project manager at Siemens Industry with full profit and loss responsibility for projects involving design, manufacture, and installation of steel mill equipment. From 2003 to 2010, I served as a submarine officer in the US Navy. This included completing the educational and on job training required to qualify as chief engineer for a submarine nuclear propulsion plant, as well as serving in roles that included line management, and shift supervision of engineering and ship wide operations and maintenance.

See Attachment A for my resume and a list of projects.

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

A. No, I have not.

Q. What is your role in the Project?

A. I am the Lead Project Manager for NEP, responsible for the high-level oversight, guidance, and execution for the NEP segments of the Project.

<u>Personal Background – David Plante</u>

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

A. My name is David L. Plante. I am the Lead Project Manager for Transmission Projects for PSNH. My business address is 13 Legends Drive, Hooksett, NH, 03106.

Q. Briefly summarize your educational background and work experience.

A. I hold a BS degree in Civil Engineering from the University of New Hampshire and am a licensed PE in the State of New Hampshire. I also hold a Masters Certificate in Project Management from George Washington University, School of Business and Public Management. I have more than 25 years of professional experience in the electric transmission and distribution industry that includes the design, management and construction of high voltage transmission line and substation projects. I joined PSNH in 1988 and served in the positions of Staff Engineer and Senior Engineer through 2002. I have served in my present position as Lead Project Manager – Transmission Projects since 2002 and am responsible for the execution of the Eversource Transmission capital program in NH, including many high profile, complex transmission line and substation projects. Over the course of my career at PSNH, I have been involved with the design, management and construction of transmission projects. In my current role as Lead Project Manager of Transmission Projects, I have been responsible for the execution of the transmission capital program, consisting of over $700 million of transmission assets in NH over the past 10 years.

See Attachment B for my resume and a list of projects.

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

A. Yes. I testified in the early 1990's relative to the PSNH Y-138 115 kV Transmission Line between White Lake substation in Tamworth, NH and Saco Valley substation in Conway, NH. I am also concurrently submitting testimony for the Seacoast Reliability Project.

Q. What is your role in the Project?

A. I am the Lead Project Manager for PSNH, responsible for the high level oversight, guidance and execution for the PSNH segments of the Project.

<u>Joint Testimony of Bryan Hudock and David Plante</u>

Q. What is the purpose of your joint testimony?

A. The purpose of our joint testimony is to provide the SEC with information about the Project construction process and to demonstrate that both NEP and PSNH have the technical and managerial capability to construct and operate the Project.

<u>Project Overview</u>

Q. Please provide a brief description of the Project.

A. MVRP is a collaborative effort between NEP and PSNH to construct a new 345 kV Transmission Line between the Tewksbury 22A Substation in Tewksbury, MA and the Scobie Pond 345 kV Substation in Londonderry, NH. In addition to the construction of the new 345 kV line (the 3124 line), NEP will also relocate its existing 115 kV line (the Y-151 line) for 7.6 miles to the western edge of ROW. The proposed new 3124 line is approximately 24.4 miles long and will be constructed within the existing ROW for its entire length. The length of MVRP in New Hampshire is 17.9 miles (hereinafter referred to as the "Project") with 8.1 miles to be constructed, owned, operated and maintained by NEP and 9.8 miles to be constructed, owned, operated and maintained by PSNH. MVRP can be broken down into four Segments to better describe areas of common characteristics. Segment 1 is in Massachusetts and not described herein, and Segments 2, 3 and 4 are in New Hampshire.

The existing ROW varies in width and currently contains a number of other electric transmission lines. From the southernmost location at the Massachusetts border in Segment 2, the 3124 line will be located on the centerline of existing NEP ROW that is typically 350 feet wide and will continue on that centerline alignment to the point of ownership demarcation, at which point the line transitions to the eastern side of an existing PSNH ROW. PSNH assumes ownership at the southernmost location in Segment 3, where the proposed 3124 line will be located on the eastern side of a 216.5 foot wide existing transmission line ROW. This ROW parallels an existing NEP ROW which is 350 feet wide creating a total combined utility ROW width of 566.5 feet. The 3124 line then heads generally east in Segment 4 approximately in the center of an existing ROW that varies in width from 460 feet to 635 feet wide. The new 3124 line will be generally supported by horizontally configured steel H-Frame type structures.

The 115 kV Y-151 line is presently located in the centerline of the NEP ROW for approximately the first 7.6 miles of the Project in Segment 2. In order to accommodate the construction of the new 3124 line, the Y-151 line will be relocated to a centerline alignment approximately 28.5 feet from the western edge of ROW. The relocated Y-151 line will be supported by steel single pole delta configured davit arm structures in its new location.

For a more detailed discussion of the Project and its components, please see section (h)(1) of the Application.

Q. Please provide a general overview of each Segment of the proposed transmission line route.

A. Segment 2 of the Project commences at the Massachusetts border. The Project route then extends northwesterly along existing transmission line ROW through the Towns of Pelham, Windham, and Hudson to the point of ownership demarcation between NEP and PSNH. As the ROW extends north from the state border, it crosses Dutton Road in Pelham to east of the intersection with Deer Hill Circle and continues northwest crossing Routes 38 and 111A before crossing into Windham. The ROW continues northwest through the westernmost portion of the Town of Windham, crossing first Route 128 and then Route 111. The ROW enters the Town of Hudson, crosses Beaver Brook, and continues northwest towards David Drive where the point of ownership demarcation occurs.

Segment 3, located within the Towns of Hudson and Londonderry, commences at the point of ownership demarcation and continues parallel to the northeastern border of the Town of Hudson, until crossing the town line into Londonderry. North of the town line in Londonderry, the ROW bends northward where it crosses NH Route 102. Segment 3 ends south of Wiley Hill Road in Londonderry.

Segment 4 is located entirely in the Town of Londonderry. This Segment begins south of Wiley Hill Road and extends northeast along the eastern edge of Musquash Conservation Area before turning eastward near High Range Road. The PSNH ROW turns northward where it crosses NH Route 128, and continues northeast until crossing Interstate 93. After the Interstate 93 crossing, the PSNH ROW turns eastward and terminates at PSNH's Scobie Pond 345 kV Substation.

Refer to Figure 2 in the Section (c) titled NH USGS Project Overview Map.

Q. What is the relationship between NEP and PSNH and which entity will be responsible for Project construction and Project operation?

A. PSNH and NEP are two separate and distinct companies that will work together to construct and operate the Project. NEP is a wholly-owned subsidiary of National Grid USA, a public utility holding company with regulated subsidiaries engaged in the generation of electricity and the transmission, distribution and sale of both natural gas and electricity. PSNH is a wholly-owned utility subsidiary of Eversource Energy, which engages in electric and gas delivery to businesses and residences throughout Connecticut, New Hampshire and Massachusetts. Both NEP and PSNH are responsible for the construction, operation, and maintenance of their respective Segments of the Project. NEP is responsible for Segment 2, while PSNH is responsible for Segments 3 and 4.

Q. Where will ownership of the new 3124 Line change and how does it affect Project construction, operation and maintenance?

A. Ownership of the new 3124 Line between NEP and PSNH will change at the boundary between the NEP easement area and the PSNH easement area situated between NEP Structure #150 and PSNH Structure #200, which is located south of David Drive in Hudson NH. NEP will construct, own and maintain Structure #150; PSNH will construct, own and maintain Structure #200. Installation of the conductor between Structure #150 and Structure #200 will be coordinated between the Applicants. The point of ownership demarcation will have no impact on the operation of the new 3124 line.

Q. Please describe "Good Utility Practice."

Good Utility Practice means any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period, or any of the practices, methods and acts which, in the exercise of reasonable judgment in light of the facts known at the time the decision was made, could have been expected to accomplish the desired result at a reasonable cost consistent with good business practices, reliability, safety and expedition. Good Utility Practice is not intended to be limited to the optimum practice, method, or act to the exclusion of all others, but rather includes all acceptable practices, methods, or acts generally accepted in the region, including those practices required by Federal Power Act Section 215(a)(4).

Q. Please describe any labor agreements that will be associated with this Project.

A. PSNH has negotiated a project labor agreement with the local International Brotherhood of Electrical Workers (IBEW) union that provides for the use of local (NH-based) union labor to the extent possible, with certain activities that allow for local non-union participation in the Project. NEP also has an agreement with local unions that contractors from the IBEW will be used if possible and where possible.

<u>Construction Process</u>

Q. Please identify the major construction activities and undertakings associated with the Project.

A. The major construction activities associated with the Project include: establishment of marshalling yard and laydown area locations; removal of ROW vegetation and mowing in advance of construction; installation of soil erosion and sedimentation controls; construction of accessway improvements; construction of work pads and pulling sites; removal and disposal of existing transmission line components; installation of foundations and structures; installation of conductor and shield wire; restoration of the ROW; testing and commissioning; and modifications at Scobie Pond 345 kV Substation.

Details associated with these activities can be found in Section (g)(8) of the Application.

Q. Please describe the ROW and any tree clearing that will be required to construct the Project.

A. The Project will be constructed entirely within the existing NEP and PSNH ROWs. In Segment 2, the ROW is presently cleared to almost its full width. Minimal vegetation removal and side line trimming will be required to support the construction of the new 3124 line and relocation of the Y-151 line. In Segment 3, PSNH will clear to the full extent of the eastern edge of its existing ROW. In Segment 4, no additional clearing along the edge of the ROW is required; however, PSNH will clear existing vegetation in the center of its ROW.

NEP and PSNH will conduct any necessary clearing in accordance with the Applicants' ROW vegetation management practices, which comply with mandatory standards adopted by NERC. These vegetation management practices are designed to allow the reliable operation of the transmission facilities by preventing the growth of trees or vegetation that would otherwise interfere with the transmission facilities or hinder access along the ROWs. As a result, the vegetation within the managed portions of the ROWs typically consists of shrubs, herbaceous species, and other low-growing species.

The amount of and type of vegetation clearing required at any given location will depend on factors such as the existing width of the managed ROW, vegetation communities present (e.g., forested, herbaceous, scrub-shrub, open field), the type of the new transmission structures, configuration and spacing of the transmission line conductors, transmission line span lengths, and terrain. A detailed description of required vegetation/tree clearing is presented in the Application, section (g)(2).

Q. Please describe how equipment and materials will be safely moved to the site.

A. As described in more detail in Section (i)(6) of the Application, materials will generally be delivered to marshalling yards identified by the Applicants. For PSNH, major substation materials will be delivered directly to Scobie Pond 345 kV Substation or to the Transmission Storeroom at Legends Drive in Hooksett. NEP will supply minor materials for the Project from the National Grid Northeast Distribution Center (NEDC) located in Whitinsville, MA. These materials will be delivered to the marshalling yards in conformance with local, state, and federal highway permit requirements. From the marshalling yards, construction contractors will be responsible for safely moving materials to individual laydown areas, and then to individual construction sites within the Project. Appropriate traffic control measures consisting of sign packages, flaggers and/or police details in accordance with the requirements of MUTCD will be required if pubic roadways are expected to be encumbered during delivery of materials to roadside sites.

Q. Please describe the size and location of the construction marshalling yards, laydown areas and work pads.

A. As described in section (g)(8) of the Application, marshalling yards have not been selected for the Project at this time. Generally speaking, marshalling yards range in size between three to five acres and are selected in areas that will have little to no adverse impact to environmental or cultural resources. Selection of marshalling yard locations typically involves striking a balance between convenient areas to major transportation routes to cut down on traffic impacts during the course of material delivery and proximity to the Project corridor to allow for the efficient daily mobilization of manpower and equipment. Marshalling yards are generally established in previously disturbed industrial areas with existing access, a gravel or stone surface, and do not require tree clearing or any impacts to wetland or other resource areas.

Laydown areas are sites within the Project ROW for short term storage of material and equipment during construction. All laydown areas within the corridor will be at mapped areas identified as laydown areas on the Project plans. See Wetland Permitting Plans included Appendix F.

Work pads will be located along the Project corridor at all new and relocated structure locations. Work pads for installation of all structures in Segment 2 and structures requiring poured concrete foundations in Segments 3 and 4 will be generally 100 feet by 100 feet and utilized for the staging of materials and equipment to install the proposed structures. Work pads for the direct embedded structures in Segments 3 and 4 will generally be 64 feet by 80 feet. Minor grading may be necessary in these work areas to create a level surface for equipment to set up. In the majority of cases, work areas are centered on the structure. In areas where environmentally sensitive areas are adjacent to structure locations, work pads will be shifted to minimize potential impacts. In locations where it is impractical to shift work pads out of environmentally sensitive areas, swamp matting will be utilized. It is the practice of the Applicants to restore work pad locations at the conclusion of construction.

Wire pulling sites are generally defined as rectangular areas ahead of and behind proposed structures. Wire pulling work areas typically extend up to 300 feet ahead of and behind pulling structure locations and are up to 100 feet in width. Most pull sites are located near angle and dead end structures. These sites are shown as enlarged work pads and are not called out separately on the Project Plans. Wire pulling sites will be set up at existing work pad sites where practical to minimize overall impact on the corridor. Pulling equipment will generally be set up at a 1:3 distance or greater from the highest wire attachment point on the pulling structure. Minor grading may be required to facilitate equipment set up and where environmentally sensitive areas are located, equipment set-ups will be adjusted to minimize impacts.

Q. Where will you locate construction access points during construction and what work must be completed for vehicles and other pieces of large equipment to access the sites?

A. Construction accessways are typically located where the Project ROW intersects town or State roads. Construction accessways, including on-ROW and off-ROW, have been identified and are depicted on the Wetland Permitting Plans included in Appendix F. The contractor will be allowed to propose additional on-ROW and off-ROW accessways during the construction phase of the Project with the review and approval of the Applicants. The Applicants request that the SEC delegate any required approvals of additional accessways to NHDES, in accordance with the delegation request contained in (d)(2) and (g)(8) of the Application.

Accessways are required within the ROW to provide the ability to construct, inspect, and maintain the proposed transmission line facilities. For the Project, existing access roads will require maintenance or upgrading to support the proposed construction activities. For example, placement of clean gravel or trap rock, and minor grading, may be necessary to stabilize and level the roads for construction vehicles. It will be necessary to establish new accessways in certain locations within the corridor to facilitate new construction. In several locations, off-ROW access roads will be used to access the Project.

Accessways across wetlands and streams, where upland access is not available, will be accomplished by the temporary placement of swamp mats. Swamp mats are placed over wetland areas so as to distribute equipment loads evenly and minimize disturbance to the wetland and soil substrates. Such temporary swamp mat accessways will be removed following completion of construction and if necessary, areas will be restored to re-establish pre-existing topography and hydrology.

Any accessway improvements will be carried out in accordance with Project permits, conditions and approvals. Exposed soils on accessways will be wetted and stabilized as necessary to suppress dust generation. Crushed stone aprons will be used at accessway entrances to public roadways to clean the tires of construction vehicles and minimize the migration of soils off-site.

<u>Construction Management</u>

Q. Please provide a general overview of how you will manage the construction of this Project.

A. NEP and PSNH have established well-qualified project teams to manage the engineering, design and construction associated with the Project. The NEP Project Team is led by Bryan Hudock, as the Lead Project Manager for all National Grid projects related to the Greater Boston Updated Transmission Needs Assessment. The PSNH Project Team is led by David Plante as the Lead Project Manager for transmission projects in New Hampshire. The construction of the Project will be managed by employing a robust team of professionals to oversee the work on-going on the Project. The number of project field oversight personnel working at any one time is scalable and will be dependent on the activities ongoing at that time.

Both Applicants' Project Teams are further described in the Project Organization Charts, Attachments C and D.

NEP and PSNH are both presently developing comprehensive construction plans for each Applicant's portion of MVRP which will be refined as the Project evolves. This construction plan identifies specific construction activities as detailed in Section (g)(8) of the Application, resources required to execute those activities both in terms of manpower and equipment, durations of each activity, and most efficient construction sequencing. The outage plans that are being developed in support of MVRP are based on the details contained in the construction plans and are being coordinated with all other outage requirements in the region.

The Project Managers (PMs) for NEP and PSNH for the Project will report to Bryan Hudock and David Plante, respectively, and will be responsible for the day-to-day oversight of each Applicant's project teams while ensuring that the Project is delivered on schedule, within budget, and is in compliance with the conditions of all permits and approvals.

Working closely with the Project Managers, a designated Construction Manager (CM) for each Applicant will manage the construction effort and will: monitor construction activities for conformance with the contract documents; ensure schedule compliance; review daily construction reports for completeness and accuracy; conduct and document recurring construction status update meetings with the project teams; review and address quality control concerns; participate in the Project outage coordination process; assist in managing the construction budget; and ensure compliance with the Project safety plan.

The CM will report to the PM and will be responsible for planning and coordinating all construction activity as well as overseeing the contractors, field supervisors, and environmental inspectors, and providing the field observations and monitoring of the construction contractor's operations. The PMs and CMs are responsible for promoting a culture of safety and environmental stewardship for the Project, reviewing contractor's quality control plan and monitoring and reporting safety concerns. Staff supporting the PMs and CMs will include, but not be limited to, safety supervisors and representatives, a project environmental team, a project engineering team, and project outreach specialists. *See* Organizational Charts, Attachments C and D.

During construction, the PMs and CMs will be responsible for holding recurring project meetings. A project job brief will be held daily to outline the planned construction activities for that day along with relevant safety and project information. A project status meeting will be held weekly to review recent activities, discuss upcoming plans and schedule, and identify, assign, and resolve open issues.

The CMs, the safety representative for each Applicant, and the contractor's safety representative are responsible for making routine work site visits, observing work activities, and reviewing the contractor's safety plans. The contractor's safety representative is responsible for recording pertinent safety information in daily reports, attending recurring construction status update meetings, and monitoring the contractor's compliance with the project safety plan. The contractor's safety representative will be responsible for ensuring the Project is built in accordance with the safety plan, company safety requirements, state and federal requirements, including OSHA requirements, along with any safety precautions identified in the detailed review of the Project with each Applicant's construction service provider.

Both NEP and PSNH will have a project environmental lead who will be responsible for monitoring compliance with federal, state, and local environmental permits and requirements. Reporting to the environmental lead, environmental inspectors will be responsible for conducting field observations and monitoring the construction activities of each contractor for compliance with permit requirements.

The Project engineering leads for NEP and PSNH are responsible for overseeing the engineering and design of the Project and will ensure deliverables are provided in support of the construction schedule. The engineering leads will also advise on technical matters during construction. A team of engineering consultants for both Applicants report to the engineering leads to support this work.

The Project outreach specialists for each Applicant are responsible for coordinating with the Project team and communicating Project information to community leaders, business groups, abutters, and other Project stakeholders during all phases of the Project.

Financial analysts provide support to the PMs and review financial data such as budgets, forecasts, variances, invoices, and overall Project spending. Schedulers provide support to the PMs and have responsibilities to create, update and report percent complete or variances for the integrated project schedules while monitoring planned outages and in-service dates.

Q. Please elaborate on the training programs and any related project oversight associated with this Project.

A. The Applicants' employees and contractors will be held to high expectations regarding safety, environmental awareness and training. Prior to commencing construction of the Project, training sessions will be held by each Applicant, which necessarily include training for the contractors. The training sessions will review the Project-specific documents, which will include a review of all relevant environmental, safety and compliance requirements and information as it pertains to the upcoming construction.

The Applicants and their respective contractors will be required to follow all safety regulations as outlined by state, federal, and company policies. Each Applicant has their respective rules and policies that outline specific items such as emergency response, medical treatment, daily documented job briefs, construction site inspections and training records for the contractor's employees and/or sub-contractors. The rules and policies walk the contractor through all these requirements as well as outline the detailed items that must be followed while working on the Project, such as reporting of all safety and environmental incidents, fall protection, personal grounding, personal protective equipment (PPE), and substation awareness and access training.

Further training must be completed by the contractor and its employees to cover utility-specific topics, including, but not limited to: CPR/First Aid, Switching and Tagging, Lockout Tag Out, Hazard Communication, Defensive Driving, Excavation and Trenching Safety, Confined Space Electric Hazard Awareness, Safe Driving and Vehicle, Operation, Ethical Business Behaviors, Permission to Work, Dig Safe requirements, understanding Health and Safety Plans (HASPs), Insulate and Isolating techniques, Incident Reporting and Analysis requirements, written Job Briefs, Load Securement, Safety Observation, Hoisting and Rigging, Trenching and Shoring, and working near Railroads, Highways and Gas lines.

Q. Please describe how you developed the construction plan and schedule.

A. The development of the construction plan and schedule interfaces directly with the engineering, environmental, and constructability review associated with the Project. To date, during the conceptual engineering phase of the Project, a high level construction and outage plan was developed to vet the viability of the Project. This construction plan was developed based on typical anticipated project activity durations, crew complements, and reasonable labor resourcing levels obtained by consulting with internal construction resources and based on current active projects. The construction plan was based on trying to balance construction efficiencies, meeting the projected in-service date of December 2017 and minimizing outage durations.

Moving forward, the construction plan will be refined by incorporating the vast experience from similar projects and the varied expertise of the project team to establish activity durations and the logical path to meet the milestones established for this Project. Consideration is given to the issues and risks that may be encountered including: time of year restrictions for both environmental and transmission system requirements; real estate agreements; long lead material procurements; and permit requirements. Using this information, a summary level schedule is developed placing each activity in a progression to achieve the final in-service date.

Q. Will construction occur in more than one location simultaneously? Please describe how you plan to manage what will be akin to multiple Project sites.

A. The nature of a transmission line project is one in which multiple construction activities will be occurring in different locations along the ROW concurrently by different construction resources. Any one of the construction activities described in section (g)(8) of the application narrative may be occur in multiple locations concurrently over the length of the Project, either by NEP or PSNH contractors. All or most of these activities described in section (g)(8) are required at each structure site and are performed by different construction resources. In order to be efficient and cost effective, the line contractor will need to schedule these resources sequentially to maintain productivity and efficiency while maintaining compliance with the requirements of the Certificate.

<u>Compliance Management</u>

Q. How will the Project comply with all of the requirements of the Certificate of Site and Facility when implementing the construction plan, including, the conditions set under each state and federal permit?

A. Prior to construction, the Applicants will create a compliance plan. The main purpose of this plan is to provide a consolidated and comprehensive list of compliance requirements that must be met during construction. Each requirement will have a responsible party assigned along with tracking for start and completion dates.

The Applicants will review permit conditions and compliance requirements in detail with contractors and construction service providers during the course of the competitive bid process and again during mandatory pre-construction meetings held post-bid award. The Applicants include in their construction services contracts the requirement that the contractor comply with all Project permits and applicable regulatory conditions during construction. The selected contractors will also be required to establish and maintain a formal quality assurance program to ensure compliance during construction operations, which will summarize environmental features and other regulatory / siting requirements relevant to construction activities.

During construction, each work location will be staffed with a hierarchy of leadership and oversight with the appropriate expertise and experience relative to the work that is being performed at that location. This team includes the CM, or his/her designee, and inspectors which will provide coordination and field oversight to the contractor during the planning and execution of the work to confirm compliance with the safety program, regulatory requirements and Project specifications. If an issue or deficiency is identified, the Project management team will issue the contractor a nonconformance notice. In response, the contractor is required to provide a corrective action plan and address the concern. The Project management team and contractors will also hold recurring construction progress meetings to review construction activities, including safety, environmental, community relations, schedule, and review of the upcoming work plan to identify and resolve any issues.

<u>Outreach / Security During Construction</u>

Q. Please describe the Applicants' plan for interacting with local officials and residents during the construction process and addressing any concerns they may have.

A. Consistent with both NEP's and PSNH's approach to stakeholder communications during the siting and permitting phase, the company will pursue transparent, proactive dialogue with stakeholders during the construction phase.

Company representatives will meet with municipal officials and other affected stakeholders during construction and through completion of the Project to address their concerns and answer questions. Among the communications methods we will employ are the following:

- Face-to-Face Pre Construction Briefings: NEP and PSNH will encourage proactive pre-construction briefings with municipalities, affected property owners, and other stakeholder groups to outline the construction process, key milestones and expected timelines.
- E-mail Updates: As needed emails will provide up-to-date information on Project activities, such as construction progress, to municipal officials, property owners or other stakeholders who request such information.

- Project Website: The Project website will provide an overview of the Project, route maps, and other relevant Project information.
- Project Hotline: A dedicated, toll-free phone line will be available for the general public to ask questions, voice concerns or express compliments about the Project. All phone calls and their resolution are tracked.
- Direct Mail and/or Door Hangers: Pamphlets, letters or postcards will be periodically mailed or hand-delivered to abutters and other relevant stakeholders to keep them apprised of milestone construction activities.
- News Releases / Media Advisories: News releases or media advisories will be issued as needed for activities such as achieving various Project milestones. All news releases will be posted on the Project website.
- Local Advertisements: To ensure that residents are aware of the start of construction or any other major activities, the companies may take out paid advertisements in local papers in advance of key work.
- Project Identification: When working in the public domain, Project workers and their vehicles/equipment will display proper markings to be identifiable to property owners, the public and motorists at job sites.

Q. How will you protect both the safety of the public and the safety of the workers during the construction process?

A. Safety is the highest priority of the Project team. The NEP and PSNH Project Teams will develop Project safety plans which will be incorporated into all contractor agreements associated with this Project. The contractors working are required to comply with applicable regulations and standards (for example OSHA and DigSafe). Typical daily activities of the Contractor will include conducting morning crew meetings to discuss activities and potential hazards (tailboards). Additionally, the contractor will perform and document site inspections, and equipment inspections. The contractors will be required to complete safety procedures such as a hazard analysis prior to performing relevant construction activities.

The safety of the public is of paramount importance. Exposure of the public to the Project is primarily related to use of public roadways and adjacent locations by construction personnel and equipment. Safe operation of motor vehicles is an absolute necessity to protect the safety of the public. The Project team will reach out to neighbors to inform them of upcoming construction activity to ensure their safety. Appropriate signage, cones, barricades and traffic control will be employed to ensure public safety.

In the event of an incident or near miss occurrence, the contractor is required to submit an incident investigation report detailing the specific information of the incident. Serious incidents resulting in an OSHA recordable injury will require additional investigation, review and root cause analysis to be performed, followed by corrective measures as deemed necessary to prevent future occurrences.

The Project team will utilize qualified management and staff, with experience on similar projects to perform contractor inspections, audits and oversight throughout the construction process. Training programs will be required for the field staff as discussed above. The Project team will use field observations to identify and address safety trends occurring on the Project. This information will be communicated to the contractors as a preventative measure. In addition, the Project team will review and discuss the safety observations in the field during recurring Project meetings.

Project Operations

Q. What security measures will you utilize during the construction process to protect workers, equipment, and material?

A. The contractor is responsible for planning and executing their construction activities in such a fashion as to ensure security of workers, equipment and materials during construction. Security measures to discourage theft and vandalism may include fencing, storage of materials in lockable containers, lighting, cameras, and employment of a security firm for overnight security. Construction equipment will likely be left in the ROW overnight. It is usually moved to a nearby road crossing for visibility to local police patrols to avoid vandalism to the equipment. If it is determined that there is a security concern for any of the workers on the Project, the Applicants' security personnel will work with local law enforcement to prepare a plan for personnel security.

Q. After the Project is constructed, how will the Project operate?

A. Once the Project is complete, it will become part of the interconnected transmission network. Operation of the transmission network in New England is the responsibility of ISO-NE. The local control centers at Eversource and National Grid operate the transmission system under the guidance of ISO-NE. The Applicants and ISO-NE will work together to ensure that the system is operated in a safe, reliable, and cost effective manner, while complying with all regulatory requirements. Both Applicants and ISO-NE have operators on duty twenty four hours per day, seven days per week.

Q. Please describe the maintenance and repair issues that are likely to be associated with the Project, and who will be responsible for those.

A. The Project is proposed to be constructed in a very typical fashion for 345 kV transmission lines in the northeast. This type of construction typically requires very little routine maintenance. Some of the more common maintenance activities include replacing damaged insulator discs, and repair or replacement of damaged guy wires.

For portions of the route where there are already transmission lines, operations and maintenance will not change substantially. Along the entire route, maintenance will be performed in accordance with the Applicants' system maintenance policies and procedures, including: best practices for preventive maintenance; compliance with regulatory and power coordination authority standards and guidelines; maintenance practices that are practical and cost effective; maintenance practices that monitor equipment operating conditions and provide trend data; and written descriptions of the maintenance program;

In addition to the actions taken above, certain specific requirements for high voltage transmission lines exist, including: aerial patrols for inspection of structures, conductors, and hardware; foot patrols to visually inspect the facilities; aerial thermographic inspections; patrol of lines after every interruption if the specific cause cannot be identified; aerial patrol of lines for vegetation management inspection; and recurring vegetation maintenance within cleared areas.

Q. Please describe the maintenance issues associated with the right-of-way.

A. For the portions of the route where there are already transmission lines, maintenance of the ROW will not change substantially from what occurs today. To facilitate access along the majority of the ROW and at structure sites, tree trimming or other vegetative maintenance, such as mowing, will be undertaken in select areas, as necessary. This will be done to provide access to structures to facilitate safe equipment passage, to provide safe work sites for personnel within the ROW, and to maintain safe and reliable clearances between vegetation and transmission line conductors. Once the line is operational, vegetation along the ROW will continue to be managed in order to: (1) provide clearance between the vegetation and electrical conductors and supporting structures so that safe, reliable delivery of power to consumers is assured; and (2) provide access for necessary inspection, repair and maintenance of the facility.

Specifically, maintenance activities in the corridor, depending on the natural features and accessibility of the corridor, can be carried out on foot or by equipment. All vegetation management and line maintenance activities associated with the Project's new lines will be performed in accordance with the Applicants' vegetation management guidelines and practices. NEP and PSNH will provide a field manual summarizing the vegetation management guidelines and practices to all contractors performing maintenance work in the corridor.

The management of vegetation on power line rights-of-way is critical to the safe and reliable operation of the electric transmission system. In New England, the natural succession of vegetation is for grassland to grow to shrubland and eventually turn to forest. When trees grow or fall into power line rights-of-way, they can cause an outage that can affect wide geographic areas and compromise the safety and reliability of the transmission system. Therefore, NEP and PSNH manage vegetation in their rights-of-way to maintain an early successional environment. Our objective is to maintain stable low-growing grass, shrub, and wildflower communities that are compatible with the safe and reliable operation of the transmission system, while providing the greatest potential for wildlife habitat. This is achieved through our cyclical selective brush maintenance and tree trimming programs. Selective brush maintenance entails the targeted removal of non-compatible tall-growing tree species. The Applicants maintain brush by means of selective mechanical mowing, hand cutting, or herbicide treatment on a cyclical basis depending on the voltage class of the transmission line. To maintain safe horizontal clearances to transmission lines, trees on the edge of the corridor are trimmed or removed on a cyclical or as needed basis. In addition, hazard trees (trees with defects such as rot, splits, lean, etc., that make them more likely to fail and potentially contact transmission lines) are also removed on an as needed basis to minimize the potential for tree caused outages.

Q. Please describe how NEP and PSNH have historically handled equipment failures and how they propose to continue to handle such occurrences in the future.

A. As long standing public utilities engaged in the transmission of electricity, the Applicants have significant experience with the installation, maintenance and repair of the various elements of the transmission system. Both Applicants have strategies to guide them on management of the various major components of the transmission system. These strategies are based on data about the population and vintage of various critical equipment types along with historical data on failure modes and expected life span. Both Applicants also have comprehensive preventive maintenance programs designed to ensure maximum service life of our transmission system while maximizing reliability. Transmission system operations and maintenance is performed by an operations and maintenance group consisting of professionals skilled in the relevant activities.

The workforce is scalable in the event that more labor or equipment is required for any particular purpose or event. Both Applicants have business relationships with a wide range of contractors who are also able to support maintenance activities if necessary. Both Applicants maintain storage facilities that are set up to carry the specific materials that are required to maintain the transmission system, in quantities to cover foreseeable needs. Sourcing arrangements are in place with a great deal of material suppliers that allows for the timely procurement of materials.

Equipment failures will be handled in the same manner they are handled today. When a transmission line outage occurs, the local control center in conjunction with field personnel determine the most efficient way to quickly and safely restore customers and system reliability. The line is patrolled by foot or by vehicles depending on ground conditions as soon as it is safe to do so. Once the cause of an interruption is found, crews are dispatched to implement restoration.

Q. Please describe all the measures that will be employed to ensure the Project operates safely.

A. During Project operations, the Project will follow all of the Applicants' policies and procedures, which necessarily include all OSHA regulations, other state and federal regulations, and guidance documents.

Each company's local control center employs a sophisticated Energy Management System (EMS) to monitor and control the operation of the transmission system. The EMS has the ability to continuously monitor the status of the system and quickly reroute power flows to ensure that under all conditions and scenarios, all elements of the system are operating within their established thermal limits. This will ensure that transmission line conductors will never sag below their minimum heights as required by applicable codes and standards.

Line maintenance and ROW maintenance practices, as outlined above, are also applicable for the safe operation of the Project.

Q. How will access to the Project be handled post-construction?

A. The existing ROW currently contains existing accessways that allow the Applicants to reach the Project site. Such accessways will be maintained and may be upgraded to ensure that the Applicants have the ability to reach each structure within the ROW post-construction. *See* Construction Access Plans, Appendix U.

Conclusion

Q. Please summarize why NEP and PSNH believe that they have the technical and managerial capabilities to construct and operate the Project in accordance with the terms and conditions for a Certificate of Site and Facility that this Committee may issue.

A. NEP and PSNH have decades of experience constructing, operating, and maintaining transmission facilities in the State of New Hampshire. NEP owns and operates over 2,300 miles of interstate electric transmission lines, 400 of which are located in New Hampshire. National Grid USA and its subsidiaries have reliably served approximately 3.4 million electric customers across the Northeast and New York State. NEP has comprehensive experience in planning, designing, engineering, permitting, constructing, financing, operating, maintaining and managing electric transmission infrastructure projects.

Eversource owns and operates approximately 4,270 miles of transmission lines in the Northeast and serves approximately 3.6 million electric and natural gas customers in the region. The Eversource Transmission Business is a procedure-driven organization that has been structured for the specific purpose of constructing, operating and maintaining transmission assets in the states of CT, MA and NH. Eversource Transmission utilizes procedures for all key functions including Project Management, Engineering, Maintenance and Operations, and Quality Control, to name a few. Eversource has a significant ongoing transmission capital construction program in New Hampshire, of which this Project is only a small part. Over the past decade, Eversource has a proven track record of constructing many complex transmission projects.

Both NEP and PSNH have an extensive staff of in-house siting, engineering, environmental, legal project management and construction professionals, skilled in the development of large transmission projects. Each company has numerous relationships with many major engineering firms, environmental and other related consultants and contractors which we will rely on to execute projects in a safe, efficient and cost effective manner. Please also see the Joint Pre-Filed Testimony of Jess Farrell and Garrett Luczszki for a detailed description of the technical design of the Project.

Both NEP and PSNH, therefore, have the requisite technical and managerial capability to design, construct and operate the Project.

Q. Does this conclude your joint testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF BRYAN HUDOCK

Bryan Hudock, PMP – Project Manager

15 Francis Ave
Shrewsbury, MA 01545

(508) 315-2655 (c)
bryan.hudock@gmail.com

Summary

PMP certified Project Manager and Navy veteran with over 10 years experience leading engineering, manufacturing, military, and utility construction projects.

Experience

National Grid
Lead Project Manager
May 2012 – Present
Waltham, MA

- Assigned Delegation of Authority (DOA) to plan and execute a portfolio of projects involving $200 Million (M) investment in electric transmission assets in MA and NH.
- Executed $23M project to build a new open air substation on a greenfield site. Project completed on schedule and on budget.
- Successfully completed $7M transmission line upgrade on schedule with 25% additional scope added 3 months prior to construction start.
- Successfully completed $4M underground distribution upgrade on schedule and under budget despite loss of construction contractor just after construction start.

Siemens Industry
Technical Project Manager
June 2010 – April 2012
Worcester, MA

- Full profit and loss responsibility for over $5M in projects involving design, manufacture, and installation of rolling mill equipment.
- Engineering coordinator for over $60M in international steel mill projects.
- Steel mill project cited as "top performer" in productivity gains across all active projects in department
- Led department effort to share and utilize lessons learned.

US Navy – NROTCU
College of the Holy Cross
Naval Science Instructor
March 2008 - June 2010
Worcester, MA

- Served as nationwide coordinator for engineering curriculum used by over 70 colleges and universities
- Responsible for training and mentoring of over 80 prospective Naval officers
- Organized year end awards ceremony involving over 40 military, civic, and academic organizations

US Navy – USS Hartford
Division Officer
Dec 2004 – March 2008
Groton, CT

- Successfully planned and executed a high risk project to safely submerge the submarine after 18 month overhaul.
- Cited for exceptional effort in development and oversight of a critical safety and training program
- Responsible for team of 15 members and $20M in equipment during 6 month overseas deployment
- Line manager and shift supervisor during 18 month shipyard overhaul.

Education

- Worcester Polytechnic Institute – M.S. Electrical and Computer Engineering, Completed May 2011, 3.70 GPA
- United State Naval Academy – B.S. Systems Engineering, Completed May 2003, 3.82 GPA

Skills

- Experience with SAP, MS Project, Primavera P6, MS Office

References provided upon request

ATTACHMENT B.

RESUME OF DAVID PLANTE

David L. Plante, PE
260 Church Road
Pembroke, NH 03275

Profile

An experienced Project Manager with a proven track record of completing large and complex infrastructure projects, on time and within budget. Licensed in New Hampshire as a Professional Engineer, with a Masters Certificate in Project Management. Core competencies include planning and executing transmission line and substation projects, labor management, budgeting and financial management, strong negotiation skills and cultivating strategic business relationships**.**

Experience

Eversource Energy (Public Service of New Hampshire), 1988–Present
Lead Project Manager

As Lead Project Manager, managing all aspects of schedule, cost, quality and cost on a variety of types and sizes of electrical infrastructure projects, ensuring successful completion of all project deliverables per budget and schedule obligations, including engineering drawings and calculations; environmental permitting and compliance; local, state and federal permitting; real estate compliance and acquisition; material procurement; public outreach; project reporting; construction.

New 115kV Y138 Transmission Line
Project Manager, Construction Manager, Design Engineer
Project involved 14 miles of new 115kV transmission line, between the White Lake substation and the Saco Valley substation. Also participated as an expert witness in the New Hampshire EFSEC siting process.

34.5kV 3157X Line Voltage Upgrade
Project Manager
Project involved a voltage upgrade of an existing ROW distribution circuit to serve a new distribution substation between the North Rochester substation to the Sanbornville substation.

Tri-State Fiber Optic Cable Installation
Project Manager, Engineer
Project involved a joint venture between Northeast Utilities and a telecommunications parter, across three states, to install fiber optic cable on Northeast Utilities transmission system. The southern New Hampshire portion of the project consisted of installing several hundred miles of OPGW and ADSS fiber optic cable. Also managed the construction in New Hampshire and assisted with construction inspection and oversight.

Lakes Region Energy Project, 115kV J125 Line
Project Manager, Engineer
Project involved the construction of a new 13 mile 115kV Line between Webster substation and Laconia substation. This project involved complex double circuit construction with existing 34kV lines while minimizing outage durations during construction.

115kV G146 Line Re-build
Project Manager, Line Engineer
Project involved 18 miles of 115kV transmission line rebuild from Deerfield to Garvin Fall in Bow, NH.

Amherst Substation Bus Expansion
Project Manager
Project created a 345kV ring bus and added a 2nd 140MVA 345/34.5kV transformer to the existing Amherst substation, involving a complex construction sequence to split and cutover 345kV Line 379.

Pond 115kV Substation Rebuild
Project Manager
Project completely rebuilt the aging 115kV substation at Scobie Pond substation in Londonderry, involving an extremely complex line cutover sequence to energize the new substation without compromising the security and reliability of the transmission system.

Tioga Power Project
Project Manager
Project consisted of construction of two new green field substations and two new 115kV lines, creating a loop in the Manchester area**.**

White Mountain Region Upgrade
Project Manager
Project involved specifying, procuring and installing the first Phase Shifting Transformer on the Northeast Utilities transmission system, at Saco Valley substation in Conway. Project required the use of the Conway Scenic Railroad for transporting the 500 ton unit on the last leg of its journey from China to Conway. Project also included the addition of 115kV Capacitor Banks at both White Lake substation and Beebe River substation.

115kV F162 Line Rebuild
Project Manager
Project involved reconstruction of 20 miles of existing 115kV line, complicated by extensive environmental challenges and a very narrow right-of-way.

Deerfield Region Upgrades
Project Manager
Project consisted of a suite of upgrades projects in the Deerfield/Seacoast Region.

Deerfield S/S
Project Manager

Project consisted of the addition of a 2nd 450MVA 345/115kV autotransformer and a new 345kV breaker, the replacement of two 345kV breakers, four 115kV breakers and all of the existing control cable.

115kV L175 Line Rebuild
Project Manager
Project included the rebuild of 20 miles of the L175115kV Line from Deerfield substation to Madbury substation.

115kV M183 Line Rebuild
Project Manager
Project consisted of the rebuild of 7 miles of the M183 115kV Line from the Madbury substation to the Dover substation.

115kV Y170 Line Construction
Project Manager
Project included the construction of 7 miles of new 115kV Line from the Eastport substation in Rochester, NH to the new Tasker Farm distribution substation in Milton, NH. Project included the relocation of existing 34kV distribution lines and a substantial amount of wetland construction with challenging access.

NH Department of Transportation, 1984-1988
Civil Engineer I-IV

- Performed detailed civil and structural engineering in the design of interstate highway bridges.
- Performed hydraulic studies.
- Wrote software for load rating of various types of highway bridges as required by State legislation.
- Provided engineering support for bridge maintenance bureau.
- Implemented Computer Aided Design and Drafting technology for bridge and highway design.

Education

University of New Hampshire, Durham, NH
Bachelor of Science, Civil Engineering

Training

OSHA 10 Hour Training	2008
Substation Design, Seimens/PTI	2008
NU Leadership Academy	2006
Fundamentals of Protection and Controls Engineering	2006
Masters Certificate – Project Management - GWU	2005

ATTACHMENT C.

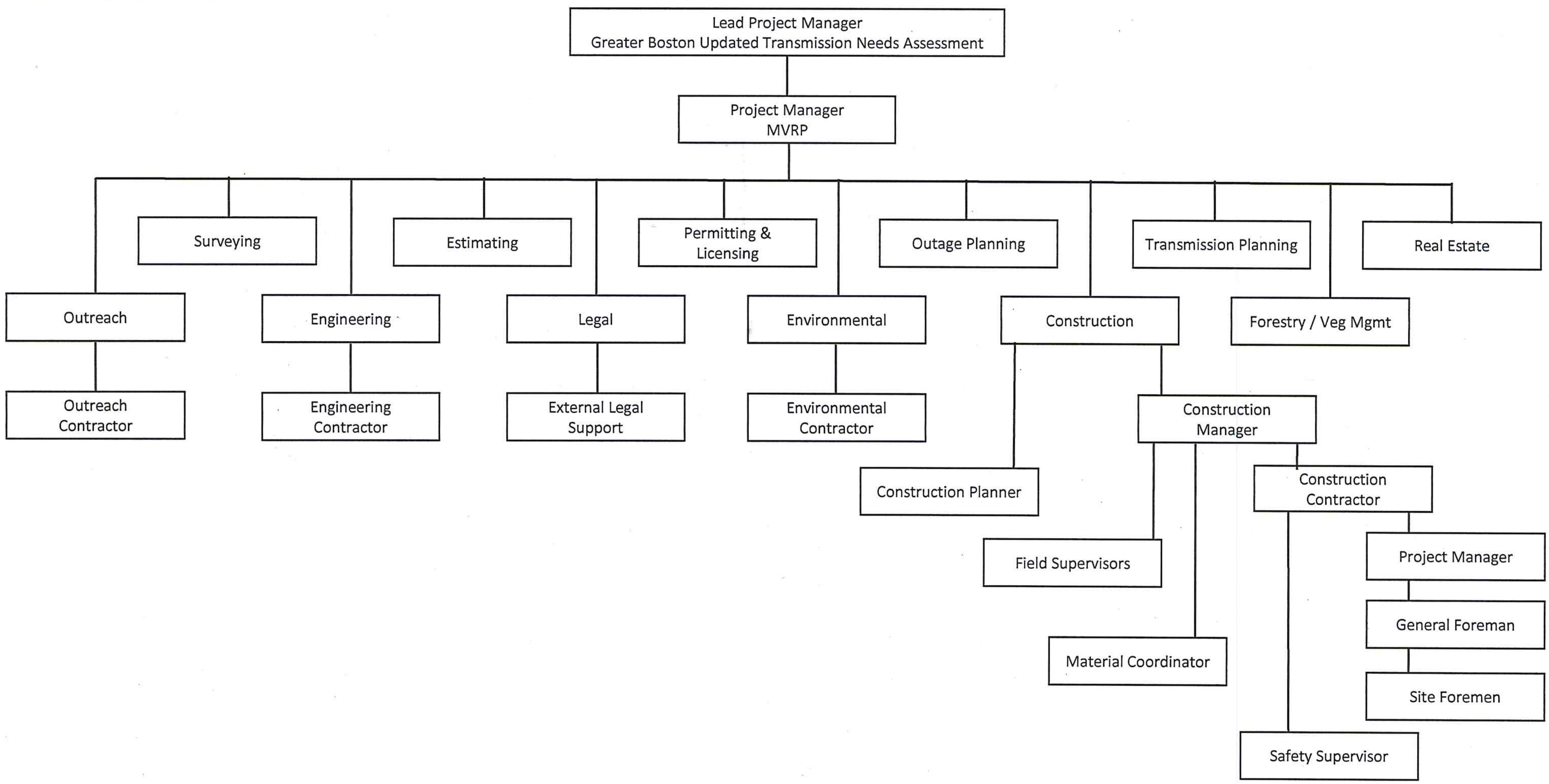
MERRIMACK VALLEY RELIABILITY PROJECT,

PROJECT ORGANIZATION CHART –

NATIONAL GRID

nationalgrid
HERE WITH YOU. HERE FOR YOU.

Merrimack Valley Reliability Project
Project Organization Chart – National Grid



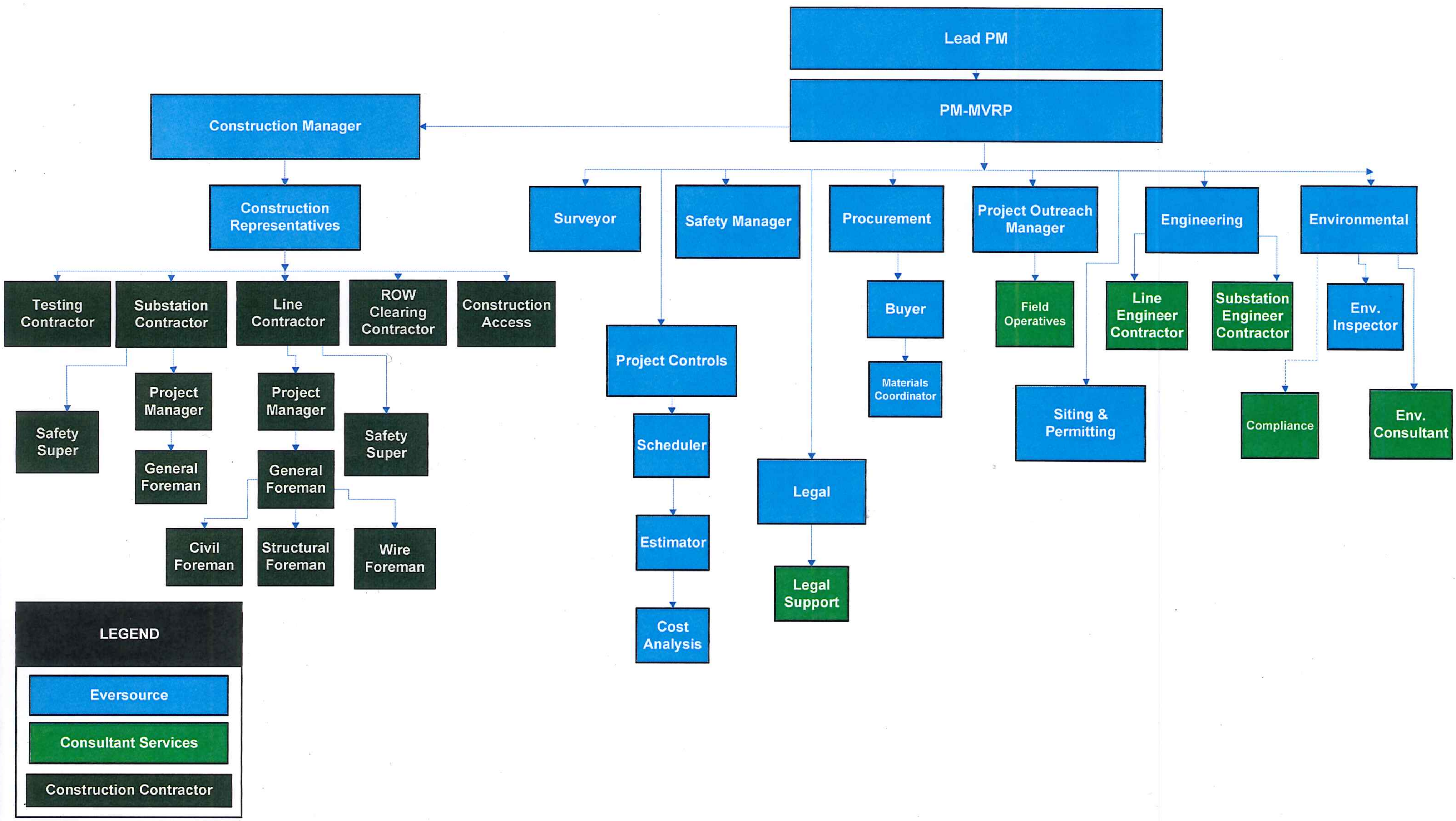
ATTACHMENT D.

MERRIMACK VALLEY RELIABILITY PROJECT,

PROJECT ORGANIZATION CHART –

EVERSOURCE

MVRP Project Organization Chart



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
JESSICA T. FARRELL, PE AND GARRETT E. LUSZCZKI, EI
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Personal Background – Jessica T. Farrell, PE

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

A. My name is Jessica T. Farrell and I am a Lead Engineer in the Transmission Engineering Department at New England Power Company d/b/a National Grid (NEP). My business address is 40 Sylvan Road, Waltham, MA 02451.

Q. Briefly summarize your educational background and work experience.

A. I have a Bachelor of Science Degree and a MS Degree in Civil Engineering from Worcester Polytechnic Institute. I graduated with High Distinction and was a member of both Tau Beta Pi and Chi Epsilon Engineering Honor Societies. The focus of my civil engineering studies was structural engineering and construction project management. I am a licensed Professional Engineer (PE) in the Commonwealth of Massachusetts. I have been working at National Grid since earning my BS Degree in 2006.

The work experience I have at National Grid ranges from small refurbishment projects, to conductor clearance evaluations, to the construction of new overhead electric transmission lines. My current role as Lead Engineer involves overseeing the work product generated by engineering consultants on behalf of National Grid and self-performing engineering and detailed design on major transmission line projects. During the course of my tenure at National Grid, I have been involved in all aspects of overhead transmission line engineering and design on voltages ranging from 69 kV to 450 kV in addition to serving as a project manager and engineering lead on multiple projects. Currently, I am working on a number of projects for National Grid spread across Massachusetts, New Hampshire, New York, and Vermont.

For additional details of my work please see my resume, 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. I am the National Grid Transmission Engineering lead responsible for the transmission line engineering and design for the NEP segments of the Project. In this role, I am also responsible for developing and analyzing alternate routes, coordinating with the PSNH project team, and oversight of the development of the technical information used as the basis for NHDOT and SEC permits.

<u>Personal Background – Garrett E. Luszczki, EI</u>

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

A. My name is Garrett E. Luszczki. I am a Transmission Line Engineer for TRC Solutions in Augusta, Maine. My business address is 249 Western Avenue, Augusta, Maine.

Q. Briefly summarize your educational background and work experience.

A. I hold a Bachelor of Science Degree and a Master of Science Degree in Civil Engineering from the University of Maine. I graduated magna cum laude and am a member of the Tau Beta Pi and Chi Epsilon Engineering Honors Societies. My main focus within the civil engineering field was in structural engineering. I am also a licensed Engineer-Intern (EI) in the State of Maine.

I first started working as a transmission line engineer evaluating clearances of existing transmission lines ranging from 34.5 kV up to 765 kV. My current projects include evaluating the structural integrity of over 400+ miles (over 4,000+ structures) for compliance with current code as well as to the standards from the time of each lines' construction. I also have served with Vermont Electric Company in reviewing the addition of a gas pipeline within a transmission line ROW. I currently serve as the Project Lead on several projects with Eversource (both in Connecticut and in New Hampshire). My role as the Project Lead includes leading a team of engineers/designers (typically between three and seven people).

For additional details of my work please see my resume, Attachment B.

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

A. No, I have not.

Q. What is your role in the Project?

A. For this Project, I am the Lead Transmission Line Engineer responsible for the transmission line engineering design of the segments of the Project located within PSNH's service territory. In this role, I am also responsible for developing and analyzing alternate routes, coordinating with the NEP Project team, developing the technical information for the NHDOT permits and SEC approval.

Joint Testimony of Jessica Farrell and Garrett Luszczki

Q. What is the purpose of your joint testimony?

A. The purpose of our joint testimony is to provide the SEC with information about the configuration and design of the Project and to demonstrate that both NEP and PSNH have the technical and managerial capability to design and construct the Project. We will also provide details on the alternative routes that the Applicants considered for the Project.

Q. Please generally describe the design process and the major factors that were considered.

A. NEP and PSNH used similar processes to develop and design their individual segments of the Project.

NEP's first activity was to develop conceptual cross-sections to verify that all Project components could be constructed in the existing ROW from the Tewksbury 22A Substation to the point of ownership demarcation in Hudson, NH. The PSNH right-of-way between the point of ownership demarcation and Scobie Pond 345 kV Substation in Londonderry, NH has remained intentionally undeveloped since its creation to accommodate a new 345 kV line. Once the conceptual cross-sections had been vetted by Project team subject matter experts, the Companies began to design the Project utilizing aerial laser survey data in PLS-CADD modeling software. Existing line models were merged to form a cohesive and comprehensive model for the entire length of the right-of-way. Design of the relocated 115 kV Y-151 line and new 345 kV 3124 line progressed in parallel with company standard structures utilized as the basis of structural design on the Project. Initial structure placement was based on an effort to place new structures lockstep with existing structures on the ROW to the greatest extent possible while considering previously identified sensitive areas such as wetlands and waterbodies, subsurface utilities, roads, circuit separation under blowout conditions, conductor clearance considerations and overall structure height.

After arriving at the optimized structure locations from an engineering perspective, these locations were refined with input from the environmental and construction subject matter experts on the Project team. Structure locations were adjusted based on the boundaries associated with delineated wetlands to reduce both permanent impacts and temporary impacts associated with the work areas necessary to construct the Project. In select areas, structures that were determined to be in potentially highly visible areas were shifted such that direct views would be blocked by stands of vegetation. Dead-end structures were also adjusted to optimize wire pull lengths and to avoid overly complex wire stringing set ups.

As of the filing date of the Application, NEP and PSNH engineering has progressed so that the standard structures have been adapted to align with the needs of the Project. Structure heights have been reduced to the greatest extent practical while ensuring design is in conformance with governing codes. The design tension of the conductor and framing details have also been finalized. Some flexibility is intentionally built into the line layout for potential future adjustments in structure position that may be required to resolve any unforeseen issues. Review and optimization of the line design will continue throughout the permitting process in an effort to adapt to the considerations of the expanding universe of stakeholders associated with the Project.

Q. Aside from the major factors you just described, what other engineering considerations went into the design?

A. The location of dead-end structures was selected to minimize the potential to have to splice conductor on the new 3124 and Y-151 lines. Locations for dead-end structures were chosen taking into consideration the maximum conductor reel sizes, mitigation of the potential for cascading failure, and the relative location of large line angles on the right-of-way.

The primary consideration for the placement of the OPGW splice locations was accessibility for OPGW splicing equipment. These splices are housed in shielded containers that are attached to the structure roughly 10 to 20 feet from the ground. The equipment for splicing is typically transported to the site in a rubber tired vehicle not ideally suited for traversing transmission line rights-of-way.

Typically, splice locations are chosen to coincide with road crossings to allow for ease of access and minimize impacts to more sensitive areas of the ROW. The last splice location along the line is located just outside Scobie Pond 345 kV Substation, which allows fiber crews to access the splice boxes without having to enter the substation.

In Segment 4, there is a gas transmission pipeline and sewer line crossing near Mammoth Road. Care was taken to accurately identify the location of the gas pipeline. Consequently, a special H-Frame structure type that is installed on foundations was selected at the angle immediately adjacent to the gas pipeline. Placing this structure on foundations eliminates the need for guy wires that might interfere with the gas pipeline and its surrounding ROW.

The Applicants exercised the same level of care in Segment 2, just south of Bridle Bridge Road, where there is an underground gas transmission pipeline crossing along with other surface mounted facilities. The relocated Y-151 line in this location had to be spotted such that it did not interfere with the underground gas pipeline and could be constructed with minimal impacts to the wetlands located just to the north.

Q. Please describe the types of structures the Project will use and why they were chosen.

A. As described in detail in section (h)(1) of the Application, the primary structure types for the new 3124 line are H-Frame structures. An H-Frame structure is a two or three pole structure with a horizontal cross-arm that supports all three phases of the conductor. Two pole H-Frames are symmetrical about the center of the structure. The two-pole structures are used to suspend the conductor in the air between dead-ends or running angles. In other words, they are used to hold up the wires when they are in a straight line. *See* Appendix R, *Engineering Drawings*, for examples of the H-Frame structures proposed for the Project.

In Segment 2, where the ROW changes direction, self-supporting steel three pole dead-end or H-Frame dead-end structures are utilized to address the line angle. The conductor at these dead-end type structures is terminated at the structure and then restarted in the new direction as a new section of conductor. *See* Appendix R, *Engineering Drawings*, for examples of these structures.

In Segments 3 and 4, whenever the line changes direction, a guyed three pole structure is typically used to change the direction of the line. At these locations the conductor is either pulled off to the side to form the angle or terminated at the structure as a dead-end. *See* Appendix R, *Engineering Drawings*, for examples of these structures.

These structure types were selected because the horizontal configuration creates a very efficient structure allowing for long spans with the lowest overall structure height. The existing 230 kV, 345 kV, and 450 kV DC circuits in the right-of-way are all horizontally configured, which makes the H-Frame structures visually consistent with the existing structures. In Segments 3 and 4, the new H-Frame structures will be similar in height and spacing to the existing structures causing them to blend more seamlessly.

Another benefit associated with H-Frame structures is structure symmetry, resulting in ground line structure loads that are typically significantly less than single pole structures. These lower structural loadings allow for the use of direct embed type foundations, which are typically the lowest cost foundation type. Generally speaking, delta and vertically configured structures supporting similar conductor types and tensions to those proposed to the 3124 line would require the use of more robust foundation types (e.g., reinforced concrete caissons), which are significantly more expensive.

The distance between the poles and cross-arm attachment heights vary from structure type to structure type. The varying distance ensures that proper clearance is maintained between the phase conductors and the shield wires that provide lightning protection. In this line design, the shield wires double as a means of communication between terminal substations.

Q. Please describe the structure configuration associated with the rebuild of the Y-151 line.

A. The relocated Y-151 line will be installed on self-weathering steel, single pole, delta davit arm configured structures. Delta configured structures feature a single pole with two davit arms on one side of the structure and a single arm on the opposite side. The use of steel delta davit arm structures on the relocated Y-151 line was driven by the need to relocate the centerline of the existing circuit within the bounds of the existing right-of-way, while providing adequate phase-to-phase clearance between the relocated Y-151 and existing 230 kV O-215 line, with the lowest visual impact, in a cost-efficient manner. The use of horizontally configured structures was not feasible as there was insufficient space at the edge of the right-of-way with the existing 230 kV lines in place to safely spot the structures within the bounds of the right-of-way. Vertically configured structures were considered, but due to their increased height and cost this option was deemed inferior to the delta configured structures. The vertically configured structures that were evaluated featured a single steel pole with three davit arms on one side of the structure. *See* Appendix R, *Engineering Drawings*, for structure examples and configuration of the Y-151 line.

Q. Why did the Applicants decide to use steel pole structures?

A. The Applicants decided to use steel pole structures to support the new 3124 line and the relocated Y-151 line because they have a longer projected asset life than their wood pole counterparts, which minimizes life-cycle maintenance costs and reduces impacts to the right-of-way and abutters over the length of the line.

The proposed steel pole structures will have a self-weathering finish. The nature of the weathering finish is one in which an oxidized patina is formed on the surface of the steel which protects the steel surface from additional oxidation and the atmosphere in general. Alternatively, galvanized and painted steel poles would require maintenance to prevent corrosion over time. In addition to requiring less maintenance than a galvanized or painted steel finish, the self-weathering finish was selected as it blends more naturally into the generally rural right-of-way in a manner similar to that of the wood poles on the adjacent lines in the ROW.

Q. Please describe the design of the aerial road crossings associated with the Project.

A. Construction of the Project will require 37 different crossings over locally and state maintained highways, 29 of which are municipal road crossings. The aerial spans will meet or exceed the NHDOT UAM requirement of 18-foot clearance above all road crossings, including highways, and NESC clearance requirements of approximately 21 feet for 115 kV and 25 feet for 345 kV for highways. These crossings have been designed in accordance with state and local standards. There will be no structures placed within any public right of way. For general design information regarding road crossings, please see Appendix R, *Engineering Drawings*.

Q. Please describe how you developed the engineering drawings for the Project.

A. Standard structure drawings were developed utilizing NEP and PSNH standard AutoCAD structures as a base (as applicable to each company) and drafted to suit the specific needs of the Project. PLS-CADD design software was used to spot structures, verify that appropriate conductor clearances were maintained and to generate the base files for the Plan and Profile drawings (which were then refined in AutoCAD) and the geo-referenced structure and centerline files which were used in the Wetland Permitting Plans. The Wetland Permitting Plans were developed using ESRI ArcGIS© desktop software based on inputs from field surveys and engineering files.

Q. Please describe the engineering drawings (Plan and Profile Drawings) included with the application and explain how they depict segments of the Project.

A. The Engineering Drawings, located in Appendix R, provide a depiction of the proposed structure locations and conductor elevations of the relocated Y-151 line and the new 3124 line. These sheets are divided into two separate views, a view from the top down (plan view) and a side view along the length of the right-of-way (profile view). These drawings show the plan and profile view alongside each other to allow for cross-reference.

Details contained on the plan view section of the drawings include existing and proposed circuit centerlines, structure locations, contour lines depicting topography, right-of-way boundaries, property lines, and other planimetric feature details. These other details include wetlands, highways, roads, other transmission lines and existing underground utilities that have been identified to date (i.e., pipelines and sewer lines).

A profile view of the line is provided at the bottom of the page. Details presented in this view include structure heights, conductor sag under maximum operating conditions, shield wire sag as noted, the topography along the centerline of the circuit, along with overhead utility crossings. The profile view is shown at an exaggerated vertical scale to better depict the topography and clearance of the conductor to features above and below it.

The drawing package also includes drawings depicting the proposed structures associated with the relocated Y-151 line and new 3124 line. These drawings depict, in detail, how the structures are assembled, the hardware used, and the insulators required to suspend the conductor. These drawings also show the framing dimensions and material types (steel poles for instance). The phasing diagram and sample foundation drawings are also provided for reference. The sample foundation drawings depict general information associated with direct embed foundations along with three typical reinforced concrete caisson foundation types.

Q. Please describe how the Project route was selected.

A. As discussed in more detail in section (h)(2) of the Application, the Applicants initially identified three possible overhead routes connecting the existing Tewksbury 22A Substation in Tewksbury, MA to the Scobie Pond 345 kV Substation in Londonderry, NH: the Preferred Route, a Western Alternative, and an Eastern Alternative. The Preferred Route for the Project was selected for several reasons: it has the shortest overall length (24.4 miles, 17.9 of which are in New Hampshire); the entire Project will be constructed within existing ROW; the chosen route does not require the Applicants to purchase any additional land rights; and it requires the least amount of tree clearing.

Q. Once the Preferred Route was selected, how did NEP and PSNH optimize the configuration of the Project within the Preferred Route?

A. As discussed in more detail in section (h)(2) of the Application, once the Preferred Route was selected, the Applicants worked diligently to optimize the configuration of the Project. The Applicants investigated design alternatives and ultimately determined that the optimal configuration for the Project consisted of standard H-frame structures, which are shorter and less expensive than monopole structures. This choice of structure type minimizes potential visual impacts.

In Segment 2, NEP analyzed the use of double circuit structures in order to alleviate the need to relocate the existing Y-151 line to the western edge of right-of-way. However, use of double circuit structures in this Segment of the Project would have resulted in significantly taller structures and would have required long duration outages of an existing transmission line. In Segments 3 and 4, PSNH considered the use of monopoles rather than H-Frame structures. However, using monopoles in these Segments would result in significantly taller structures and substantially increased costs.

Q. Please summarize why the Applicants believe that they have the technical and managerial capabilities to design and construct the Project.

A. NEP and PSNH each have decades of experience designing and constructing transmission facilities in the State of New Hampshire. Both NEP and PSNH have extensive staff that consists of in-house siting, engineering, environmental, legal and project management professionals, who are skilled in the design, siting and construction of large transmission projects. Moreover, each Applicant has numerous engineering firms, environmental consultants, and contractors which are relied upon to design and execute the Project safely, efficiently and effectively. Therefore, NEP and PSNH both have the requisite technical and managerial capability to design and construct the Project.

Q. Does this conclude your joint testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF JESSICA T. FARRELL, PE

Jessica T. Farrell
80 Mile Hill Road
Boylston, MA 01505

Summary

- Well-motivated engineer with experience in the inspection, design, and construction of electrical transmission line facilities.
- Experience as project manager and owner's engineer for major transmission line projects in New York and New England.
- Transmission line engineering expert witness for projects in Massachusetts, New York, and Vermont.
- Professional Engineer – Commonwealth of Massachusetts (51146)

Present Responsibilities

- Self-performing asset condition assessment, inspection, engineering, design, material management, and construction support associated with electric transmission line projects in New England and New York.
- Oversight and management of consulting engineering firms on select projects.
- Project management support and technical lead on projects requiring regulatory permitting.

Projects

- Clay – DeWitt Line 3 and Clay-Teall Line 10 Rebuild and Reconductoring Project – self-performing the engineering and design associated with the rebuilding and reconductoring of two existing 115kV transmission lines in Central New York over a distance of approximately 15 miles. Providing expert witness support for pending Article VII filing.

- Salem Harbor Reconductoring Projects – served as project engineer on two of the three fast-tracked reconductoring projects associated with the retirement of the Salem Harbor Power Plant in Salem, MA. The two projects were the 14.5 mile reconductoring of the existing B154N and C155N Lines and the 8.3 mile reconductoring and refurbishment of the 115kV Y151 line. Self-performed the inspection, engineering and construction support associated with both projects as well as provided project team support for permitting, access, and construction service provider acquisition.

- A127/B128 West Reconductoring Project – managing engineering consultant work associated with the reconductoring of 67 miles of double-circuit 115kV lines with high-temperature low-sag conductor. Provided expert witness testimony for Vermont Section 248(j) filing (Docket 7709). Currently providing engineering support to construction crews and coordinating materials.

- Mohican-Battenkill Rebuild Project – managing engineering consultant work associated with the rebuild and reconductoring of two existing 115kV transmission lines in Eastern New York over a distance of approximately 14.2 miles. Served as the expert witness in the Article VII filing associated with the project (11-T-0068) and was the project lead for the development of the Environmental Management and Construction Plans (EM&CP). Project management support also provided.

- Spier Falls – Rotterdam New 115kV Lines Project – managed engineering consultant work associated with the creation of two new 115kV lines in eastern NY. Served as the expert witness in the Article VII filing associated with the project (10-T-0080).

- New 115kV R170 Line Project – managed engineering consultant work associated with the upgrade of an existing 69kV transmission line to 115kV. Served as the expert witness in the Energy Facilities Siting Board filing associated with the Project (EFSB 10-1/DPU 10-107/108).

- New 115kV H134 Line Project – self-performed the engineering and design associated with a new 115kV transmission line on partially new and partially unused but existing right-of-way. Assisted in the routing study associated with the proposed line, refinement of structure placement based on sensitive areas.

- E205W Reconductoring Project – self-preformed the inspection, engineering and construction support associated with a 3.5-mile reconductoring and 8-mile shield wire replacement project on the 230kV E205W line in western Massachusetts and southwestern Vermont. Served as project manager for the majority of the project and was an expert witness in the Project's section 248(j) filing (Docket 7609).

- G33 Rebuild Project – managed engineering consultant work during the course of construction on the 69kV G33 line. Provided engineering support to construction personnel, sourced construction materials, and assisted in project management activities.

Technical Skills

- Microsoft Office, AutoCAD, Sag10, PLS-CADD and associated software packages, and FAD.

Educational Background

College/University

- M.S. in Civil Engineering, Worcester Polytechnic Institute, 2009
- B.S. in Civil Engineering, Worcester Polytechnic Institute, 2006

Advanced Courses and Certificates

- Electrical Power Research Institute – Red Book Training 2011
- Utility Aviation Specialists – Utility Patrol Operations Parts 1 & 2 & Crew Resource Management Seminar (Certified helicopter flight crew member) 2011 & 2013
- Merrimack College - Certificate in Project Management 2007

Experience

All experience with National Grid in the Transmission Engineering and Transmission Project Engineering departments.

Lead Engineer – July 2011 to Present
Senior Engineer – July 2010 to June 2011
Engineer – July 2008 to June 2010
Associated Engineer – June 2006 to June 2008

ATTACHMENT B.

RESUME OF GARRETT E. LUSZCZKI, EI

GARRETT E. LUSZCZKI, EI

EDUCATION
M.S., Structural Engineering, University of Maine, 2012
B.S., Civil Engineering, University of Maine, 2010

REGISTRATIONS/CERTIFICATIONS
Engineer-Intern, Maine (#6215)

AREAS OF EXPERTISE
Mr. Garrett E. Luszczki, EI has experience in the following general areas:

- Transmission Line Design/Layout/Analysis for 115kV to 765kV lines
- PLS-CADD expert including the modules for Pole, Tower, and SAPS
- Concrete foundation design per ACI 318 including the analysis of drilled caissons using LPile software
- Modeling and analysis of existing steel, wood, laminated single pole and H-frames, and steel lattice structures
- Resolving clearance issues with a comprehensive understanding of available methods, including PhaseRaiser ™ and Nip/Tuck method
- Review and identification of gas and electrical transmission line cohabitation conflicts and potential resolutions
- Engineering Studies

PUBLICATIONS
"Nip/Tuck Method – A Solution to Providing Additional Conductor-to-Ground Clearances for Transmission Lines" – Co-authored and Presented at the 2013 Transmission and Substation Design and Operations Symposium (TSDOS) Conference in Addison, TX.

Garrett E. Luszczki, Joshua D. Clapp, William G. Davids, and Roberto Lopez-Anido (2013) Withdrawal Capacity of Plain, Annular Shank, and Helical Shank Nail Fasteners in Spruce-Pine-Fir Lumber. Forest Products Journal: 2013, Vol. 63, No. 5-6, pp. 213-220

REPRESENTATIVE EXPERIENCE
Mr. Garrett E. Luszczki has experience in all aspects of transmission line design. This includes the analysis and resolution of transmission line clearance issues, structure modeling, analysis, and foundation design. Mr. Luszczki currently serves as the project lead on transmission line projects for several of the group's high profile clients, most notably Eversource. Responsibilities include leading a team of 3 to 7 engineers/designers to complete complex projects.

Eversource (previously PSNH) Merrimack Valley Reliability Project 345kV Line 3124 Design, Londonderry, New Hampshire
(Transmission Engineer: January 2014 - Present)
Mr. Luszczki serves as the Lead Transmission Engineer for the design of approximately 10 miles of newly proposed 345kV transmission line in New Hampshire. Responsibilities include project engineering oversight/organization of a team of 4 engineers/designers for the modeling design, analysis and permit support. The design and analysis includes line layout, the development of steel structure types similar to the existing wood 345kV structures within the ROW, and review of structures per client and NESC 2012 requirements.

Public Service of New Hampshire, Q166 Line Design, Owners Engineer, Fitzwilliam, New Hampshire
(Transmission Engineer: January 2014 - Present)
Mr. Luszczki serves as the Owner’s Engineer, collaboratively reviewing the design of approximately 2 miles of line with PSNH. Q166 is a proposed new 115kV line being designed and constructed. This line features a combination of wood and laminate single pole and H-Frame type structures. Responsibilities include on-call project reviews of submittals made by another consultant to ensure the design complies with the client’s Overhead Transmission Standard (OTRM).

Northeast Utilities, 115kV Storm Hardening Initiative, Multiple Projects, Connecticut and Massachusetts
(Transmission Engineer: January 2013 - Present)
Mr. Luszczki serves as the Lead Transmission Engineer for the structural analysis of each structure for approximately 200+ miles of line. Responsibilities include project engineering oversight/organization, modeling, and verification of steel lattice towers, and steel, wood, and laminated single and H-Frame structures along 115kV lines; ensuring the structures are adequate for the loads they were originally designed to withstand. Analysis includes the review of structures per NU criteria and NESC code requirements at the time of each line’s construction. The analysis uses fully developed PLS-Tower and PLS-Pole models for all structures which incorporate wood pole defects for all wood dead-end and tangent structures.

Public Service of New Hampshire, Storm Hardening Initiative, 345kV & 115kV Transmission Lines, New Hampshire
(Transmission Engineer: November 2013 – Present)
Mr. Luszczki serves as the Lead Transmission Engineer for this work, analyzing over 1000+ miles of line. Responsibilities include the modeling and analysis of every 345kV and 115kV structure in the PSNH transmission system; ensuring the structures are adequate for the loads they were originally designed to withstand. Analysis included the review of structures per NESC code requirements at the time of each line’s construction as well as current design codes. The modeling effort involved the development of full finite-element PLS-Pole models for the

existing wood, laminate, and round steel structures as well as PLS-Tower to model the steel lattice towers found on their 345kV system. PLS-Tower models range from 150’ towers up to 330’ towers. An extension of the work involves the development of 350+ digital plan and profiles drawings to replace existing hand drawn plan and profile drawings.

Northeast Utilities, 345kV Storm Hardening Initiative, 345kV Transmission Lines, Connecticut and Massachusetts
(Transmission Engineer: June 2013 – January 2013)
Mr. Luszczki served as the Lead Transmission Engineer for 280 miles of line where responsibilities included verification of over 2100+ structures on 18 separate 345kV lines; ensuring the structures were adequate for the loads they were originally designed to withstand. Analysis included the review of structures per NU criteria and NESC code requirements at the time of each line’s construction. The analysis used fully developed PLS-Pole models for all angle structures and analysis spreadsheets which incorporated pole degradation observations for all deadend and tangent structures. A second extension of this work involved the model development, placement, and analysis of double circuit PLS-Tower models for ~25mi of line within PLS-CADD.

Vermont Electric Company, VT Gas Pipeline Review, 115kV and 345kV Transmission Lines, Vermont (Transmission Engineer: 2012 - Present)
Mr. Luszczki serves as a Transmission Engineer reviewing the cohabitation of approximately 28 miles of newly proposed 12” gas pipeline within multiple VELCO 115kV and 345kV transmission line right-of-ways. The review includes tracking the gas pipeline’s location and location changes in consideration to how the pipeline and pipeline’s route may affect VELCO’s existing and future transmission line structures and right-of-way. Other aspects of this project involve the development of clearance profile drawings at any location where the pipeline crosses VELCO transmission lines; identifying OSHA working clearance limits beneath the conductor.

New York Power Authority, NERC Compliance, 230kV, 345kV, and 765kV Transmission Lines, New York (Transmission Engineer: 2012)
Mr. Luszczki served as a Transmission Engineer on this project, where his responsibilities include the development of recommendations for resolving clearance issues. Solutions included using the Nip/Tuck method, structure change-outs or moving wire attachment positions. Other non-traditional solutions included the development of an innovative design to lift the bottom set of conductors using the conductors directly above. The project also required the development of a new structure using common NYPA stock items.

OTHER PROJECTS

Iberdrola USA Management Company, Inc., NERC Compliance for Central Maine Power Co., 115kV and 345kV Transmission Lines, Maine (Transmission Engineer: 2012-2013)

Vermont Electric Company, Line 340 Structural Analysis for 1961 and 2012 NESC Code, Vermont (Transmission Engineer: 2012 – 2013)

NextEra Energy, Blue Summit Wind Farm Interconnect, Texas (Transmission Engineer: 2012)

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

PRE-FILED TESTIMONY OF MARK D. SUENNEN, PE, PTOE
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

<u>Personal Background</u>

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

A. My name is Mark Suennen. I am a Project Manager and Senior Traffic Engineer for VHB in Bedford, New Hampshire. My business address is 2 Bedford Farms Drive, Suite 200 in Bedford, New Hampshire.

Q. Briefly summarize your educational background and work experience.

A. I have a Bachelor of Science in Civil Engineering (BSCE) from Worcester Polytechnic Institute (WPI) and a Master of Science in Civil Engineering (MSCE) from the University of Maryland, College Park. For both degrees, I specialized in transportation engineering. My work experience began in 1996 working for the Maryland State Highway Administration (SHA) where I performed traffic engineering studies and work zone traffic control reviews. After eight years with SHA, I worked for two years with the Department of Defense as the facility traffic engineer managing the traffic and parking operations at a military base in Fort Meade, Maryland. In 2006, I began working for VHB as a Senior Traffic Engineer and Project Manager performing traffic engineering studies, traffic control device designs, and traffic operational analyses, including the development of several traffic control and traffic management plans for construction projects. I have also been responsible for the construction oversight for several transportation engineering projects in New Hampshire. In total, I have over 18 years of traffic engineering planning, design and operations experience both on the public side and in private consulting. I am a licensed professional engineer in New Hampshire, Maine, and Maryland and I am certified as a Professional Traffic Operations Engineer (PTOE) by the Institute of Transportation Engineers (ITE).

For additional information, please find my resume 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. I am responsible for preparing the traffic management plans and NHDOT permit applications for locations where the proposed transmission lines cross public highways and streets. I am also responsible for preparing the driveway permit applications for access locations along the state-owned highway system.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to identify the impacts of the construction of the proposed transmission lines on the traveling public and to develop traffic management plans to mitigate those impacts during construction.

<u>Permitting for Project Construction</u>

Q. Please describe the NHDOT permits and other approvals that the Applicants are seeking that relate to construction.

A. The Applicants are seeking four types of NHDOT permits or agreements: (1) Aerial Utility Permits for two state-maintained highway crossings and the rail-trail crossing; (2) a Temporary Driveway Permit for one construction access point along NH Route 28 in Londonderry; (3) a Temporary Use Agreement for construction access to the transmission line corridor along the Manchester/Lawrence Recreational Rail Trail (a.k.a. Granite State Rail Trail or the Londonderry Rail Trail); and (4) a Railroad Crossing Agreement for the Manchester/Lawrence Recreational Rail Trail. The NHDOT permit applications and supporting documentation are provided as Appendix P.

The Applicants also seek approval from the NH SEC to construct the new transmission line along, over, and across locally maintained highways. The Applicants have prepared a traffic management plan and designed the Project so as to not interfere with the safe, free and convenient use of public travel along these local roadways. The Applicants believe that this local roadway traffic management plan meets all requirements that would otherwise be enforced at the local level for such an approval and ask that it be accepted and approved as sufficient to meet the needs of the local communities.

Additionally, the Applicants are asking the SEC to delegate approval authority for overheight, overweight and oversized hauling permits to NHDOT. The Applicants will seek these hauling permits at the time of material delivery.

Q. How will the Applicants ensure compliance with all of the requirements of NHDOT permits and agreements when constructing the Project?

A. The NHDOT permits and agreements each have a series of conditions that the Applicants and Contractor(s) must meet. Upon issuance of the Certificate of Site and Facility, the Applicants will select one or more Contractors to perform the work. The conditions of the permits will be made part of the construction contract(s) for the utility work. Additionally, the Contractor will be required to hold a pre-construction meeting with the NHDOT District Five office prior to beginning any work along or adjacent to the state-maintained highways to discuss additional site-specific requirements and restrictions to conduct the work. The conditions of the NHDOT permits will be included in the compliance plan. Details of the compliance plan are provided in the accompanying testimony of Project Managers David Plante (PSNH) and Bryan Hudock (NEP).

Traffic Impacts and Mitigation

Q. Please summarize the process you used to analyze traffic impacts during construction.

A. The traffic impacts anticipated from this Project were determined from previous similar projects constructed by both NEP and PSNH. The Project's impacts were determined by pre-planning the several construction phases and assigning construction resources to those phases. Based on previous similar projects, the construction phases include:

- Construction of accessway improvements and maintenance;
- Removal and disposal of existing transmission line components;
- Installation of foundations and structures;
- Installation of conductor and shield wire; and
- Restoration of the ROW.

Construction resources were assigned to each phase to determine the expected type and quantity of construction and delivery vehicles that would access the Project corridor. For example, the foundation and structure construction phase will require skilled labor (carpenters and concrete finishers), an excavator and/or a drill rig with operators, a crane with an operator, and concrete delivery trucks at each support structure. The excavator, drill rig and crane will progress from structure to structure within the Project corridor while the operators will come and go with the other skilled labor by work truck or private vehicle. On the days when concrete pours are scheduled, several concrete delivery trucks will enter and exit the Project corridor via the access driveways. Based on this exercise, the traffic impacts at any given access point along the public road network will range between eight trips per day for a typical day to about 40 trips per day for labor-intensive operations (e.g., concrete pours and structure erection). While a precise number of construction vehicle trips will vary by work activity and location, the total construction traffic impact at any given time will be less than the NHDOT minimum threshold for a traffic impact study of 100 peak hour vehicle trips.

Because the majority of the Project involves off-road work within the transmission line corridor and isolated from the public road network, the Project will have minimal impact to the traveling public. The impacts are isolated to roadways where the proposed utility lines will cross public highways, streets, sidewalks and the Granite State Rail Trail (Londonderry Rail Trail). The impacts will occur during the construction phase of the Project and will be mitigated through temporary traffic controls within the public rights-of-way to maintain vehicular, bicycle and pedestrian mobility through the work zones.

Q. Please describe how you will manage and mitigate traffic impacts during construction.

A. Traffic impacts are anticipated to occur at the locations where the Project corridor intersects the public road network. Access from the public road network to the Project corridor will occur at specific driveways as indicated by the Project plans. Where feasible, the access will occur at existing driveways along the Project corridor, thereby reducing the need for new access points. Where new access points are required, the Contractor will provide a stone apron to act as a temporary stabilized construction entrance to minimize dirt and debris being tracked onto the roadway by vehicles and equipment. The locations of these temporary driveways will be selected based on access to the construction sites and satisfactory sight distance along the public highway or street. For day-to-day construction access, construction warning signs such as the MUTCD[1] W20-1 (Road Work Ahead) and

1 Manual on Uniform Traffic Control Devices (MUTCD), published by Federal Highway Administration (FHWA), 2009 Edition.

W11-10 (Trucks Entering) may be used on the street approaches to the driveways to reinforce the idea that construction vehicles may be entering the roadway at the temporary driveways. When large vehicles need to enter and exit the construction sites, the Contractor may provide flaggers to temporarily stop traffic while the large vehicles (cranes, concrete trucks, and flat-bed delivery trucks) negotiate the turn into or out of the driveways. Any stoppage of traffic for this purpose is expected to be very brief and not unduly disruptive to the normal flow of traffic. For individual entries or exits lasting less than eight minutes, the traffic control will be limited to the construction warning signs and flaggers. If multiple deliveries are anticipated on a given day, W20-7 (Flagger Ahead) warning signs may be added to the approaches.

Each state highway crossing includes a traffic control plan for the Contractor to follow. These traffic control plans will be reviewed by the Contractor with the NHDOT District Five office at a mandatory pre-construction meeting to be held prior to any work along state highways. Traffic controls on local roadways will comply with the MUTCD typical application drawings as modified for specific site conditions and work required. All traffic controls for this Project will be in accordance with the 2009 edition of the MUTCD and NHDOT policies.

When the Contractor is prepared to install the proposed transmission cables across the roadways, the Contractor will set-up traffic control equipment and provide flaggers or uniformed officers to maintain traffic along the highway while constructing the aerial crossings. The flaggers or uniformed officers will temporarily stop traffic along the roadway for not more than eight minutes per closure in accordance with the approved traffic management plans. During these temporary road closures, the Contractor will pull ropes across the highway and secure them above the roadway. The pull ropes will then be used to pull the utility cables across the roadway over traffic, maintaining tension on the lines to prevent excessive cable sag. It is anticipated that each roadway crossing will require not more than one week to complete, most likely on weekdays between 8:00 AM and 3:30 PM, except the I-93 crossing, which will have to be scheduled between 9:00 PM and 4:00 AM.

See Appendix AH for the traffic management plans for state-maintained and local road crossings.

Q. How will the Applicants ensure that the approved traffic management components will be complied with at all times?

A. The approved traffic management plans will be made part of the construction contract(s) for the utility work. The field construction inspectors have the ability to oversee the Contractors' operations and have the authority to stop work if the Contractors are not in compliance with the approved or amended traffic management plans. The conditions of the NHDOT permits will be included in the Project's compliance plan. Please see the joint pre-filed testimony of Bryan Hudock and David Plante.

Q. In your opinion, will the Project have a negative effect on public safety with regard to public highways and local streets?

A. As described above, it is anticipated that the traffic management components of the Project will provide appropriate mitigation of the Project's traffic impacts to ensure that there will be no negative effect on public safety along the public highways and local streets.

Q. Does this conclude your testimony?

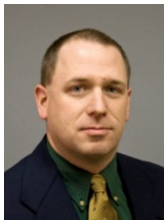
A. Yes, it does.

ATTACHMENT A.

RESUME OF MARK SUENNEN PE, PTOE

Mark D. Suennen, PE, PTOE, IMSA II

Traffic Engineer



Education

MS, Civil Engineering, University of Maryland, 2004

BS, Civil Engineering, Worcester Polytechnic Institute, 1996

Registrations

Professional Engineer (Transportation) NH, 2006

Professional Engineer (Transportation) ME, 2008

Professional Engineer (Transportation) MD, 2002

Professional Traffic Operations Engineer, 2012

International Municipal Signal Association Certified Level 2 – Fiber Optics

Certified NHDOT Local Public Agency (LPA) Training – Federal Aid, 2012

Work Zone Design Training – Maryland Transportation Tech Transfer Center 2002

Affiliations/ Memberships

Institute of Transportation Engineers, 2006

A traffic engineer in VHB's Bedford, New Hampshire office, Mr. Suennen has extensive traffic engineering experience. His responsibilities include highway signing and pavement markings, traffic signal design, signal system design, timing, and implementation, intelligent transportation solutions, and traffic control plan development. Representative projects are included below.

18 years of professional experience

Water Line on Route 151 Bridge over I-95, North Hampton, New Hampshire

Mr. Suennen was project engineer for the development of traffic control plans to support the installation of a replacement water line on the Route 151 bridge over I-95 in North Hampton, New Hampshire. This work involved the development of a phased traffic control plan to close lanes and shoulders along I-95 to support the water line installation. The traffic control plan was reviewed and approved by the NHDOT Bureau of Turnpikes.

Maine Turnpike Authority, I-95 Bridges over the York River, York, Maine

Under contract with the Maine Turnpike Authority (MTA), Mr. Suennen was the traffic engineer for the development of traffic control plans for the I-95 Bridges over the York River. This work included the development of traffic control plans for a temporary roadway cross-over and a multiple phase traffic control plan to shift traffic around bridge deck reconstruction on both the northbound and southbound bridges.

Maine Turnpike Authority, Various Detour Traffic Control Plans, Maine

Under contract with the Maine Turnpike Authority (MTA), Mr. Suennen was the project engineer for the development of traffic control plans and detour designs for several bridge construction projects, including: Old Lisbon Road over I-95; Litchfield Road over I-95; Lunts Hill Road over I-95; and the Ramp H and Ramp M overpasses at I-95 Exit 2. This work included the identification of the proposed detour routes and the development of detour signing plans to direct traffic around the closed bridges.

Special Event Traffic Control for Ice Arena, Holderness, New Hampshire

Under contract with the architect working for Plymouth State University, Mr. Suennen was the traffic engineer for developing a special event traffic control plan to assist the Towns of Holderness and Plymouth, and Plymouth State University in planning and preparing for large special events that are scheduled for the Ice Arena. This special event plan included recommendations for directional access and egress, parking and shuttle service circulation patterns, and uniformed police officer stations.

NHDOT, Spaulding Turnpike Final Design, Newington-Dover, NH

Under contract with the New Hampshire Department of Transportation (NHDOT), Mr. Suennen is the project engineer for the development of intelligent transportation system (ITS), traffic signals, and highway signing plans, specifications, and construction estimates for the widening and reconstruction of the Spaulding Turnpike from Exit 1 through the Dover Toll Plaza. Work includes installation of closed circuit television (CCTV) cameras for traffic monitoring and bridge security; integration with a proposed wireless communications system for communication with the Transportation Management Center in Concord; installation of an ITS fiber optic communication conduit system for enhanced communications; modification and new construction for traffic signals and a fiber optic traffic signal interconnect system; replacement of guide, warning, and regulatory signs; and replacement of overhead sign structures.

THE 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

PRE-FILED TESTIMONY OF JOHN D. HECKLAU
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Qualifications

Q. Please state your name and business address.

A. My name is John D. Hecklau. My business address is 217 Montgomery Street, Suite 1000, Syracuse, New York 13202.

Q. By whom are you employed and what position do you hold?

A. I am a Principal with Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR).

Q. What is the purpose of your testimony in this proceeding?

A. My testimony addresses the aesthetic/visual impact of the New Hampshire portion of the MVRP (the "Project") and summarizes the VIA which EDR prepared. The VIA was filed with the Application in this proceeding and is provided in Appendix AB.

Q. Please describe EDR.

A. EDR is a design, planning and environmental consulting firm with offices in Syracuse and Rochester, New York. Founded in 1979, EDR is committed to providing appropriate and innovative design, planning and environmental services to communities, institutions, corporations, developers and private individuals throughout the Northeast. Over the years, EDR has developed a wide range of experience and specialized expertise in land planning, community design, site design, environmental management, regulatory compliance and visual impact assessment. EDR's multidisciplinary staff of landscape architects, civil engineers, ecologists, environmental analysts, planners and computer specialists work with clients to craft creative approaches to project design, permitting and implementation.

Q. What are your responsibilities with EDR?

A. As a Principal within EDR's Environmental Division, I oversee all aspects of the firm's environmental inventory, permitting and management projects. I am responsible for visual impact analysis, resource management planning, environmental impact analysis, and regulatory compliance on behalf of EDR's clients. I have over 30 years of experience performing and/or supervising projects involving wetlands delineation, environmental impact assessments, vegetation and wildlife studies, visual impact assessments, natural resource management plans, recreation planning, wetland permitting and environmental compliance monitoring.

Q. Please describe your education, training and experience.

A. I hold a Master of Science degree in Environmental and Forest Biology, specializing in Wildlife Biology, from the State University of New York, College of Environmental Science & Forestry. I hold a BA degree in Biology from Middlebury College. I have over 20 years of experience conducting visual impact assessments for a variety of energy generation and transmission projects, and have prepared several publications and presentations regarding the visual impact of wind power projects. Additional information on my experience is presented in my curriculum vitae, which is included as Attachment A.

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

A. Yes, I previously testified before the SEC regarding the visual impacts of the Groton Wind Project.

Q. Are you familiar with the Project?

A. Yes, EDR was engaged by the New England Power Company (NEP) and Public

Service Company of New Hampshire (PSNH) (together, the "Applicants") to assess the aesthetic/visual impact of the Project.

Q. Please describe the methodology that EDR used to conduct an assessment of the Project's visual impacts.

A. A VIA is used to determine the extent of a project's potential visibility and to assess the significance of its visual effect using an accepted impact assessment methodology. For this Project, EDR used standard analyses of potential project visibility, and evaluated visual impact using a rating system based on methodology developed by the U.S. Department of Interior BLM. The VIA prepared for the Project includes definition and characterization of a visual study area, identification of different viewer groups, identification of scenic resources, viewshed mapping, confirmatory visual assessment fieldwork, visual simulations, and visual impact evaluation. These are generally accepted methods and components of a VIA and were accepted by the SEC on the Groton Wind Project.

The VIA methodology used on this Project provides a comprehensive means of evaluating existing visual character and aesthetic quality and the ability of a landscape to accommodate visual change. Existing condition photographs and visual simulations, showing the Project in these photographs, were used to determine the Project's degree of contrast with the identified scenic resources, and users of those resources, within the visual study area.

Q. What is the study area that EDR evaluated for this analysis?

A. The study area for the VIA consisted of a two-mile radius around the center line of the proposed transmission line. This study area is larger than the study areas typically defined for a transmission line project, and includes a total of approximately 76.7 square miles.

Q. Please describe the specific components of the VIA.

A. The VIA for the Project includes the following:

1. General landscape character within the study area was defined, based on the existing pattern of topography, vegetation (as indicated in the U.S. Geological Survey [USGS] National Land Cover Dataset [NLCD]), water features and observed land use and user activity.

2. Specific user groups within the study area were identified to evaluate viewer sensitivity and assure the selection of appropriate key observation points (KOPs) during the visual impact evaluation.

3. An inventory of potential scenic resources within the study area was completed, based on industry standards regarding what are generally considered public resources of potential statewide and local significance, and guidance provided by the New Hampshire Code of Administrative Rules proposed by the SEC (draft SEC Rules).

4. As an initial step in evaluating potential Project visibility, a topographic viewshed analysis was performed for the proposed transmission structures. The topographic viewshed analysis utilized USGS digital elevation model (DEM) data, the height of the proposed transmission structures, and a computer program (ESRI ArcView® with the Spatial Analyst extension) to determine locations where the Project could potentially be visible, discounting any screening provided by trees or man-made structures. The ArcView program defines the viewshed by reading every cell of the DEM data and assigning a value based upon visibility from observation points throughout the two-mile radius study area. The resulting topographic viewshed maps define the maximum area from which any portion of any proposed transmission structure could potentially be seen within the study area (ignoring the screening effects of existing vegetation and structures). As a means of comparison, visibility of the

existing transmission lines within the study area was evaluated in the same manner. Potential visibility of the existing structures was based on structure heights ranging from 50 to 130 feet above ground level. Potential visibility of the proposed lines was based on structure heights ranging from 40 to 130 feet above ground level. All structure height and location data were provided by the Applicants.

5. To more accurately account for the screening effect of forest vegetation, a vegetation viewshed analysis was also prepared. The vegetation viewshed analysis involved creation of a vegetation layer based on the location of mapped forest vegetation as indicated in the USGS NLCD, with an assumed elevation of 40 feet. This layer was added to the digital elevation model to produce a base layer for the viewshed analysis, as described above. Once the viewshed analysis was completed, the areas covered by the forest vegetation layer were designated as “not visible” on the resulting data layer to reflect the fact that views from within mapped forested areas will generally be screened by mature overstory trees.

6. To verify the accuracy of the viewshed analysis in predicting where actual views of the Project are likely to occur, EDR staff conducted field reviews of the visual study area. The purpose of these reviews was to document the presence or absence of open views toward the Project site from publicly-accessible vantage points, including potential scenic resources, within a two-mile radius of the proposed line. Photo documentation of potential Project visibility was obtained from 122 representative viewpoints within the study area. Existing transmission structures on the ROW were used as locational and scale references when verifying potential Project visibility in the field.

7. Field review indicated that open views of the Project are not anticipated to be available from sites beyond 0.5 mile from the ROW. Consequently, identified potential scenic resources located within 0.5 mile of the Project center line were reviewed to determine: 1) if the resource could actually

be considered a scenic resource, based on existing scenic quality and/or the availability of public access; and 2) whether the Project was likely to be visible from some portion of the resource based on the results of field review and (if necessary) follow-up desktop analysis. Results of this review indicate that, of the 51 potential scenic resources located within 0.5 mile of the Project center line, 23 (45%) would actually not be considered scenic resources due to a lack of formal scenic designation, low scenic quality, and/or lack of public access. Of the remaining 28 sites that could be considered scenic resources, it was determined that the Project would not be visible from 15 (54%) of these sites. From the 13 scenic resources that would have open views of the line, eight KOPs from seven different scenic resources were selected for use in the development of visual simulations. The selected KOPs represent viewpoints from scenic resources that have the greatest number of proposed facility structures or components potentially visible, where the greatest amount of public use is anticipated, and/or at which access to the scenic resource is most easily or likely achieved.

8. To illustrate the anticipated visual changes associated with the Project, digital models of the proposed transmission lines were prepared based on plans and specifications provided by the Applicants. The models were used to create realistic photographic simulations of the completed Project (i.e., the built transmission lines and associated vegetation clearing) from each of the selected KOPs. The photographic simulations were developed by using Autodesk 3ds Max Design 2015® to create a simulated perspective (camera view) to match the location, bearing, and focal length of the viewpoint (existing conditions) photograph. Existing elements in the view (e.g., buildings, existing transmission structures, roads) were modeled based on aerial photographs and DEM data in AutoCAD Civil 3D 2014®. A three dimensional (3-D) topographic mesh of the landform (based on DEM data) was then brought into the 3-D model space. At this point minor adjustments were made to camera and target

location, focal length, and camera roll to align all modeled elements with the corresponding elements in the photograph. This assures that any elements introduced to the model space (i.e., the proposed transmission structures) will be shown in proportion, perspective, and proper relation to the existing landscape elements in the view.

Computer models of the proposed transmission structures were prepared based on specifications and data provided by the Applicants. Using the camera view as guidance, the visible portions of these modeled Project components were imported to the landscape model space described above, and set at the proper coordinates. Coordinates for proposed transmission structures, were provided to EDR by NEP and PSNH. For the purposes of this VIA all new transmission structures were assumed to be self-weathering steel with brown insulators.

Once the Project was accurately aligned within the camera view, a lighting system was created based on the actual time, date, and location of the photograph. Using the Mental Ray Rendering System® with Final Gather and Mental Ray Daylight System® within the Autodesk 3ds Max Design 2015® software, light reflection, highlights, color casting, and shadows were accurately rendered on the modeled Project based on actual environmental conditions represented in the photograph. The rendered Project was then superimposed over the photograph in Adobe Photoshop CS5® and portions of the Project that fall behind vegetation, structures or topography were masked out. Photoshop was also used to take out any existing structures or vegetation proposed to be removed as part of the Project. Once the new Project components were added to the photo, any shadows cast on the ground by the proposed structures were also included by rendering a separate “shadow pass” over the DEM model in Autodesk 3ds Max Design 2015® and then overlaying the shadows on the simulated view with the proper fall-off and transparency using Adobe Photoshop CS5®.

9. The visual impact assessment methodology utilized on this Project involved completion of a visual contrast rating form developed by EDR based on methods utilized by the U.S. Department of the Interior BLM. This visual contrast rating form is an updated version of the form that was used by EDR and accepted by the SEC on the Groton Wind Project. The procedure involves using a numerical contrast rating system to compare representative views with and without the Project in place and quantifying visual contrast. The form also provides for the description of existing scenic quality and viewer sensitivity, in addition to the actual rating of contrast between the Project and the existing view. A panel of three experienced visual impact assessors (two from EDR's staff and one independent) evaluated the visual impact of the Project using the BLM-based methodology. The VIA evaluation involved viewing and rating 11"x17" color prints of the views with and without the Project in place from each of the selected representative KOPs.

Q. What conclusions did you reach as a result of the VIA analysis?

A. From the VIA, we concluded that the Project is likely to be visible from approximately 25-30% of the visual study area (based on viewshed analysis and field review). The vegetation viewshed analysis indicates that only about 3% of the study area that does not already have the potential to see the existing transmission lines would have potential views of the Project. Field review and evaluation of simulations from selected KOPs indicate that the Project will be visible from several identified scenic resources, and could have some effect on the scenic quality and viewer enjoyment of some of these resources.

Our specific findings and conclusions are as follows:

- Topographic viewshed analysis (which assumes no trees or vegetation) indicates that the maximum area of potential visibility for the proposed structures, only 0.2 percentage points larger than that portion of the study area that already has potential views of transmission structures. This compares 89.7% of the study area that has potential views of the existing transmission structures.

- Vegetation viewshed analysis, which considers the screening effect of mapped forest vegetation and more accurately reflects the extent of likely Project visibility, indicates that 29.5 % of the two-mile study area could have potential views of the proposed structures. When compared to the viewshed of the existing transmission structures, it was determined that areas of potential Project visibility cover the same general areas and have the same pattern as the viewshed of the existing lines. The "newly visible" area associated with the proposed line (i.e., areas where the proposed structures are potentially visible but the existing structures are not) only totals 2.3 square miles, or 3% of the study area.
- Field review revealed that actual Project visibility is likely to be much more limited than suggested by viewshed mapping. This is due to the fact that screening provided by buildings is significant in village/town center areas and other areas of intensive land use, and trees within and adjacent to residential neighborhoods and in undeveloped portions of the study area typically limit long distance views.

Field review confirmed that open, unobscured views of the Project will generally be available only at sites within, or immediately adjacent to, the existing transmission ROW. These open views are typically restricted to road crossings and open yards/fields that abut the ROW. Due to a general lack of topographic variability and the abundance of trees within the study area, no long-distance views of the existing transmission lines or cleared ROW were documented during field review. In village and neighborhood areas, where population is concentrated, views of the Project site are generally well-screened by buildings, street trees, yard trees, and/or adjacent areas of the forest. Open views were documented from the more heavily traveled highways that traverse the study area (e.g., State Routes 28, 38 and 102), but generally only at, and immediately adjacent to, the point where the lines cross the road.

Field review at potential scenic resources indicated that Project visibility will be highly variable, and largely dependent on proximity to the Project. Views from potential scenic resources located more than 0.5 mile from the Project were totally screened, with the exception of potential views from Dragonfly Way (a trail which does not display scenic quality, and therefore is not considered a scenic resource), and possibly certain high points within the Jeremy Hill State Natural Area, if there are breaks in the forest canopy that allow outward views (this was not confirmed during field review).

- Of the 51 potential scenic resources located within 0.5 mile of the Project center line, only 13 both would be considered scenic resources and have the potential for views of the proposed transmission line. These 13 resources include: the Apple Way Scenic Byway, Route 28 Scenic Drive, Granite State Rail Trail (a.k.a. Londonderry Rail Trail in this location), Londonderry Scenic Views #11, #14 and #17, Peabody Town Forest, Leslie C. Bockes Memorial Forest, Musquash Conservation Area, Centennial Park/West Road Fields, Londonderry Town Center and Public Schools, George M. Muldoon Park and Town Forest, and Robinson Pond Park.
- Of the sites listed above, views of the Project are likely to be distant and/or substantially obscured from the Londonderry Town Center and Public Schools, George M. Muldoon

Park and Town Forest, and Robinson Pond Park. From the 10 remaining scenic resources with open foreground views of the Project, eight KOPs were selected for the development of visual simulations. The selected KOPs included viewpoints at the Peabody Memorial Forest, Apple Way Scenic Byway, Granite State Rail Trail, Route 28 Scenic Drive, Town of Londonderry- Designated Scenic View #17 (two viewpoints), Musquash Conservation Area, and Continental Park/West Road Fields. Although clear views of the Project would also be available from the Town of Londonderry Scenic View #11, the lack of scenic quality at the location of the transmission line crossing suggested that the view from the Route 28 scenic drive and the Apple Way Scenic Byway would be a better representation of the Project's potential effect on scenic quality and viewers along a designated scenic road. Similarly, the view from the Apple Way was determined to be representative of potential views from the Town of Londonderry Scenic View #14. In addition, foreground views from the Peabody Town Forest and Musquash Conservation Area were determined to adequately represent potential views from Bockes Memorial Forest.

- Visual simulations were prepared from each of the eight selected KOPs described above. The simulations show that, in all cases where open views are available, the Project will be viewed along with existing transmission lines. In none of the simulated views does the Project result in the addition of man-made features to a primarily undeveloped view. Consequently, perceived contrast with land use and viewer activity, as well as adverse impact on scenic quality are limited.
- Evaluation of these simulations on a scale of 0 (insignificant) to 4 (strong) by a panel of three experienced visual impact assessors indicates the Project's overall contrast with the

visual/aesthetic character of the area will be minimal to moderate. Composite contrast ratings for individual KOPs ranged from 0.2 to 3.2, and averaged 1.5 (minimal-moderate). Appreciable contrast (scores between 2.5 and 3.5) was noted for two of the eight KOPs; Viewpoint 83 on the Granite State Rail Trail and Viewpoint 97 in the Town of Londonderry Scenic View #17. In these views clearing of forest vegetation between two cleared transmission corridors created appreciable to strong contrast with multiple landscape features, primarily vegetation, sky and viewer activity. Even though the Project is occurring within an existing transmission corridor, the utilitarian land use is accentuated in these views with the Project in place. However, the impacts described for these viewpoints will be limited to locations where the viewer is at, or directly adjacent to, the proposed ROW. They thus affect only a small portion of the scenic resource in question, and/or an area that is already characterized by reduced scenic quality. Visibility and visual impact drop off dramatically as one moves away from the cleared ROW.

On the other end of the scale, three of the eight KOPs received a score of less than 1.0 (Viewpoint 5 on the Peabody Memorial Forest, Viewpoint 65 on the Apple Way Scenic Byway and Viewpoint 114 at Continental Park/West Road Fields). Scores in this range indicate insignificant to minimal contrast, primarily because vegetation clearing was limited and the ROW did not appear to substantially increase in width. This is largely attributable to the location of the Project on an existing cleared ROW with numerous other transmission structures already present in the view.

- Use of a panel and a standardized rating form for the evaluation of visual impact allows definition of shared perceptions, as well as differing opinions, regarding the type and extent of anticipated Project-related visual impacts. Areas of general agreement among the panel members included the following:

1. Existing scenic quality and the aesthetic expectations of viewers are relatively low at the selected KOPs due largely to the proximity of the existing transmission lines.
2. The Project is generally compatible with the existing transmission lines in terms of its line, form, color and scale.
3. The location of the Project, on a well-established ROW that already accommodates multiple existing transmission lines, limits perceived changes to existing land use.
4. The most substantial impact occurs in those areas where additional vegetation clearing results in a substantially wider cleared ROW with more visible transmission structures.
5. Project impact on scenic quality and viewer activity are reduced due to the presence of the existing transmission lines.

- Considering the results of Project visibility assessment (viewshed analysis and field verification), as well as the evaluation of visual impact conducted by the rating panel, EDR's conclusion is that the Project will impact a small number of scenic resources within the two-mile radius study area. In most cases, the impact is limited to that portion of the resource crossed by, or directly adjacent to, the existing ROW. Consequently, the geographic extent and/or temporal duration of the impact will generally be small. This, along with the relatively low scenic quality and compromised aesthetic expectations of viewers at those locations where the Project will be visible, means that overall visual impact will be minimal. However, in those relatively few locations where construction of the Project will result in a substantially wider cleared ROW and increased visibility of both existing and proposed transmission lines in the foreground of the view, it is likely that scenic quality and viewer enjoyment of the view will be diminished to some extent.

Q. Have mitigation measures been implemented to reduce the Project's visual impact?

A. Yes. The following measures have been incorporated into the Project design:

- Siting the Project on an existing transmission line ROW, that is generally well screened from scenic resources, minimizes its visual impact. The Project's location on an existing transmission corridor also serves to minimize the contrast presented by the new and relocated lines and concentrates visual impacts in an area already affected by existing transmission lines.
- Proposed structure design, color and spacing are consistent with the existing transmission structures on the ROW, which increases Project compatibility with the existing facilities.
- The dark brown color of the self-weathering steel proposed for the new structures generally minimizes contrast with surrounding vegetation under most conditions. Use of alternate materials, such as galvanized steel rather than wood could reduce color contrast and visual weight when the structures are viewed against the sky. However, this material would increase color contrast when the structures are viewed against a vegetated backdrop, and would contrast with the color of the other transmission structures already on the ROW. Because self-weathering steel poles minimize color contrast with existing background vegetation, they are considered the best material for reducing visual impact in most situations.

- The height of the proposed structures has been minimized by utilizing a single-circuit H-frame design for structures on the proposed 3124 Line. Further reduction in structure height is not feasible given the line clearance/safety requirements of the Project. The only way to accommodate lower structures would be to shorten span length and install additional structures or widen the existing ROW to accommodate shorter but wider H-frame structures where single poles are currently proposed. This alternative (i.e., more numerous shorter structures and/or a wider cleared ROW) could actually increase visual impact.

Q. In your opinion, will this Project have an unreasonable adverse effect on aesthetics?

A. No. Based upon the results of EDR's VIA discussed above, the Project will not have an unreasonable adverse effect on aesthetics.

This conclusion is based on the following: 1) the Project will have very limited visibility from most locations within the two-mile radius study area, including the majority of scenic resources; 2) scenic resources located beyond 0.5 mile from the proposed center line will generally not have views of the Project; 3) open views from scenic resources will generally present limited contrast with the existing landscape and will have minimal impact on scenic quality and viewer expectations, due to the location of the Project within an existing transmission corridor; 4) even where presenting appreciable visual contrast, the Project would not be perceived as a dominant feature of a landscape in which existing human development is not already a prominent feature; 5) the Project would not offend the sensibilities of a reasonable person or violate a clear written community standard intended to preserve scenic resources; and 6) the Applicants have committed to feasible and appropriate mitigation measures that improve the harmony of the Project with its surroundings.

Therefore, based on these findings, we conclude that the Project will not have an undue or unreasonable adverse effect on aesthetics.

Q. Does this complete your testimony?

A. Yes it does.

ATTACHMENT A.

RESUME OF JOHN D. HECKLAU

John D. Hecklau
Principal

education

State University of New York, College of Environmental Science and Forestry, Syracuse, New York, *Master of Science in Environmental and Forest Biology,* Specializing in Wildlife Biology, 1982.

Middlebury College, Middlebury, Vermont, *Bachelor of Arts in Biology*, 1979.

professional affiliations

Member, The Wildlife Society.
Member, American Wind Energy Association
Member, Town of Kirkland Planning Board

certification

Wildlife Biologist – *The Wildlife Society*

employment history

Principal, Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C., Syracuse, New York, 2014-Present

Executive Vice President, EDR Environmental Services, LLC, Syracuse, New York 2008 to 2014.

Principal/Senior Ecologist, Environmental Design & Research, Syracuse, New York, 1995 to Present.

Ecologist, Environmental Design & Research, Syracuse, New York, 1989 - 1994.

Self-Employed Environmental Consultant, John D. Hecklau, Clinton, New York, 1988.

Resource Manager, Environmental Programs Division, New York State Power Authority, Marcy, New York, 1984 - 1987.

Wildlife Biologist, Connecticut Department of Environmental Protection, Burlington, Connecticut, 1983 -1984.

publications/presentations

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Hecklau, J. and J. Gagliano. *Local Review of Commercial Wind Power Projects.* Presentation at Onondaga County Planning Federation Conference. January 21, 2009, Syracuse, NY.

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Hecklau, J. 2006. *Evaluating the Visual Impacts of Wind Power Projects*. North American Wind Power. 3 (June): 48-52.

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Lamanna, B. and J. Hecklau. 2002. *The Windmills of Madison County*. New York State Conservationist. 56(5): 8-11.

Hecklau, J. *Overview of Wind Permitting Frameworks in Different Settings*. *Case Study 1: Madison, NY*. Presentation at New England Wind Power Siting Workshop, October 24, 2001, Boston, MA. Sponsored by the National Wind Coordinating Committee.

project experience

Sodeman Road Substation – Oversaw preparation of an Article VII Application for a new National Grid substation tying into an existing Article VII transmission line in Saratoga County, New York. Also prepared a Visual Impact Assessment (VIA), wetland delineation, and alternatives analysis for the project. Coordinated preparation of noise study and Stormwater Pollution Prevention Plan (SWPPP), and provided expert witness testimony.

Eastover Road Substation – Coordinated all environmental and civil engineering support to National Grid in their development of the proposed Eastover Road Substation and Tap Lines in Rensselaer County, New York. Services provided on this project included preparation of a Visual Impact Assessment, on-site wetland delineation and permitting, SEQRA documentation, OPRHP coordination, Part 102 report preparation, site grading, and stormwater design, wetland mitigation area design and documentation, preparation of Stormwater Pollution Prevention Plan (SWPPP), and SWPPP inspections during construction.

Aquidneck Island Reliability Project – Oversaw preparation of the Visual Impact Assessment (VIA) for the proposed upgrade of approximately 4.4 miles of National Grid 69 kV transmission line to 115 kV in Newport, Rhode Island. The VIA also addressed construction of a new substation and retirement/removal of five substations. Specific tasks included field verification of project visibility, definition of landscape similarity zones and viewer groups, identification of sensitive resources/receptors, development of viewshed maps, preparation of visual simulations, impact evaluation, and preparation of the VIA report.

Wild Meadows and Groton Wind Farms – Oversaw preparation of Visual Impact Assessments (VIAs) and Shadow Flicker Analyses for two commercial wind power projects in New Hampshire. VIAs included viewshed analysis, photo documentation and visual simulations. Also assisted with public outreach efforts. Participated in Site Evaluation Committee proceedings for the Groton Project, including preparation of pre-filed testimony, response to discovery requests, and participation in a technical session and adjudicatory hearings as an expert witness.

John D. Hecklau
Principal-in-Charge

project experience

Article VII Compliance Monitoring – Oversaw environmental compliance monitoring on three Article VII projects in Upstate New York. Projects included a 48-mile long natural gas pipeline (St. Lawrence Gas Norfolk to Chateauguay Transmission Line), an 11-mile long 115 kV transmission line (Central Hudson A&C Line Rebuild Project) and a new substation tying into an existing Article VII line (National Grid Five Mile Road Substation). Directed efforts of on-site Environmental Monitors to assure compliance with all conditions of the project Environmental Management and Construction Plan (EM&CPs) and Stormwater Pollution Prevention Plans (SWPPPs). Assisted with environmental training of contractors, agency liaison, and reporting. Worked with agency staff and project sponsors to assure compliance with all environmental protection requirements during project construction, including protection of wetlands and streams, active agricultural land, threatened and endangered species, and archeological resources.

Block Island Offshore Wind Farm – Oversaw preparation of Visual Impact Assessments (VIAs) for the proposed Block Island Wind Farm and associated on-shore transmission facilities. The wind farm is a proposed 30 MW facility located in the Atlantic Ocean, 3 miles off the coast of Block Island, Rhode Island. On-shore facilities include electrical lines, switchyards, and substations. The project involved the preparation of 28 daytime and nighttime simulations of the offshore turbines from viewpoints on Block Island and the mainland. Simulations of the above-ground on-shore components of the project were also prepared, including landscaping and architectural façade treatments of the switchyards. VIAs also included inventory of visually sensitive resources, viewshed analysis, cross section analysis, and evaluation of visual impact by a panel of landscape architects. In addition to the VIAs, managed preparation of various presentation graphics for public outreach purposes, including poster boards, animated daytime and nighttime simulation, an interactive web site, and an animated "fly-through" video of the wind farm.

Hardscrabble and Hoosac Wind Power Projects – Managed environmental compliance monitoring during construction of a 19-turbine wind power project in Berkshire and Franklin Counties, Massachusetts and a 37-turbine wind power project in Herkimer County, New York. Assisted with preparation of the Environmental Compliance Manuals and provided compliance training to project contractors. Oversaw and assisted EDR field staff with daily on-site monitoring, weekly Stormwater Pollution Prevention Plan (SWPPP) inspections, preparing reports, coordinating resolution of compliance issues with Construction Site Manager and contractors, and assuring compliance with local, state, and federal permit conditions.

Deerfield Wind Power Project– Managed preparation of a National Environmental Policy Act (NEPA) compliant Environmental Impact Statement (EIS) for the first wind power project proposed on U.S. Department of Agricultural (USDA) Forest Service land. The project involves the proposed construction of 17 2.0 MW wind turbines on forested ridges in the Green Mountain National Forest. Project activities included preparation of a Public Information Plan, significant public outreach, project scoping, coordination with Forest Service staff, and review of subconsultant resource reports for inclusion in the EIS. A draft supplemental draft, and final EIS were prepared for the project. Responses to over 500 public comments on the draft EIS and 1,000 comments on the supplemental draft were prepared.

Cohocton and Marble River Wind Power Projects – Coordinated State Environmental Quality Review Act (SEQRA) compliance for these commercial wind power projects in Steuben County and Clinton County, New York. Work on these projects included project layout/environmental field review to assure that impacts on wetlands, agricultural land and ecological resources were minimized. Conducted or oversaw all environmental support studies on these projects and incorporated the results of these studies into Draft Environmental Impact Statements. Prepared Supplemental Draft Environmental Impact Statements to address project changes, and Final Environmental Impact Statements to address all public and agency comments on both of these projects. Also completed state and federal wetland permitting for the Cohocton Project.

Commercial Wind Power Project Visual Impact Assessments – Coordinated preparation of Visual Impact Assessments (VIAs) for 15 commercial wind power projects in Upstate New York. The VIAs for these projects the visual character and significant aesthetic resources with a 5 or 10 mile visual study area. Viewshed analysis, line-of-sight cross sections, field review, and computer-assisted visual simulations were used to evaluate the potential visibility and visual impact of these projects. Notable projects include the Madison, Fenner, Maple Ridge, Jordanville, Hardscrabble, Cohocton, Dutch Hill, Dairy Hills, Howard, Munnsville, Alabama Ledge and Roaring Brook projects, totaling over 1,400 MW of proposed wind power.

Maple Ridge Wind Power Project – Coordinated State Environmental Quality Review Act (SEQRA) compliance, including preparation of Draft and Final Environmental Impact Statements (DEIS/FEIS) for the largest commercial wind power project in the Northeast. Oversaw production of all support studies and directly prepared ecological, wetlands, agricultural, and visual studies for 300 MW wind power project on the Tug Hill Plateau, Lewis County, New York. Incorporate study results into the DEIS and responded to all public and agency comment in the FEIS. Also assisted with state and federal wetland permitting.

Munnsville, Fenner, and Madison Wind Power Projects – Prepared expanded Environmental Assessment Forms (EAFs) for these three commercial wind power projects in Madison County, New York. Work on the projects included project layout/environmental field review to assure that wetland impacts were avoided and impacts to agricultural and ecological resources minimized. Conducted or coordinated support studies addressing potential visual, cultural, noise, ecological, avian and agricultural impacts. Summarized results into expanded EAFs. On each of these projects the Lead Agency issued a Negative Declaration under SEQRA, indicating that no significant adverse environmental impacts were anticipated. Monitored environmental compliance during construction of the Munnsville and Madison Projects.

New England East-West Solution Project – Coordinated preparation of Visual Impact Assessments (VIAs) for multiple National Grid transmission system improvement projects in Rhode Island and Massachusetts. The transmission system improvements involve upgrade of existing transmission lines, construction of new transmission lines, construction of new substations, and existing substation upgrades. Prepared VIAs for each project that included the identification of existing visually sensitive resources, photo documentation of existing views, and description of existing landscape character along over 75 miles of proposed transmission line route. Viewshed analyses of existing and proposed facilities were conducted, and over 20 visual simulations were prepared and rated by a professional panel of landscape architects. VIA reports and/or simulations were included in applications submitted to the State Utility Siting Boards. Also prepared pre-filed visual testimony, responded to discovery requests, and provided testimony before the Rhode Island Energy Facility Siting Board.

LIPA Offshore Wind Park – Coordinated preliminary visual studies associated with a 150 MW offshore wind power project proposed by the Long Island Power Authority (LIPA). Project included preparation of visual simulations from heavily used beaches and state parks on the South shore of Long Island, New York. Graphics were used for public information and outreach efforts.

TransEnergie Cross-Sound Cable Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of submarine cable crossing of Long Island Sound. VIA focused on the visual impact of above-ground transition stations and associated structures in New Haven, Connecticut and Shoreham, New York.

Cape Wind Project – Oversaw production of visual simulations and other graphics/analysis for proposed 130-turbine offshore wind power facility near Cape Cod, Massachusetts. Prepared visual methodology write-up for project Environmental Impact Review and presented methodology at a public/agency forum sponsored by the Massachusetts Technology Forum. The project's visual impact was a sensitive issue, subject to intense scrutiny. Graphics for project were featured in New York Times Magazine article.

Southern Rhode Island Transmission Project – Oversaw preparation of the Visual Impact Assessment (VIA) and Supplemental VIA prepared for the proposed upgrade and extension of approximately 26 miles of an existing National Grid 115 kV transmission line in southern Rhode Island. The effort consisted of fieldwork, definition of landscape similarity zones and viewer groups, identification of sensitive resources/receptors, development of viewshed maps and visual simulations, impact evaluation, and preparation of the VIA report. Also provided expert witness testimony to the Rhode Island Energy Facility Siting Board.

Neptune Regional Transmission System Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of aboveground components of submarine/underground transmission line in New York City metropolitan area. VIA focused on the visual impact of transition stations in Manhattan and on Long Island.

Athens Power Project – Evaluated visual resources and visual impacts associated with construction of a 1,080 MW power plant proposed by PG&E National Energy Group. Also delineated state and federal wetlands and documented ecological conditions on the project site and along proposed off-site utility (gas, water, and electric transmission) corridors associated with the project. Assisted with field data collection, agency liaison, and preparation of a wetland delineation report and functional analysis. Oversaw preparation of the Ecological Resources and Visual Resources sections of the Article X Application, and provided expert witness testimony on potential ecological impacts. Project was the first permitted under New York's Article X power plant siting regulations.

ATTACHMENT B.

VISUAL IMPACT RATING FORM INSTRUCTIONS

Visual Impact Rating Form Instructions

Project Name:	Merrimack Valley Reliability Project	**EDR Project No:**	14111
Date:	February 12, 2015		
Reference:	Visual Impact Rating Form - Instructions		

These instructions are intended to guide personnel conducting visual impact assessment contrast ratings through EDR's Visual Impact Rating Form.

Viewpoint #/Viewpoint Location:

Please fill this in based on the information in the title block for each photograph/viewpoint that is provided.

Your Name/Date:

Please complete.

Designated Aesthetic Resource:

Please refer to the Viewpoint Location Map and title block for photographs to identify the designated aesthetic resource for each viewpoint.

Viewer Type:

Please infer who the mostly likely viewer(s) is/are based on the location and context of the view. Please also refer to the Viewpoint Location Map and title block for photographs. For instance:

- If the photo shows a residential or concentrated settlement, check *resident*.
- If the viewpoint is a roadway location, check *traveler*.
- If the viewpoint is from a recreational area or the view suggests recreational activities, check *recreational*.

Viewpoint Description:

Please describe the view in your own words, focusing on the landscape components described below.

- *Landscape Composition:* The arrangement of objects and voids in the landscape that can be categorized by their spatial arrangement. Basic landscape components include vegetation, landform, water and sky.
- *Form, Line, Color, and Texture*: These are the four major compositional elements that define the perceived visual character of a landscape. Form refers to the shape of an object that appears unified; often defined by edge, outline, and surrounding space. Line refers to the path the eye follows when perceiving abrupt changes

in form, color, or texture; usually evident as the edges of shapes or masses in the landscape. Texture in this context refers to the visual surface characteristics of an object.

- *Focal Point*: Certain natural or man-made landscape features stand out and are particularly noticeable as a result of their physical characteristics. Focal points often contrast with their surroundings in color, form, scale or texture, and therefore tend to draw a viewer's attention. Examples include prominent trees, mountains and water features. Cultural features, such as a distinctive barn or steeple can also be focal points.

- *Order*: Natural landscapes have an underlying order determined by natural processes. Cultural landscapes exhibit order by displaying traditional or logical patterns of land use/development. Elements in the landscape that are inconsistent with this natural order may detract from scenic quality.

- *Atmospheric Conditions*: Clouds, precipitation, haze, and other ambient air related conditions affect the visibility of an object or objects and can greatly impact the design elements of form, line, color, texture, and scale.

- *Lighting Direction*: Backlighting refers to a viewing situation in which sunlight is coming toward the observer from behind a feature or elements in a scene. Front lighting refers to a situation where the light source is coming from behind the observer and falling directly upon the area being viewed. Side lighting refers to a viewing situation in which sunlight is coming from the side of the observer to a feature or elements in a scene.

- *Visual Clutter*: Numerous unrelated built elements occurring within a view can create visual clutter, which adversely impacts scenic quality. Note that because the project is a transmission line rebuild, the extent of existing electrical infrastructure in the view may contribute to a sense of visual clutter.

Viewpoint Sensitivity:

Please rate the sensitivity of each viewpoint as determined by scenic quality and viewer exposure, as follows:

Scenic Quality:

Please rate the scenic quality of the existing view according to your opinion about the quality of the existing landscape, without the project in place, for the general public. Please consider the following:

- An undeveloped landscape, or one containing aesthetically important structures, might be at the high end of the scale, while a landscape already impacted by infrastructure or industrial facilities might be at the low end. Most residential areas will fall into the moderate category, unless they are either historic neighborhoods, or degraded/abandoned.

- Because the proposed project is the construction of a new transmission line within an existing transmission line corridor, all of the views under consideration include existing electrical transmission infrastructure. Please factor this into your assessment of existing scenic quality for each viewpoint.

- Note that designation as a scenic or recreational resource is an indication that there is broad public consensus on the value of that particular resource. The particular characteristics of the resource that contribute to its scenic or recreational value provide guidance in evaluating a project's visual impact on that resource. However, the scenic quality rating you assign depends on your individual judgment.

View Exposure:

Please infer the frequency and duration of views based on the Viewer Type, LSZ, viewpoint context, and viewpoint location map. Please consider the following:

- Some views are seen as quick glimpses while driving along a roadway or hiking a trail, while others are seen for a more prolonged period of time. Longer duration views of a project, especially from significant aesthetic resources, have the greatest potential for visual impact.

- Please indicate whether there is potential for continuous or repeated exposure (such as residences, village intersections, and principal transportation routes with an open view towards the project), brief or occasional exposure (such as openings in otherwise screened areas or secondary roads that most people will not use on a daily basis), or rare exposure (such as viewpoints that are clearly off the beaten track and/or represent small areas of narrow visibility in otherwise completely screened areas).

Contrast Rating:

The New Hampshire Site Evaluation Committee (SEC) Draft Code of Administrative Rules (or, the Draft SEC Rules) advise that assessment of potential visual impact include the following considerations:

1. The expectations of the typical viewer;
2. The effect on future use and enjoyment of the scenic resource;
3. The extent of the proposed facility, including all structures and disturbed areas, visible from the scenic resource;
4. The distance of the proposed facility from the scenic resource;
5. The horizontal breadth (visual arc) of the visible elements of the proposed facility;
6. The scale of the proposed facility relative to surrounding topography and existing structures;
7. The duration and direction of the typical view of the elements of the proposed facility; and
8. The presence of intervening topography between the scenic resource and elements of the proposed facility.

Please rate the level of contrast that you perceive between the existing landscape components (as they appear in each in photo) and the effect that the proposed project has on those components. Please provide a numerical rating between 0 and 4 for each landscape component, where:

0 = Insignificant Contrast
1 = Minimal Contrast
2 = Moderate Contrast
3 = Appreciable Contrast
4 = Strong Contrast
* (please make use of .5 to allow for refinement or ambivalence between any of these ratings, e.g., 2.5 = Moderate to Appreciable Contrast).

Please then also describe in your own words the factors in the appearance of the photo that contribute to or affect the degree of contrast for each landscape component.

Please consider the following for each landscape component:

Landform: Please consider the effect of the project relative to the appearance of the landform or topography, including the strength and range of color, the density of relief, the space as defined by the landform, and the extent of its scale.

Because this project is the construction of a new transmission line within an existing transmission line corridor, key considerations relative to landform may include:

- The vertical scale relationship and spatial presence/prominence of the proposed structures relative to existing topography and other landscape elements, including existing utility structures. The effect of scale is often a function of the viewing distance relative to the proposed structures.

- Relevant considerations include the form, size, and spacing of the proposed structures relative to landscape elements in the view.

Vegetation: Please consider the effect of the project relative to the appearance of the form(s) and variety of vegetation, including the extent of clearing, the range of color, the density of texture, space as defined by the vegetation, and its hierarchy/diversity of scale.

Key considerations for this project relative to vegetation include:

- Change in vertical scale of the proposed structures relative to vegetation in the view.

- Proposed vegetation clearing associated with new right-of-way (ROW) and/or expansion of the existing ROW.

- The color of the proposed transmission structures relative to their visual setting. Structures that are consistent in color or tone with their backdrop, such as brown structures against a forested backdrop, are less likely to attract viewer attention.

- The introduction of transmission structures into an otherwise "natural" setting that does not include visible utility infrastructure is likely to be perceived as generally less compatible (or greater contrast).

- In areas with existing electrical infrastructure, the replacement, alteration, or addition of transmission structures is generally less likely to attract attention or be perceived as incompatible with the existing setting.

Land Use: Please consider the effect of the project relative to the appearance of identifiable land use(s) in the view, and evaluate the degree to which the project is compatible/consistent with the appearance of existing land use(s) in the view.

The key considerations for this project relative to land use are:

- The natural and man-made features of the landscape that define its dominant character. The type and extent of existing development and the compatibility of the proposed changes to the utility infrastructure with their setting – including whether similar structures are present in the existing view – should be considered.

- In instances where similar infrastructure or other man-made features are not apparent in the existing view, the proposed project is more likely to attract viewer attention and may be perceived as less compatible with existing land use.

- In areas with existing electrical infrastructure, the replacement, alteration, or addition of transmission structures is generally less likely to attract attention or be perceived as incompatible with the existing setting.

Water: Please consider the effect of the project relative to the appearance of water features in terms of the form of the water body(ies), its (their) shorelines, color, and texture (which refers here to movement), reflection, degree of enclosure, and the scale (or extent) of the presence of water in the view. Waterbodies typically attract viewer attention, provide a focal point in the view, and are generally associated with higher scenic quality.

Key considerations for this project relative to waterbodies include:

- The degree to which the changes to the view resulting from the project obstruct, compete with, or distract from the viewer's attention and/or enjoyment of the waterbody as a focal point or scenic element in the view. This effect is often a function of project's proximity to the water and/or the viewer's distance relative to the project.

Sky: Please consider the effect of the project relative to the appearance of the sky in terms of form (including the appearance of clouds), the edges of its lines (perhaps in terms of the horizon), clarity of color, texture (which here could refer to cloudiness or other atmospheric conditions), the degree of openness or enclosure, and the scale (or extent) of the sky in the view.

Key considerations for this project relative to sky include:

- Potential changes in height of the proposed structures relative to existing structures. Visual contrast is generally increased if the proposed structures appear significantly taller and/or appear significantly more prominent relative to existing structures and the horizon in the view. Structures that are "skylined" or silhouetted on the horizon typically result in greater visual contrast.

- The color of the proposed structures can also affect the degree of contrast, with lighter poles often appearing less prominent against the backdrop of the sky.

Viewer Activity: Please consider the effect of the project on the viewer's perception of the scenic quality and potential enjoyment of the view, taking into account the viewpoint location and context, viewer type, and duration of the view.

Key considerations for this project relative to viewer activity include:

- The degree to which the proposed project would compete for viewer attention and/or decrease the viewer's enjoyment of whatever activity in which they are engaged. For instance, viewers engaged in activities such as outdoor recreation and sightseeing would generally be more sensitive to visual impact than those commuting or participating in athletic events.

- In instances where similar or comparable infrastructure is not apparent in the existing view, the proposed project is more likely to attract viewer attention and may be perceived as less compatible with existing viewer activities.

- In areas with existing electrical infrastructure, the replacement, alteration, or addition of transmission structures is generally less likely to attract attention or be perceived as incompatible with the viewer activities.

Variable factors that may have influenced rating:

Please note any conditions, based on what is visible in the photographs that may influence the degree of contrast perceived between the project and the existing conditions (e.g., atmospheric condition, season, etc.).

Perceived effect on scenic quality/viewer enjoyment:

Please summarize your evaluation of the project's overall effect on the appearance of the view, taking into account the viewpoint location and context, sensitivity of that location, scenic quality of the existing view, viewer type, and viewer exposure.

ATTACHMENT C.

VISUAL IMPACT RATING FORM

Visual Impact Rating Form

Merrimack Valley Reliability Project (EDR Project #14111)

Viewpoint #:	Your Name:	Date:
Viewpoint Location:	Designated Aesthetic Resource (Identify/Describe):	
Viewer Type *check as many as apply* ☐Resident ☐Traveler ☐Recreational ☐Other:		

VIEWPOINT DESCRIPTION: *Please describe this view in your own words.*

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____

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VIEWPOINT SENSITIVITY: *Rate the scenic quality and viewer exposure for this view.*	
SCENIC QUALITY: *please rate existing scenic quality* ☐Low ☐Moderate ☐High	VIEWER EXPOSURE: *frequency and duration of view* ☐ Continuous ☐Repeated/Regular ☐Occasional/Brief ☐Rare

CONTRAST RATING: *Rate the level of contrast between the proposed structures and the existing view.*

COMPONENT	*SCORE*	*DESCRIPTION OF CONTRAST*
Landform		
Vegetation		
Land Use		
Water *		
Sky		
Viewer Activity		
TOTAL		*Total all scores above.*
AVERAGE		*Average all scores above.*

* *If no water is visible in the view, please enter "N/A" in the 'Score".*

Variable factors that may have influenced rating (atmospheric conditions, season, etc.):

____

Perceived effect on scenic quality / viewer enjoyment:

____

____

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____

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Contrast Rating
Score Chart

0	Insignificant
0.5	
1	Minimal
1.5	
2	Moderate
2.5	
3	Appreciable
3.5	
4	Strong

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

PRE-FILED TESTIMONY OF SHERRIE TREFRY
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

<u>Personal Background</u>

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

A. Sherrie L. Trefry, CSS, Director of Energy Services, VHB, 2 Bedford Farms Drive, Suite 200, Bedford, NH 03110.

Q. Briefly summarize your educational background and work experience.

A. I have been in the natural resource field for my entire professional career, beginning with a BS in Environmental Conservation with a concentration in Soil Science from the University of New Hampshire in 1999. I obtained a MS in Natural Resources: Soil Science from the University of New Hampshire in 2001. I began my career as an Environmental Consultant in 2004 with New Hampshire Soil Consultants, Inc. (NHSC) following a 30-month assignment as an Agroforestry Peace Corps Volunteer in Cameroon, Africa. I worked for NHSC conducting wetland delineations; wetland function and value assessments; wetland restoration implementation and monitoring; soils mapping; and local, state and federal environmental permitting until 2009. In 2009, NHSC was acquired by GZA GeoEnvironmental, Inc. (GZA). From 2009 to 2014, I worked at GZA primarily conducting natural resource assessments and preparing environmental permit applications for utility projects in New Hampshire. In June of 2014, I joined VHB as the Director of Energy Services to continue to provide environmental services to energy clients. I am a Certified Soil Scientist in the State of New Hampshire (CSS #93) and in the State of Maine (SS #527). I have served on the Board of Directors of the Society of Soil Scientists of Northern New England for the past three years and am currently serving as the Treasurer for the organization in my fourth year of service. I am a member of the New Hampshire Association of Natural Resource Scientists and formerly served five years on the Board of Directors, including two years as President of the organization. See Attachment A for my resume.

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

A. No. I have not previously testified before the Site Evaluation Committee.

Q. What is your role in the Project?

A. My role in the Project is to ensure that appropriate natural resource assessments and regulatory coordination are completed so that environmental permit applications can be prepared and environmental criteria within the Site Evaluation Committee Application can be addressed.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the work that was conducted in support of the Project to identify and address environmental issues. Also, I offer the opinion that the Project will not have an unreasonable adverse effect on air quality and water quality.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am familiar with the portion of the Merrimack Valley Reliability Project that is the subject of this Application. I have visited most areas of the Project with our staff and representatives of NEP and PSNH. My VHB colleagues and I worked with TRC, Black & Veatch, NEP and PSNH engineers through many design stages of the Project, to ensure that impacts to environmentally sensitive areas were avoided and minimized. I attended pre-application meetings held with the NHDES, USEPA, USACE, NHF&G, and NHNHB. I have also attended numerous Project steering meetings with NEP, PSNH, and their designated consultants. Lastly, I am the primary author of the environmental sections of the SEC Application.

<u>Environmental Assessments</u>

Q. Please describe the design and location of this Project.

A. The MVRP involves the construction of a new 345 kV electric transmission line within an existing ROW between the NEP-owned Tewksbury 22A Substation in Tewksbury, Massachusetts and the PSNH-owned Scobie Pond 345 kV Substation in Londonderry, New Hampshire and the relocation of the Y-151 115 kV transmission line along 7.6 miles of the Project ROW. The portion of the MVRP located within New Hampshire is referred to herein as the "Project". The Project extends from the Massachusetts border in Pelham, New Hampshire to Scobie Pond 345 kV Substation in Londonderry. The Project proposes 17.9 miles of new transmission line (which will be known as "3124 Line") within the Towns of Pelham, Windham, Hudson, and Londonderry. For purposes of discussion, the MVRP has been divided into four Segments. The four Segments are delineated by state, ownership, and line alignment. Segment 1 of MVRP is located in Massachusetts and is not discussed herein. Segments 2, 3 and 4 occur in New Hampshire.

Q. Please describe your permit application efforts.

A. VHB has prepared a Wetlands Permit Application, a Shoreland Permit Application, a 401 Water Quality Certification Application, and an Alteration of Terrain Permit Application as contained within Appendices E - G in the SEC Application. VHB held pre-application meetings with NHDES, USEPA, and USACE to confirm the appropriate approach to resource identification, permitting, and mitigation. The permit applications reflect the calculated impacts to water and shoreland resources and land disturbance for the Project.

Q. Please describe your natural resources studies.

A. VHB was contracted by NEP and PSNH to identify, describe, and assess impacts of the Project on air resources, water resources, wildlife, and wildlife habitat. The conducted studies involved a combination of research and review of existing sources of information, on-site investigations, and communications with regulatory agencies to identify and describe existing natural resources within the Project area and assess impacts to these resources. Results of the natural resource studies that were conducted by VHB are presented in narrative form and as a depiction of resources on Project figures, where appropriate in the SEC Application and the supporting permit applications contained in Appendices E - G. Water resources, protected shoreland, and wildlife habitat and impacts to these natural resources have been described and quantified for the Project. In addition, land disturbance has been quantified to support review of the Project by the NHDES Alteration of Terrain Bureau (AoT). As with similar overhead transmission construction, it is anticipated that the Project will qualify for a General Permit by Rule in accordance with AoT Rule Env-Wq 1503.03, for projects that disturb less than 100,000 square feet of contiguous area and less than 50,000 sq. ft. of contiguous area in the protected shoreland. However, an AoT Permit Application has been prepared for informational purposes to facilitate a jurisdictional determination by the AoT Bureau.

Q. Please describe the mitigation techniques taken by the Applicants to minimize impacts to natural resources in the Project area.

A. The Applicants mitigated impacts to natural resources in the Project area in multiple ways including avoidance of impacts through design, minimization of impacts through construction BMPs, and mitigation of unavoidable water resource impacts. The compensatory mitigation package is being developed in coordination with NHDES, USACE, and USEPA. The package is anticipated to be a combination of in-kind mitigation and in-lieu fee payment to the ARM fund.

<u>Water Resources / Water Quality</u>

Q. Please describe your surface waters and wetland resources studies in or adjacent to the Project site.

A. The water resources study included several components: 1) delineating and mapping wetlands and surface waters; 2) classifying wetlands and vernal pools; 3) preparing an evaluation of wetland functions and values; and 4) identifying and analyzing surface water and wetland impacts. Water resources were delineated by NH Certified Wetland Scientists in accordance with the *Corps of Engineers Wetland Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0* (January 2012) and NH Wetlands Rules (Env-Wt 100-900). Wetlands within the PSNH ROW were previously delineated in the Fall of 2012 by Normandeau Associates, Inc. ("Normandeau"). VHB reviewed the previously delineated wetlands within the PSNH ROW and performed delineations within the entire Project ROW during the 2014 field season (April through October) and a portion of the 2015 field season (April through May). Delineated water resources included wetlands, intermittent and perennial streams, and vernal pools. Wetlands were classified in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979, revised 1985). Intermittent and perennial stream designations were verified by reviewing USGS topographic maps.

A vernal pool survey was conducted in the Project ROW in the Spring of 2015 during active amphibian breeding season. Field documentation of vernal pools was conducted using methods described in *Identification and Documentation of Vernal Pools in New Hampshire, 2nd Ed.* 2009, published by the New Hampshire Fish and Game Department. Surveys consisted of sampling the pools to identify primary and secondary vernal pool indicators species in accordance with Env-Wt 100.

VHB conducted an assessment of wetland functions and values for representative wetlands in accordance with *The Highway Methodology Workbook Supplement* (USACE, 1999). Detailed information about the wetlands and streams on the Project site including wetland functions and values assessment forms is contained in the Wetlands Permit Application submitted as Appendix F.

Q. Please summarize the results of your surface waters and wetland resources studies.

A. One hundred eighty-one wetlands were delineated along Segments 2, 3 and 4 of the Project accounting for approximately 163 acres within the ROW. Wetlands within the Project area include PFO, PSS, PEM, and scattered POW and PAB components. The majority of the delineated wetlands were within the limits of existing maintained transmission ROWs and thus exhibit characteristics (e.g., vegetative cover) typical of this ROW environment. Thirteen perennial stream crossings and 20 intermittent stream crossings were identified within the NH Project ROW. A map series depicting delineated wetlands and surface waters is included as Figure 3.

Wetland and surface water impacts were assessed using ESRI ArcGIS© desktop software to calculate impact types and areas. The details of these impacts are reported in the Wetlands Permit Application, which is included in Appendix F. Permanent wetland impacts associated with the installation of structures and permanent access wetland crossings total 4,428 square feet (0.10 acre). Temporary wetland impacts for construction access total 388,895 square feet (8.93 acre). Stream impacts for the realignment of one stream channel include 80 square feet of stream bed and 17 linear feet of permanent impact. Temporary stream bed impacts for construction activities totals 6,365 square feet (0.15 acre) of temporary stream bed impact. Secondary wetland impacts resulting from the conversion of forested wetland to scrub-shrub or emergent wetland totals 10.9 acres.

A qualitative assessment of 13 wetland functions and values was made for each identified wetland within the Project ROW. Some of the larger wetland complexes found within the Project ROW provide multiple principal functions and values. Large wetland complexes include Lower Golden Brook Prime Wetland, Beaver Brook Floodplain wetland, and other unnamed large emergent/scrub-shrub systems associated with open water components. These wetlands offer floodwater storage, sediment and shoreline stabilization, sediment and nutrient retention, groundwater discharge or recharge, wildlife habitat, and production export functions as wildlife food sources. The wetlands that are associated with waterbodies may also contribute to fisheries habitat and recreational opportunities such as canoeing and kayaking.

The majority of the remaining Project ROW wetlands are currently maintained as either scrub-shrub or emergent habitat. Scrub-shrub/emergent wetlands associated with a stream, provide flood alteration, sediment and shoreline stabilization, wildlife habitat and production export functions as wildlife food sources. However, when not associated with a stream, hydrologically isolated and small in size, these wetlands tend to exhibit limited functions and values.

None of the Project impacts are expected to alter the hydrology of wetlands (i.e., no inflow/outflow restrictions) along the Project ROW and, therefore, will not significantly impact water quality and hydrologic functions (groundwater recharge/discharge, floodflow alteration, or sediment and nutrient retention) which are performed by these wetlands. Some temporary impacts to the wildlife habitat value of Project ROW wetlands are anticipated during the construction period as a result of noise and the presence of work crews and equipment.

Tree clearing is proposed along certain portions of each of the three Segments of the Project ROW in New Hampshire, which will result in the conversion of forested wetland cover types to scrub-shrub/emergent cover types. It is expected that some of this tree clearing will impact wildlife habitat; however, the forested communities where clearing impacts will occur are not significantly different in their general habitat characteristics relative to adjacent forested uplands. The most valuable wildlife habitat functions of the Project ROW wetlands are provided by the emergent-open water wetland classes currently present within the interior of the Project ROW, which will not be impacted by clearing activities.

Although the Project will require tree clearing in close proximity to many of the area streams that are crossed by or are adjacent to the Project ROW, the proposed clearing will be limited to only a minor portion of the overall width of the existing ROW. Given that much of the existing ROW width is already cleared, the added clearing is not expected to result in any discernable effect on water quality or water temperatures in the intermittent or perennial streams.

The 2015 spring vernal pool survey found a total of 17 vernal pools. No direct impacts are proposed to the documented breeding habitat of any of the vernal pools. There will be indirect impacts to vernal pools associated with tree clearing within the footprint of forested vernal pools and within the 250-foot federally-regulated vernal pool buffer.

The principal water quality concern associated with this Project relates to the potential for increased sediment erosion and movement during the construction period. Avoidance and minimization of impacts to water quality will occur through the implementation of BMPs.

Q. Please describe the mitigation techniques taken by the Applicants to minimize impacts to water resources in the Project area.

A. Impacts to water resources that are anticipated to result from the construction and operation of the Project have been avoided to the greatest extent feasible. The Project has been designed to avoid structure placement in water resources wherever possible within the limitations of span lengths. In addition, VHB worked with construction representatives to site construction access, work pad, and pull site placement outside of water resources, where feasible.

Project impacts were minimized by limiting permanent and temporary impacts in the following ways. Impacts of pole footprints have been minimized by utilizing direct embed structures, where feasible. Guy anchor types in wetlands are selected based on soil conditions with a preference for minimizing excavation. Impacts to wetlands for permanent crossings have been minimized by designing stone fords or similar pre-fabricated solutions in wetlands versus a traditional road and culvert installation. These solutions do not require maintenance similar to culverts that, if unmaintained, can restrict wetland hydrology.

Temporary impacts resulting from tree clearing have been minimized in the following ways. Tree clearing in wetlands will be completed from access points proposed for construction activity to minimize the number of construction routes within jurisdictional areas. In addition, forested wetlands will be hand cut and logs will be pulled out of the wetlands using machinery staged in upland areas. Slash and logs generated during clearing activities will be removed from jurisdictional areas.

Temporary impacts have been minimized by selecting construction access in areas previously disturbed and/or at the narrowest point in the wetland complex. Where temporary wetland impacts are required, swamp mats will be utilized to reduce ground pressure of construction vehicles and prevent rutting. Swamp mats are proposed for use in wetlands for temporary construction access, work pads around structure locations, and other temporary work areas. Use of swamp mats at the time of construction will be determined based on field conditions (i.e., dry or frozen ground conditions).

Sediment and erosion controls will be appropriately implemented as depicted on Wetland Permitting Plans contained in Appendix F and in accordance with the Applicants' guidance documents provided in Appendix S and T. The environmental controls shown on the Wetland Permitting Plans may need to be supplemented due to season of work, work methods proposed, and additional requirements of permits. A Construction Access Plan has been developed that contains additional BMPs for Project areas that have a higher potential to impact water quality due mostly to steep slopes and proximity to water resources. The Construction Access Plan is contained in Appendix U. Temporary sediment and erosion controls will be installed to prevent impacts to water quality resulting from land disturbance. Temporary and permanent stabilization will occur in accordance with Applicant's guidance documents. In addition, a SWPPP, as required by the USEPA under the CGP, will be developed and implemented during construction to minimize potential impacts to wetlands and surface waters.

Unavoidable impacts to water resources will be mitigated in accordance with appropriate regulations and guidance. Project impacts fall below the NHDES threshold for mitigation (10,000 sq. ft. of permanent wetland impacts). However, unavoidable direct and secondary impacts to wetlands, riparian buffers, and vernal pool buffers will be mitigated in accordance with federal regulations and guidance documents. It is anticipated that NEP and PSNH will provide a compensatory mitigation package for the proposed impacts that is a combination of in-kind mitigation and an in-lieu fee payment to the ARM fund.

<u>Air Quality</u>

Q. Please describe any potential effects to air quality associated with the Project.

A. VHB reviewed the Project for potential air pollutant sources resulting from the construction and operation of the Project. The review involved conversations with NEP, PSNH, Project engineers, and construction representatives to identify any potential emissions. The Project will not combust any fuels to produce electricity and, therefore, will not create any air emissions during operation. Generators that may be used during construction of the Project will be operated in compliance with permitting and emission requirements. Contractors are expected to adhere to NH state laws relative to idling. The potential for fugitive dust resulting from construction activity will be controlled in accordance with conditions of the NPDES CGP (Section 2.1.2.5 Minimize Dust). No air permits are required for the Project.

<u>Conclusion</u>

Q. In your opinion will this Project have an unreasonable adverse effect on air and water quality?

A. No. It is my opinion that the Project will not have an unreasonable adverse impact on air and water quality. As a transmission line, operation of the Project will result in no air emissions. Air emissions during construction will be negligible. Wetland impacts have been minimized by siting structures out of wetlands wherever possible, utilizing existing accessways during construction wherever possible, constructing any new accessways to avoid wetland impacts, and mitigating unavoidable wetland impacts in a manner that meets state and federal regulations. Utilizing an existing ROW and existing accessways minimizes impacts to water quality. Appropriate mitigation will be provided by NEP and PSNH, at the direction of NHDES, USACE, and USEPA, as required, such that the Project will not have an unreasonable adverse effect on wetlands and water quality.

Q. Are there any other comments you would like to make at this time?

A. No.

Q. Does this conclude your pre-filed testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF SHERRIE TREFRY

Sherrie L. Trefry, CSS

Director of Energy Services

Sherrie is the Director of Energy Services in VHB's Bedford, New Hampshire office. She specializes in environmental permitting on the federal, state, and local levels, particularly in support of energy projects. Sherrie is also skilled in regulatory consulting, environmental impact evaluation, land use planning, wetland mitigation – design/implementation, and project management. She has experience in developing Integrated Contingency Plans, Spill Prevention, Control and Countermeasure Plans, Stormwater Pollution and Prevention Plans, and conducting annual training to support environmental compliance.

11 years of professional experience

National Grid, 3315 Transmission Line, Vermont and New Hampshire

Sherrie was project manager for the environmental permitting of the removal of an existing 34.5 kV transmission line in Vermont and installation of a new 34.5 kV transmission line within an existing right of way in New Hampshire. The work involved obtaining a Certificate of Public Good from the Vermont Public Service Board for the removal of the existing line, as well as, New Hampshire wetlands and shoreland permits for the construction of the proposed line. In addition, federal permits were required for wetland and surface water impacts under Section 404 and Section 10 of the Clean Water Act.

Eversource Energy, 76W5 Distribution Line, Keene, New Hampshire

Sherrie was project manager for the natural resource assessment, survey, and permitting to support the installation of a 12 kV distribution line from the proposed North Keene Substation over Route 12 in Keene, New Hampshire. The work involved NH Department of Environmental Services and NH Department of Transportation permitting for the installation of facilities within wetlands and limited access right-of-way.

Vermont Gas Systems, Inc., Transmission Line Expansion, Phase II, Vermont and New York

Sherrie was a permitting specialist for the preparation of state and federal environmental permits in support of the proposed gas pipeline that would extend from Middlebury, Vermont to the International Paper facility in Ticonderoga, New York. The work involved the preparation of a Vermont Wetland Program's Individual Permit Application, the preparation of an US Army Corps of Engineers Individual Permit Application and an Individual 401 Water Quality Certificate Application.

Green Mountain Power, 16Y3 Line Upgrade, Winooski, Vermont

Sherrie was a task manager for the preparation of a US Army Corps of Engineers General Permit Application in support of an upgrade to a portion of the 16Y3 distribution and 3309 transmission lines from the Gorge Substation to where underground transmission starts in Winooski, Vermont.

Encore Redevelopment, Illuzzi Solar Site, Berlin, Vermont

Sherrie was a task manager for permitting of a proposed expansion of an existing solar array in Berlin, Vermont. The work involved the preparation of a Vermont Wetlands Program's Individual Permit Application and preparation of a mitigation plan to compensate for wetland impacts.

Public Service Company of New Hampshire, New Hampshire

Prior to joining VHB, Sherrie prepared federal, state, and local wetland permit applications for the construction of four new 115 kV transmission lines, one 34.5 kV distribution line, one substation, and the upgrade of three 115 kV transmission lines in New Hampshire.

Education

MS, Natural Resources, Soil Science, University of New Hampshire, 2001

BS, Environmental Conservation, University of New Hampshire, 1999

Certifications

Certified Soil Scientist ME SS 527

Certified Soil Scientist NH CSS 93

OSHA Certified Hazardous Waste Health and Safety Operator (OSHA 1910.120)

Affiliations/Memberships

New Hampshire Association of Natural Resource Scientists, 2004

Society of Soil Scientists of Northern New England, Treasurer, 2008

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

PRE-FILED TESTIMONY OF DARRELL OAKLEY
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. Darrell Oakley, Senior Ecologist, VHB, Union Station, Suite 209, 2 Washington Square, Worcester, Massachusetts 01604

Q. Briefly summarize your educational background and work experience.

A. I graduated from Colby College, majoring in Biology with a Concentration in Environmental Science. I earned a Certificate in Advanced Field Botany from the New England Wildflower Society and I am a Certified New Hampshire Wetland Scientist. Since I began my professional career in natural sciences over 20 years ago, I have specialized in ecology and rare species management. My experience has ranged from rare plant inventories, moth surveys, aerial avian surveys, radio telemetry tracking, turtle relocation projects, and prescribed burns. I have consulted with and coordinated numerous rare and wildlife surveys and protections plans for New Hampshire Fish and Game, New Hampshire Natural Heritage Bureau, Massachusetts Natural Heritage and Endangered Species Program, Vermont Fish and Wildlife Department, Maine Department of Marine Resources, New York State Department of Environmental Protection, New Jersey Department of Environmental Protection, Connecticut Department of Energy and Environmental Protection, Pennsylvania Natural Heritage Program, and Florida Fish and Wildlife Conservation Commission. I also have ten years of experience in conducting surveys for federally-listed species and Section 7 Consultations with the US Fish and Wildlife Service. Representative projects are listed in my resume in Attachment A.

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

A. No.

Q. What is your role in the Project?

A. I am a task manager focusing on identifying wildlife and plant habitat, and state- and federally-listed rare, threatened, and endangered species and assessing impacts to these resources that may occur during the construction and operation of a new 345 kV line in New Hampshire (the "Project").

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the work that was conducted to identify and evaluate wildlife habitat and rare, threatened, and endangered species that could be impacted by the Project. I also offer my opinion that the Project will not have an unreasonable adverse effect on the natural environment.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am familiar with the Project that is the subject of this Application. I have reviewed the Project plans and conducted field surveys within the Project ROW. I have attended and participated in numerous meetings with the Project team and regulatory agencies. I am the primary point of contact with representatives of NHF&G, NHNHB, and USFWS for this Project.

Wildlife Habitat

Q. Please describe your studies of wildlife resources for the Project site.

A. The wildlife resources study included several components: 1) screening and survey of state-listed rare, threatened, and endangered species; 2) screening for federally-listed threatened and endangered species; 3) general wildlife habitat land cover type mapping and assessment; and 4) identifying and analyzing wildlife impacts.

VHB requested a review of the Project area by the NHNHB for the occurrence of known rare plant, animal and natural communities using the online Data Check Tool. NHNHB responded in a memorandum, dated December 17, 2014, that occurrences near the Project included historical records of ten rare plants, one invertebrate species, two exemplary natural communities, and five vertebrate species.

VHB also reviewed the Project area for the presence of federally-listed species, designated critical habitats, or other natural resources of concern through the USFWS IPaC System. The IPaC report, dated May 15, 2015, indicates that no listed species or critical habitats are located within the Project area. This report is provided is included in Appendix F. The USFWS listed the northern long-eared bat as threatened and the bat's range is statewide. Project coordination with the USFWS regarding northern long-eared bat is ongoing.

VHB consulted with the NHF&G and NHNHB in order to develop protocols to survey the Project area for state listed species. VHB, with assistance from NHF&G, conducted snake surveys in April and May of 2015 to determine the presence or absence of the northern black racers near a historical record within the Project area. NHF&G's primary concern is that hibernation areas (hibernacula) may occur within proposed work areas and winter construction could affect hibernating snakes. Surveys were conducted in early spring as snakes emerge from hibernacula with the intent of identifying whether or not hibernacula occur within the Project area.

Surveys for Blanding's and spotted turtle nest sites occurred in May and June 2015. Although not mapped as occurring in the Project area, the Applicants will sponsor a New England cottontail survey in an area where NHF&G is lacking data. Results of 2015 and 2016 surveys will help determine avoidance and minimization techniques employed for listed species.

Land cover type maps developed by NHF&G under the statewide WAP were used to help identify cover types on the Project area. Mapped cover types were field verified in Spring 2015 and are shown in Appendix I.

Q. Please summarize the results of your wildlife resource surveys.

A. VHB did not observe any northern black racers within the Project area during its surveys conducted in spring 2015. Additional surveys will be conducted in Spring 2016 to provide further information regarding the presence or absence of northern black racer within the Project area. A spotted turtle was observed during black racer surveys and is being reported to the NH Reptile and Amphibian Reporting Program. Preliminary results of the turtle nesting surveys resulted in one spotted turtle and one painted turtle nesting on the ROW.

Seventeen vernal pools were located during the spring 2015 survey. No direct impacts (i.e. fill) are proposed to the documented breeding habitat of any of the vernal pools. Vegetative clearing associated with Project construction will occur within and adjacent to 14 vernal pools. Vegetation clearing is proposed within the boundaries of nine pools.

In order to identify the types of wildlife habitat present within the Project area, wildlife habitat land cover types, which were developed by NHF&G under the statewide WAP, were assessed and field verified within the Project ROW Wildlife habitat cover types on the ROW were field verified in spring 2015. The majority of the habitat on the ROW is maintained shrubland and emergent habitat.

Q. Please describe the mitigation techniques taken by the Applicants to preserve wildlife in the area?

A. Field surveys for rare, threatened, and endangered wildlife species will be conducted by VHB throughout 2015 and in 2016. Avoidance, minimization, and mitigation techniques will be developed for each surveyed species in coordination with NHF&G and possibly USFWS, based on the results of field surveys. Species observers will be employed to ensure construction equipment does not take listed species. Contractor education will also be implemented to ensure a safe environment for listed species. Certain sections of the ROW, such as turtle nesting areas or snake hibernacula may be cordoned off so there are no direct effects. It is anticipated that BMPs will be implemented to avoid and minimize impacts to wildlife that may inhabit the ROW or utilize the corridor for critical life functions.

Impacts from construction in uplands and wetlands will also be minimized by using appropriate BMPs. Vehicles and swamp mats will be inspected and cleaned prior to mobilization to the Project area to limit the spread of invasive species. Through these measures, impacts to the wildlife habitat will be minimized to the greatest extent practicable.

Plant Communities

Q. Please describe the assessment of plant species within the Project site that has been completed for the Project.

A. Common plant species were observed and recorded during the course of wetland delineations conducted during the growing season in 2014. The majority of the ROW is cleared and consists primarily of shrubland and emergent vegetation, except for narrow sections of a forested edge along the western portion of the ROW in Segment 2, an approximately 90-foot forested portion to be cleared along the eastern portion of the ROW in Segment 3, and an approximately 50-foot forested strip to be cleared in the middle of the ROW in Segment 4. Additional forested habitat within the Project area is located just southwest of the Scobie Pond 345kV Substation. Construction of the new 345 kV line would require widening the existing cleared limits of the ROW into these undeveloped forested portions of the ROW. Limits of clearing are shown on the Wetland Permitting Plans located in Appendix F.

Field surveys for New Hampshire listed plant species will be conducted by VHB during the 2015 growing season. Species include yellow star grass (*Hypoxis hirsuta*), round-leaved trailing ticktrefoil (*Desmodium rotundifolium*), eight-flowered six-weeks grass (*Vulpia octoflora var tenella*), and smooth forked whitlow-wort (*Paronychia canadensis).* Once rare plants are mapped, project engineers will assess whether Project components can be modified to avoid or minimize impacts. NEP and PSNH are committed to minimizing impacts to rare plants to the greatest extent practicable.

Q. Please describe the mitigation techniques used by the Applicants to preserve plant communities in the area?

A. Mitigation of impacts will occur through the implementation of approved BMPs for tree clearing and wetland crossings. Forested wetlands will be hand-cut to eliminate rutting in wetlands from machinery. Stumps will remain in place with the exception of stumps that need to be removed for pole installation. Swamp mats will be used in wetland crossings to minimize impacts to vegetation. Swamp mats and machines will be inspected and cleaned routinely to prevent the spread of invasive plants within the ROW.

Tree clearing in forested wetlands, riparian buffers, and vernal pool buffers are considered secondary impacts under the Wetlands Permit Application. Mitigation ratios for each jurisdictional area have been assigned by the USEPA. For additional information regarding mitigation, refer to the Wetlands Permit Application in Appendix F.

Field surveys for rare, threatened, and endangered plant species will be conducted by VHB in the summer of 2015. Avoidance, minimization and mitigation techniques will be developed for each surveyed species in coordination with NHNHB, based on the results of field surveys. It is anticipated that BMPs will be implemented to avoid impacts to plant species that may occur within the Project ROW.

<u>Endangered, Threatened and Rare Species</u>

Q. Please describe the studies you conducted for endangered, threatened or rare plants, animals and natural communities.

A. NEP and PSNH have met with the NHF&G and have corresponded with the NHNHB to develop surveys for the listed rare species. There are plans to survey for New Hampshire listed species such as black racers, Blanding's and spotted turtle nesting habitat, and New England cottontail. Studies for black racers and turtles have begun and surveys for New England cottontail will occur in winter 2015. Surveys may be needed for the federally-threatened northern long-eared bat and the Applicants are coordinating with the USFWS.

Normandeau identified potential vernal pools during field investigations in 2012 within the PSNH ROW and throughout the Project ROW by VHB wetland scientists in 2014. These habitats were surveyed for the presence of vernal pool indicator species during the peak breeding season in the spring of 2015.

Q. Please explain the results of your studies.

A. Please see results previously covered under results of wildlife resource surveys. Surveys for rare plants have not occurred yet.

Q. Please describe the mitigation techniques used by the Applicants to minimize impacts to these species in the Project area.

A. The Applicants are in discussions with NHF&G and the NHNHB on developing mitigation techniques. Mitigation techniques involve surveys for potential rare species and developing avoidance measures to avoid and minimize impacts to rare species. Avoidance measures may include timing constraints, assigning species observers to avoid direct take, and protection of critical habitat areas. Mitigation techniques may also include habitat enhancement for some species.

In accordance with federal mitigation requirements, a percentage of secondary impacts to vernal pools resulting from clearing of vernal pools and buffers will be mitigated. A compensatory mitigation package is being developed in coordination with the USACE, USEPA, and NHDES. Under consideration is a combination of upland buffer preservation and in-lieu fee payment to the Aquatic Resource Mitigation (ARM) fund.

<u>Regulatory Agency Consultations</u>

Q. Please describe the consultations the Applicants have had with State and Federal agencies during your studies.

A. An information request for Project review was sent to the NHNHB on December 12, 2014. A response for Project review was released on December 17, 2014. Dale Abbott of VHB entered into a Data Sharing Agreement for NHNHB Environmental Review Data on January 8, 2015 in order to plot known occurrences of rare, threatened, and endangered species on Project plans. The Applicant and consultants had a pre-application meeting with the NHDES on January 22, 2015 where representatives from the NHF&G and the NHNHB were present.

Ms. Sherrie Trefry, Director of Energy Services at VHB, corresponded with the NHNHB regarding rare plant surveys and VHB met with NHF&G on February 17, 2015 to discuss the results of the mapped rare species along the Project ROW and potential surveys. The Applicants and I held an additional meeting with NHF&G on March 26, 2015 to further develop surveys and discuss avoidance techniques. We have had follow-up emails and telephone calls with NHF&G to facilitate survey plans. A plant survey protocol was sent to the NHNHB on April 20, 2015 and Ms. Amy Lamb of the NHNHB approved the plant survey protocol on May 26, 2015. A survey protocol and Application for Scientific License for northern black racer was submitted to NHF&G on April 13, 2015. On April 15, 2015, NHF&G issued the scientific license to capture and implant radio transmitters into northern black racers. I sent a memorandum to Mr. Michael Marchand of NHF&G detailing rare species survey protocols, avoidance and minimization measures, and an overview of discussions to date between the Applicants and NHF&G on June 2, 2015. Concurrence with the memorandum was received on June 8, 2015.

I discussed the Project with Ms. Susi vonOettingen of USFWS on February 10, 2015. The topic concerned potential surveys with the expected listing of the northern long-eared bat. The Applicants filed a review with the USFWS IPaC System web site on May 15, 2015. The review resulted in no listed threatened or endangered species or critical habitats in the Project area (Appendix F). Coordination with USFWS is ongoing.

Conclusion

Q. In your opinion, will this Project have an unreasonable adverse effect on the natural environment?

A. No. The Project has been sited within an existing transmission ROW and utilizes existing access ways wherever possible. Avoidance, minimization, and BMPs will be implemented to protect the natural environment. As may be required at the direction of NHF&G or NHNHB, mitigation will be provided by NEP and PSNH for rare, threatened, and endangered species. In fact, the Project will provide certain benefits to selected species, such as birds that depend on early successional habitats, rare plants, and New England cottontail. Therefore, based on my analysis coupled with the avoidance minimization and mitigation measures to be employed, it is my opinion that the Project will not have an unreasonable adverse effect on the natural environment.

Q. Are there any other comments you would like to make at this time?

A. No.

Q. Does this conclude your pre-filed testimony?

A. Yes.

ATTACHMENT A.

RESUME OF DARRELL OAKLEY

Darrell Oakley, PWS, NHCWS

Senior Ecologist

Darrell has extensive experience in wildlife biology, natural resource inventories, botany, wetland ecology, wetland replication and restoration, impact statement preparation, and environmental regulatory analysis. He is experienced in federal and state permitting for merchant power projects for municipal agencies and private utility companies, natural gas pipelines, and electric transmission lines. His environmental permitting experience includes projects involving the Bureau of Ocean Energy Management, Federal Energy Regulatory Commission, US Army Corps of Engineers, and US Fish and Wildlife Service, the Massachusetts Environmental Policy Act, the Wetlands Protection Act, the Endangered Species Act, and the Water Quality Certification Program. He has recently completed Bat Acoustic Training by Bat Conservation Management in March 2015.

21 years of professional experience

Education

BA, Biology with a Concentration in Environmental Science, Colby College, 1994

Registrations

Professional Wetland Scientist (reg. # 1424)

Certified Wetland Scientist NH (reg. # 154)

OSHA Certified Hazardous Waste Health and Safety Operator (OSHA 1910.120)

Affiliations/Memberships

Society of Wetland Scientists

Massachusetts Association of Wetland Scientists

New England Wildflower Society

Northeast Bat Working Group

Eversource, Mendon and Uxbridge Massachusetts

Mr. Oakley conducted surveys and tracked two state-listed species of Special Concern—eastern box turtle (*Terrapene carolina*) and wood turtle (*Glyptemys insculpta*) with radio telemetry. The state-listed species surveys are being conducted as part of a Conservation and Management Permit application associated with tree removal maintenance within Massachusetts Natural Heritage and Endangered Species Program designated priority habitats.

Laidlaw Berlin BioPower, Comprehensive Environmental Impact Analysis and Permitting, Berlin, NH

Prior to joining VHB, Mr. Oakley was the Senior Ecologist for the development of a 70 MW biomass fueled energy generating facility in Berlin, New Hampshire. He has conducted environmental studies and mitigation plans to evaluate the project's potential impacts on stormwater, surface water, and habitat. He has prepared environmental applications required for construction and operation of the project including Alteration of Terrain and Shoreland Protection Applications. The studies and applications were compiled into a comprehensive Application for Site and Facility that was filed with the New Hampshire Site Evaluation Committee (SEC). The application was formally deemed complete and accepted by the SEC.

Cape Wind Associates, LLC, Avian and Bat Surveys and Analysis, Nantucket Sound, MA

Prior to joining VHB, Mr. Oakley conducted numerous avian and bat field studies and impact analysis in support of the Cape Wind project. Avian studies focused on potential impacts to Common and Roseate Terns, sea ducks, and waterbirds. He conducted avian surveys from sea and land. Field studies included bird identification during radar ground-truthing, tern observations near Monomoy Island and Waquoit Bay, and winter sea duck and waterbird surveys. Mr. Oakley was responsible for preparing the avian sections of the Final Environmental Impact Report to the MEPA Office and Development of Regional Impact Report to the Cape Cod Commission. He provided comments to the Minerals Management Service in preparation of the Biological Assessment for Consultation with the United States Fish and Wildlife Service and NOAA Fisheries. Mr. Oakley assisted the Minerals Management Service and the United States Fish and Wildlife Service in developing and implementing protocols for the Avian and Bat Monitoring Program.

Massachusetts Technology Collaborative, Community Wind Program, Massachusetts

Prior to joining VHB, Darrell is responsible for preparing Phase I Avian and Bat Risk Assessments to the Massachusetts Technology Collaborative for communities in Massachusetts that have potential sites for one to three wind turbines. Darrell has prepared avian and bat risk assessments for three sites on Cape Cod and three assessments along the Massachusetts coastline.

Morris County, Long Valley Bypass, Threatened, and Endangered Species Survey, Morris County, NJ

Prior to joining VHB, Mr. Oakley surveyed for wood turtle (Glyptemys insculpta) and timber rattlesnake (Crotalus horridus). Identified potential habitats and directed the movement of heavy machinery near potential threatened and endangered species habitats and wetlands of exceptional resource value.

New York Regional Interconnection, New York Public Service Commission Article VII Application, New York

Prior to joining VHB, Mr. Oakley was Responsible for the assessment of environmental impacts for an Article VII filing for a 450 kV dc transmission project in New York State that is over 300 miles in length. The project includes a routing evaluation, the assessment of the environmental impacts for the project route, and alternatives and the preparation of the Article VII application to the New York State Public Service Commission. Mr. Oakley has specifically been leading the field surveys for the state listed Bald Eagle and state and federally listed bog turtle. He is focused on assessing impacts and minimizing the project's effects to the listed species.

New York Regional Interconnection, Phase I Bog Turtle Survey. Orange County, NY. Pursuant to the New York Public Service Commission Stipulation, identified potential bog turtle nesting habitat along 23 miles of the proposed electric transmission line in Orange County using GIS database information. Conducted Phase I bog turtle habitat assessments based on wetland information at 30 wetlands.

Northeast Utilities, Rare Species Habitat Assessment, 38-mile Electric Transmission Line, Lebanon to Chaplin, CT

Prior to joining VHB, Mr. Oakley assessed potential electric transmission line impacts to two rare habitats and thirteen listed species. Significant Habitats included poor fen and an Atlantic White Cedar Swamp. Rare species included American Bittern, Pied-billed Grebe, Blue-winged Teal, Purple Martin, Northern Saw-wet Owl, Savannah Sparrow, Whip-poor Will, wood turtle (Glyptemys insculpta) eastern hognose snake (Heterodon platyrhinos), banded bog skimmer (Williamsonia lintneri) bog copper (Lycaena epixanthe), aquatic snail (Gyraulus circumstriatus) American rubyspot (Hetaerina americana) Henry's elfin (Callophrys henrici), frosted elfin (Callophrys irus), noctuid moth (Lepipolys perscripta) and mustached clubtail (Gomphus adelphus). Identified rare species habitats and host plant species for moths. Developed survey protocol to survey for two host plants species: blue toadflax (Linaria canadensis) and lupine (Lupinus perennis). Worked with Connecticut Department of Environmental Protection to assess and minimize potential impacts.

Raleigh Development Corporation, Rare Species Investigation, Wellfleet, MA

Prior to joining VHB, Mr. Oakley assessed site for Species of Special Concern common's panic grass (Dichanthelium ovale ssp. pseaudopubescens) eastern box turtle (Terrapene carolina carolina). Mr. Oakley documented on-site and off-site occurrences of broom crowberry, which were unknown to Natural Heritage. He negotiated a mitigation scheme for impacts to broom crowberry that has been accepted by Natural Heritage. Future work includes Conservation and Management Plan and propagation and relocation of broom crowberry.

Professional Development Activities

Ct, Bat Acoustic Training March 7-9 2015 Bat Conservation Management

Ct, Advanced Field Biology, New England Wildflower Society, 2012

Ct, CSX On-Track Safety, 2001

Ct, Amtrak Roadway Worker Protection, 2000

Ct, Connecticut Southern Railroad Track Safety, 1998

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

PRE-FILED TESTIMONY OF STEPHEN A. OLAUSEN
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

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

A. Stephen A. Olausen, Executive Director and Senior Architectural Historian, The Public Archaeology Laboratory, Inc. (PAL), 26 Main Street, Pawtucket, Rhode Island.

Q. Please describe your educational and employment background.

A. Attachment A is my current resume, which states my qualifications. I hold a MS Degree in Public History from the University of South Carolina and have worked as a cultural resource management consultant for 27 years. Before joining PAL as a Senior Architectural Historian in 1997, I served as the Vice President and Project Manager for Historic Property Associates, Inc., in St. Augustine, Florida. I have conducted hundreds of historic architectural survey and planning projects in the Eastern United States and have extensive experience in the evaluation and registration of historic properties. Areas of expertise include Section 106 of the National Historic Preservation Act consultation, National Register nominations, Historic American Buildings Survey/Historic American Engineering Record documentation, environmental compliance documentation, Section 4(f) of the Department of Transportation Act evaluation, cultural resource management plans, architectural design guidelines, and historic preservation tax incentive projects. Since 1997, I have served as the project manager for cultural resource management activities undertaken by TransCanada Hydro Northeast, Inc. (and its predecessors PG&E and US Gen New England) at the hydroelectric developments the company owns on the Deerfield and Connecticut Rivers. I have also served as a senior architectural historian on numerous electrical transmission projects for a variety of private transmission companies in the Northeast.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the assessment PAL conducted of historic resources and offer the opinion that the Project will not have an unreasonable adverse effect on historic resources.

My testimony specifically refers to historic architectural, or aboveground resources. The impacts of the Project on archaeological, or below ground, sites are the subject of pre-filed testimony supplied by Dianna Doucette of PAL.

Q. What methods were used to identify historic architectural resources within the vicinity of the Project?

A. The initial effort to identify historic resources in the vicinity of the Project consisted of a due diligence review. The nature of the Project's potential impacts was considered in determining the extent of a preliminary study area for the identification of historic architectural resources.

The Project consists of adding a new transmission line, named the 3124 Line, within existing transmission line ROWs owned by NEP and PSNH. There are from one to five existing transmission lines with the ROWs. The new 3124 Line will be 345 kV overhead transmission line carried on steel structures of similar height and materials to those of the existing lines.

Because the Project will be entirely constructed within an existing transmission line ROW, its potential to impact historic architectural resources is limited. PAL, therefore, established a preliminary study area that extends one-quarter of a mile from either side of the Project centerline.

Information about previously identified properties within the preliminary study areas was developed through a search of the historic architectural inventory files maintained by NHDHR in March 2014. A site visit to the study area was conducted by a team consisting of a PAL architectural historian and archaeologist on January 22, 2015. The purpose of the site visit was to determine the types of resources that are present within the study area and collect information required to produce a RPR form required to initiate consultation with the NHDHR. During the site visit the team inspected places where the existing transmission line intersects with public roads. Based on a desktop review of the Project route, the areas around those intersections are the places where the Project has the greatest potential to impact historic architectural resources due to the proximity of the existing transmission line structures and the cleared cuts of the ROWs that produce views. At the intersections, the PAL team searched for properties that are at least 50 years of age and have not previously been surveyed and recorded in the NHDHR inventory. The site visit was conducted during an overcast day when the trees were devoid of leaves. There was some snow cover, but otherwise the conditions were ideal to assess potential views of the Project from the resources identified. Properties that met the basic criteria of being at least 50 years old and would have views of the Project were photographed and recorded on a base map. Photos showing the views from the recorded properties to the Project were also taken. Please see the Due Diligence Report contained in Appendix J.

Q. What were the results of the due diligence review conducted by PAL?

A. The Project study area does not contain any properties that are listed or previously determined eligible for listing in the State or National Register of Historic Places ("State/National Registers"). There are four previously surveyed properties within the study area. Three properties—10 Rockingham Road (NHDHR ID #LON097), 18 Rockingham Road (NHDHR ID #LON098 and 22 Rockingham Road (NHDHR ID #LON099) —are located at the northwest end of the Project route on the east side of Route 28 in Londonderry. They were evaluated by the NHDHR in 2002 as not eligible for listing on the State/National Registers due to either a lack of significance or architectural integrity.

The Castle Hill Road Bridge (NHDHR #PEL0012), located in a residential area in Pelham, was evaluated in 2008 as eligible for individual listing on the State/National Registers. Since that time, however, the historic bridge was replaced with a modern structure and is no longer eligible for the State/National Registers.

During the site visit, the area in which the Project is located was found to be largely undeveloped or contains areas of non-historic late-twentieth century residential development. One potentially significant historic property was identified during the field survey. It consists of farmstead located on a hill at the north side of a curve on Elwood Road in Londonderry. Part of Ellwood Orchard, the farm house is a two-and-a-half-story, two-by-five-bay, gable-front Italianate-style residence that was constructed about 1870. An adjacent two-story, gable-front bank barn also appears to date from the late nineteenth century. The property includes about eight other outbuildings, most of which appear to date to the mid- to late-twentieth century. The farm house is surrounded on all sides by open and active agricultural fields, planted with corn and fruit trees. Portions of the orchard extend into the Project ROW to the east of farm house.

Q. In your opinion, will the Project have an unreasonable adverse effect on historic resources?

A. No.

Q. Please explain.

A. The inventory file review revealed that there are no properties that have been previously listed or determined eligible for listing within the study area. In evaluating the potential effects of the Project on the farmstead at Ellwood Orchard, PAL concluded that the Project would have no adverse effect because the view to and from the Project, which could be considered an element of the farm's historic setting, have already been compromised by the transmission line structures that already exist in the adjacent transmission ROW. Because the same conclusion would likely be reached for other potentially significant historic properties that have views of the Project, if any exist, PAL recommended that no further historic architectural investigations are necessary to arrive at finding that the Project will not cause any effect on historic architectural resources.

Q. Please describe the status of consultation with the NHDHR regarding the potential effect of the Project on historic architectural resources.

A. An RPR, which contained the results of the due diligence review that PAL conducted was submitted to initiate consultation with the NHDHR in February of 2015. *See* Appendix K for the RPR. In a letter dated June 2, 2015 (Appendix AC), Director and State Historic Preservation Officer Elizabeth Muzzey wrote to Frank Delguidice of the Regulatory Branch of the N.H. Division of the U.S. Army Corps of Engineers, that the NHDHR concurred with PAL's conclusion that the Project has no potential to affect historic architectural resources.

Q. Does this conclude your testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF STEPHEN A. OLAUSEN

STEPHEN A. OLAUSEN

EXECUTIVE DIRECTOR/SENIOR ARCHITECTURAL HISTORIAN

EDUCATION

MA, University of South Carolina, Applied History and Historic Preservation, 1988

BA, Roanoke College, History, 1984

EXPERIENCE

Years with PAL: 17
Years Experience: 27

CERTIFICATION

Basic First Aid/BBP - American Heart Association

Adult CPR/AED - American Heart Association

OSHA 29 CFR 1910.120(e) 40-Hour Hazardous Waste/Emergency Response

OSHA 29 CFR 1910.120(e) 8-Hour Hazardous Waste/Emergency Response Supervisor

PROFESSIONAL DEVELOPMENT

Section 106: Working with the Revised Regulations

Workshop on the New 36 CFR Part 800: Highlights of Changes

Federal Energy Regulatory Commission Section 106 Compliance Seminar

As a PAL Senior Architectural Historian and Project Manager, Mr. Olausen conducts cultural resource management projects that require consideration of historic architectural and landscape properties. He also serves as PAL's Executive Director and oversees the administrative operations of the firm, including the information systems, production, and human resources departments.

Mr. Olausen has extensive experience in the coordination of projects requiring review under Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, and Section 4(f) of the Department of Transportation Act. His project responsibilities include the preparation of technical proposals; project administration and communication; and supervision of PAL's architectural history staff in conducting project research, fieldwork, and report production. He is fully qualified under the Secretary of Interior's Professional Qualification Standards (36 CFR Part 61 Appendix A).

Mr. Olausen's experience includes the completion of more than 150 historic property survey and evaluation projects, more than 150 successful National Register of Historic Places nominations, and a large number of HABS/HAER and state-level documentation projects. He manages and serves as lead author for PAL's National Register work for the National Park Service, which has included the preparation of evaluations and nominations for a number of nationally significant resources within the National Park System, including Acadia National Park, Minuteman National Historical Park, Saratoga National Historical Park, Martin Van Buren National Historic Site, Cape Cod National Seashore, Fire Island National Seashore, Gateway National Recreation Area, and Upper Delaware Scenic and Recreational River. Other National Register documentation projects have included a Multiple Property Submission for Historic Family Housing at the U.S. Military Academy at West Point and a National Historic Landmark nomination for Mulberry Plantation, Camden, South Carolina.

Olausen has managed and served as senior architectural historian for hundreds of compliance projects. This work has included coordinating consultation, directing survey and evaluation to identify historic architectural properties, assessing direct and indirect effects, developing memoranda of agreement, recording properties to state-level and HABS/HAER standards, and preparing interpretive educational materials and displays for the purpose of disseminating information about historic properties. He has served as project manager and senior architectural historian for numerous large-scale compliance projects in the Northeast, including the completion of the cultural resource mitigation phase of Amtrak's Northeast Corridor - New Haven to Boston Electrification; New Bedford/Fall River Rail Restoration in Massachusetts; T.F. Green Airport Improvement Project in Warwick, Rhode Island; I-95 Ramp Improvements in Providence, Rhode Island.

Since 1998, Mr. Olausen has served as the lead cultural resource management consultant for TransCanada Northeast Hydro, Inc. and the predecessor owners the Deerfield and Connecticut River Hydroelectric Systems. This work has involved the completion of more than 60 projects that have assisted TransCanada in meeting its goals to protect historic properties under the terms of its licensing agreements with the Federal Energy Regulatory Commission (FERC) and Section 106 of the National Historic Preservation Act. In the late 1990s Olausen conducted a survey and the preparation of historical documentation for aboveground historic properties within the FERC licensed boundaries of all TransCanada developments along the Deerfield and Connecticut Rivers. The project, which also included the preparation of an extensive historical context for historic hydroelectric development along the rivers, has served as the basis for evaluating and mitigating subsequent impacts to historic properties within those areas. Olausen has also managed the cultural resource management aspects of relicensing efforts at the Fifteen Mile Falls Project and is currently overseeing the work associated with relicensing the Vernon, Bellows Falls, and Wilder Projects. The work required for the relicensing efforts has included participation in consulting party meetings, historic property identification and evaluation surveys, and the preparation of Programmatic Agreements and Historic Property Management Plans. Olausen has also managed the implementation of those agreements and plans. This work has included the preparation of cultural resource monitoring reports, project review and effect assessments, and the production of educational and historic documentation materials. Other projects that required significant cultural resource management activities have included the Vernon Station Repowering Project and the Bellows Falls GSU Transformer Switchyard Project. The Vernon Repowering Project involved extensive consultation under Section 106 that resulted in a memorandum of agreement specifying a slate of activities to minimize or mitigate project effects. These activities, including an archaeological survey of lands within and adjacent to the FERC boundaries, the development of a Historic Property Management Plan, and the preparation of a public education video about the history of Vernon Station, were carried out under Olausen's direction.

Olausen has also managed the above-ground historic property elements of PAL projects conducted for a number of major energy suppliers in the Northeast, including National Grid, Vermont Electric Power Company (VELCO), Spectra Energy, Tennessee Gas Pipeline Company, and Duke Energy. This work has included the preparation of due diligence reviews, historic property identification and National Register evalution, and project efffects assessments for the extensive linear cooridors that typically characterize these types of projects. Olausen often provides expert testimony to support filings to state public service boards and commissions that oversee electrical developments.

Over the last 10 years, Olausen has managed numerous wind energy projects in Massachusetts and Maine. The work has included historic property identification and evaluation surveys, effects assessments, consultation under Section 106, and the preparation of mitigation documentation. The projects have ranged from large utility scale developments like Cape Wind in Nantucket Sound to single turbine projects. Projects conducted in Maine have included Stetson Ridge, Stetson II, Oakfield, Highland, Rollins, Bowers Mountain, Bull Hill, and Record Hill. Through this work, Olausen has acquired a solid understanding of the Maine site laws governing major wind developments and the particular requirements of the Maine Historic Preservation Commission for the review of such projects.

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

PRE-FILED TESTIMONY OF DIANNA L. DOUCETTE
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

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

A. Dianna L. Doucette, Senior Archaeologist, The Public Archaeology Laboratory, Inc. (PAL), 26 Main Street, Pawtucket, Rhode Island.

Q. Please describe your educational and employment background.

A. Attachment A is my current resume, which states my qualifications. I hold a Doctoral Degree in Archaeology from Harvard University and have worked as a cultural resource management consultant for 32 years. My responsibilities as Senior Archaeologist/Principal Investigator at PAL include supervising and coordinating research, excavation, analyses, and report preparation at all levels of archaeological investigation in the Northeast. I manage long-term compliance survey projects for private, large-scale power line and natural gas pipeline companies in New England. My project responsibilities also include the preparation of technical proposals; project administration and communication; and supervision of PAL's archaeological staff in conducting archival research, fieldwork, site avoidance and protection planning, and report production. I have extensive experience in the coordination of projects requiring review under Section 106 of the National Historic Preservation Act and the National Environmental Policy Act.

Q. Please describe PAL and the services the company provides.

A. PAL is a leading authority in cultural resource management in the New England and Mid-Atlantic regions of the United States. Based in Pawtucket, Rhode Island, the firm is an independent, non-profit corporation that specializes in terrestrial and marine archaeology, architectural history, historical research and documentation, and preservation planning. PAL has completed more than 3,000 projects for a wide variety of clients, including federal, state, and local agencies; non-profit institutions; and private developers. We have a multidisciplinary staff of more than 50 cultural resource management professionals and support personnel. Our reputation is built on our ability to manage projects of any size and deliver timely products that consistently meet the highest standards in our industry.

Q. What is the purpose of your testimony?

A. I will discuss my analysis of the Project effect on archaeological resources and offer the opinion that the Project, as proposed, will not have an unreasonable adverse effect on those resources.

My testimony specifically refers to archaeological or below ground resources. The impacts of the Project on historic architectural or aboveground resources are the subject of pre-filed testimony supplied by Stephen Olausen of PAL.

Q. What methods were used to identify archaeological resources within the vicinity of the Project.

A. The initial effort to identify cultural resources in the vicinity of the Project consisted of a due diligence review and desktop sensitivity assessment. The nature of the Project's potential impacts were considered in determining the extent of the initial study area for the identification of archaeological resources. In summary, the Project consists of adding a new transmission line named the 3124 Line and relocating an existing line named the Y-151 Line within existing transmission line ROW owned by NEP and PSNH. For archaeological resources, PAL established a preliminary study area that extends one-half of a mile from either side of the Project centerline for a total width of one mile. Environmental and cultural contexts for the greater general vicinity were also taken into account.

The environmental and cultural data were used to provide preliminary archaeological sensitivity rankings for portions of the Project ROW in New Hampshire, according to regional and local predictive models for pre-contact Native American and post-contact Euro-American site locations. Known sites were identified through a search of the data maintained by the NHDHR in March 2014.

PAL archaeologists then conducted Phase IA walkover surveys of the NEP portion of the ROW (Segment 2) on May 21, 2015, and a similar walkover survey along portions of the NEP ROW that will be used to access the PSNH ROW on June 10, 2015. The purpose of the Phase IA was to determine the physical condition of the Project area, define areas of disturbance, establish areas of low archaeological site probability, and delineate areas of archaeological sensitivity.

Q. What were the results of the due diligence review conducted by PAL?

A. There are seven pre-contact sites and four post-contact archaeological sites recorded within a one-half mile of the Project ROW. Results of research indicate that the pre-contact sites consist of four find spots (defined as less than three pieces of cultural material) and three pre-contact Native American archaeological sites (27-HB-209, 27-RK-301 and 27-HB-225). The Pelham Incinerator Site (27-HB-209) is the best documented, ca. 4500 years old, and the only site located within the ROW, along Golden Brook in Pelham. Of the four post-contact archaeological sites, three are in Londonderry and one is in Hudson; none of these are located within the Project ROW. The Aiken Saw Mill Site (27-RK-21) in Londonderry consists of a stone lined mill race, a stone wall, mill pond (Aiken Pond) and foundation dating to 1722. The remaining three sites are residential in nature, containing foundations, and date to the late nineteenth and twentieth centuries.

The PSNH portion of the Project in New Hampshire (Segments 3 and 4) previously underwent a Phase IA archaeological survey and NHDHR project review for the PSNH 326 Line Thermal Uprate Project (Bunker 2011). On the basis of field observations and research results, no further archaeological survey was recommended and that project received a determination of no effect from NHDHR (R&C

#4356) contained in Appendix L. Given this prior NHDHR determination, it was considered by PAL that another Phase IA of the PSNH portion was not needed.

Q. Please describe the initial findings of the Phase IA conducted by PAL.

A. PAL conducted Phase IA walkover inspections of the NEP portion of the ROW in New Hampshire, from the Massachusetts border in Pelham to the PSNH portion of the ROW in Hudson (Segment 2) as well as along portions of the NEP ROW that will be used to access the PSNH ROW. There were no new pre- or post-contact sites identified on the surface during the pedestrian survey along the NEP ROW. The area where the Pelham Incinerator Site (27-HB-209) was located has been developed along Newcomb Field Parkway; no evidence of the site was detected and the area has low archaeological sensitivity due to construction and grading disturbance along the ROW. Approximately 39.6% of Segment 2 of the ROW is archaeologically sensitive for pre-contact resources based on the favorable environmental setting, level, undisturbed terrain and well drained soils, and the proximity of other known pre-contact archaeological sites. The remaining 60.4% of the NEP ROW is not considered archaeologically sensitive due to excessive modification of the landscape through soil removal and re-deposition, sand and gravel pit operations, deeply cut recreational trails, landscaping and dumping, exposed bedrock, wetlands, and steeply sloped terrain.

Q. Do you expect that the Project will have an unreasonable adverse effect to archaeological resources?

A No, the Project will not have unreasonable adverse effect on archaeological resources. If such resources are identified, necessary and reasonable actions to avoid, minimize, or mitigate any unreasonable adverse effects will be taken.

Q. Have NEP and PSNH consulted with the NHDHR regarding the potential effect of the Project on archaeological resources?

A. Yes. An RPR was submitted to NHDHR in February, prior to completing the Phase IA for archaeological resources. The NHDHR responded on March 4, 2015 that they needed more information (results of a Phase IA survey) in order to comment on the potential effect of the Project on archaeological resources. PAL completed Phase IA walk over surveys of the NEP ROW (Segment 2) and portions of the NEP ROW that will be used to access the PSNH ROW during the weeks of May 18, 2015 and June 10, 2015. The purpose of the Phase IA was to determine the physical condition of the Project area, define areas of disturbance, establish areas of low archaeological site probability, and delineate areas of archaeological sensitivity. A complete Phase IA analysis has now been completed and submitted to NHDHR. See Appendix AM.

Q. Does this conclude your testimony?

A. Yes.

ATTACHMENT A.

RESUME OF DIANNA L. DOUCETTE

Public Archaeology Laboratory

DIANNA L. DOUCETTE, PhD, RPA

PRINCIPAL INVESTIGATOR / SENIOR ARCHAEOLOGIST

EDUCATION

PhD, Harvard University, Anthropology, 2003

MA, Harvard University, Anthropology, 1999

Graduate Certificate, Harvard University Extension School, Museum Studies, 1994

BA, University of New Hampshire, Anthropology, 1985

REGISTRATION

Registered Professional Archaeologist

CERTIFICATION

Basic First Aid - American Red Cross
Adult CPR - American Red Cross

OSHA 29 CFR 1910.120(e) 40-Hour Hazardous Waste/Emergency Response

EXPERIENCE

Years with PAL: 25
Years Experience: 35

PROFESSIONAL DEVELOPMENT

Instructor, Harvard University Extension School

Instructor, University of Massachusetts Boston

Instructor, University of Massachusetts Amherst

Archaeological Resources Protection Act compliance training (ARPA)

Dr. Doucette received her Ph.D. and MA in Anthropology from Harvard University in 2003 and 1999, respectively and earned a Graduate Certificate in Museum Studies from the Harvard University Extension School in 1994. Her research specializations include pre-contact period Native American land use, subsistence and settlement patterns in the Northeast, and geoarchaeological methods. Dr. Doucette is recognized for her research on Middle and Late Archaic Native American sites in southeastern Massachusetts, originating from supervising a large scale data recovery program at the Annasnappet Pond Site in Carver, which became the focus of her dissertation research. Annasnappet Pond was a component of the Massachusetts Department of Transportation's Route 44 project between Carver and Raynam, which also included several archeological site examinations.

Dr. Doucette served as a PAL project archaeologist from 1985 to 2000 before pursuing her graduate degrees, and rejoined the PAL staff in 2005 as a principal investigator. Before her tenure at PAL, Dr. Doucette served as a project archaeologist on a number of sites in Nevada, Georgia, and Texas. Between 1995 and 1997, she was a curatorial assistant in archaeology in the Repatriation Department at Harvard's Peabody Museum of Archaeology and Ethnology where she was responsible for collections research and consultation with Native American tribes as part of the museum's Native American Graves Protection and Repatriation Act (NAGPRA) compliance.

Dr. Doucette has extensive experience in the coordination of projects requiring review under Section 106 of the National Historic Preservation Act and the National Environmental Policy Act and has supervised archaeological investigations for a variety of federal and state agencies including the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers, National Park Service (NPS), and the Massachusetts Department of Transportation. She also is involved in long-term compliance survey projects for private, large-scale natural gas pipeline and power line companies in New England. She was responsible for Phase I, Phase II site evaluations, and Phase III data recovery investigations for approximately 20-miles of transmission line right-of-way along the S145/T146 and Y-151 Lines in northeastern Massachusetts, including existing and proposed access roads and pole laydown/staging areas. As a senior archaeologist at PAL, her project responsibilities include the preparation of technical proposals; project administration and communication; and supervision of PAL's archaeological staff in conducting archival research, fieldwork, site avoidance and protection planning, and report production. She is fully qualified under the Secretary of Interior's Professional Qualification Standards (36 CFR Part 61 Appendix A).

Dr. Doucette is a member of several professional and amateur organizations including the Society for American Archaeology (SAA), the Conference on New England Archaeology (CNEA), and the Massachusetts Archaeological Society (MAS). Since 2003 she has served as an instructor in the Harvard University Extension School, University of Massachusetts Boston, and University of Massachusetts Amherst Anthropology departments. She is also a research affiliate at Harvard University's Harvard Forest, with whom she is currently collaborating with on an National Sccience Foundation funded project focused in southeastern Massachusetts, and a research associate at the Peabody Museum of Archaeology and Ethnology. Dr. Doucette meets the professional qualifications standards for archaeology set by the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716).

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

PRE-FILED TESTIMONY OF WILLIAM H. BAILEY, PH.D.
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Q. Please state your name and business address.

A. My name is William H. Bailey. I am employed by Exponent, Inc. (Exponent), a scientific and engineering firm, located in the Maryland Science and Technology Center at 17000 Science Drive, Suite 200, Bowie, Maryland, 20715.

Q. What is your position at Exponent?

A. I am a Principal Scientist in the Center for Exposure Assessment in Exponent's Health Sciences Practice.

Q. Please describe your current responsibilities.

A. My practice specializes in the health sciences and, more specifically, in human exposure and risk assessment. My work involves reviewing, analyzing, and conducting health research. Much of my work relates to the exposures and potential biological, environmental, and health effects associated with electrical facilities, such as transmission lines and substations, and with electrified railroad lines, including the possible effects of EMFs. In the course of this work, I work with and supervise professionals in diverse health, engineering, and environmental practices, mentor junior scientists and engineers, and direct scientific research and data collection.

<u>Education and Experience</u>

Q. Please summarize your education and academic research and teaching experience.

A. My education includes a Bachelor of Arts (BA) degree from Dartmouth College, awarded in 1966, and a Masters of Business Administration (MBA) degree from the University of Chicago, awarded in 1969. I earned a PhD in neuropsychology from the City University of New York. Since 1986, I have been a visiting research scientist at the Cornell University Weill Medical College. I also have been a visiting lecturer at Rutgers University, the University of Texas (San Antonio), and the Harvard School of Public Health in the field of bioelectromagnetics. From 1983 through 1987, I was head of the Laboratory of Neuropharmacology and Environmental Toxicology at the New York State Institute for Basic Research. For the nine previous years, I was an Assistant Professor and Postdoctoral Fellow in Neurochemistry at The Rockefeller University in New York City.

Q. Are you a member of any professional organizations?

A. Yes. I am a member of the Rockefeller University Chapter of Sigma XI, a national scientific honor society; the Health Physics Society; the International Committee on Electromagnetic Safety, Subcommittees 3 and 4 – Safety Levels with Respect to Human Exposure to Fields; the Bioelectromagnetics Society; the Engineering in Medicine and Biology Society of the IEEE; the Conseil International des Grands Reseaux Electriques; the American Association for the Advancement of Science; the New York Academy of Sciences; the Society for Neuroscience; the Society for Risk Analysis; and the International Society for Exposure Analysis.

Q. Have you served as a reviewer and scientific advisor on health-related issues for state and federal agencies or scientific organizations?

A. Yes. I have reviewed research for the National Institutes of Health, the National Science Foundation, and other federal government agencies. Specifically regarding transmission lines, I served on a Scientific Advisory Panel convened by the Minnesota Environmental Quality Board to review the health and safety aspects of a high-voltage transmission line. In addition, I served as a consultant on transmission line health and safety issues to the Vermont Department of Public Service, the New York State Department of Environmental Conservation, the staffs of the Maryland Public

Service Commission and the Maryland Department of Natural Resources, and the Island Regulatory and Appeals Commission of Prince Edward Island.

I have worked with the National Institute of Occupational Safety and Health, the Oak Ridge National Laboratories, the U.S. Department of Energy, and the Federal Railroad Administration to review and evaluate health issues related to EMF from other sources. I also assisted the U.S. EMF Research and Policy Information Dissemination (RAPID) program to evaluate biological and exposure research as part of its overall risk assessment process.

I worked with scientists from 10 countries to evaluate possible hazards from exposures to static and ELF EMF for the International Agency for Research in Cancer (IARC), a division of the WHO located in Lyon, France. I also was an invited participant in the workshop convened by the ICNIRP to update guidelines for human exposures to AC EMF. I have participated in peer reviews of ICNIRP's draft guidelines for direct current (DC) and AC magnetic fields that were submitted by ICES.

Most recently, I have served as an advisor to government agencies in Canada and the Netherlands on topics relating to scientific research on EMF health and safety and have peer reviewed a "Preliminary Opinion on Potential Health Effects of Exposure to Electromagnetic Fields" that was submitted by a committee of the European Commission for comment prior to issuing its final opinion in 2015.

Q. Have you published or presented your research in bioelectromagnetics and other areas to the scientific community?

A. I have published or presented more than 50 scientific papers on EMF and related subjects. These publications and presentations are listed in my *curriculum vitae*, attached as Attachment A.

Q. Have you ever appeared as a witness before a regulatory agency?

A. Yes. I have appeared before state, provincial, and national regulatory agencies to summarize the status of research on EMF at the request of applicants as well as these agencies.

Purpose and Scope of Testimony

Q. What is the purpose and scope of your testimony?

A. The purpose of my testimony is to summarize my human health and safety assessment of the EMF associated with the operation of the proposed MVRP, and to assess whether EMF associated with the Project would result in an unreasonable adverse effect on public health and safety.

Methods for Assessment

Q. What information served as the basis for your assessment?

A. My assessment took into account multiple sources of information. Based upon Exponent's report *Eversource / National Grid Merrimack Valley Reliability Project: Electric Field, Magnetic Field, Audible Noise, and Radio Noise Modeling in New Hampshire* found in Appendix AG, I considered how the relocation of an existing 115 kV transmission line and the addition of the proposed 345 kV transmission line (Line 3124) to the proposed route could potentially change public exposure to EMF on the proposed route based on the post-project levels. To assess the potential health significance of these exposures, we reviewed previous assessments of the scientific research conducted by scientists for both scientific and government agencies, and relevant standards and guidelines for exposure. In addition, I reviewed searches of the literature to identify new relevant research that might shed light on potential mechanisms of interaction with organisms and effects on their biology, health, and behavior to assess the cumulative weight of the evidence, as is customarily done for health risk assessments. Our summary of this EMF health research is provided as Appendix AF, *Current Status of*

Research on Extremely Low Frequency Electric and Magnetic Fields and Health: Merrimack Valley Reliability Project.

Q. Are there international criteria by which post-project EMF levels can be evaluated?

A. Yes. The international guidelines and standards established by ICNIRP and ICES for limiting public exposure to EMF are used to distinguish EMF exposures in our everyday environment that have not been shown to produce adverse effects from higher exposures that might.

<u>Assessment of EMF Exposure and Interaction Mechanisms</u>

Q. What are electric and magnetic fields?

A. Electric charges are contained in objects in our environment. When the numbers of positive and negative charges in the object are equal, the object is described as electrically neutral. When the object contains more of one charge or the other, the net charge gives rise to an electric field. Magnetic fields are created by moving electric charges or the movement of electrons in certain materials such as permanent magnets.

Both electric fields and magnetic fields are properties of the space surrounding anything that generates, transmits, or uses electricity. Electric fields are the result of the voltage applied to these objects, while magnetic fields result from the current flowing through these objects. They are characterized by both magnitude and direction. Just as the heat from a radiator decreases as you move farther away, the levels of both electric and magnetic fields decrease with distance from the source. Additional information about the nature and sources of EMF and typical exposure levels is provided in Section 2 of *Current Status of Research on Extremely Low Frequency Electric and Magnetic Field and Health Report*, Appendix AF.

Q. Since EMF is characterized not only by magnitude but also by direction, does this have any significance for the levels of EMF around a transmission line?

A. Yes. In this Project, the proposed transmission line 3124 will be constructed adjacent to existing transmission lines and lower voltage lines. The fields from the three phases (i.e., the single or bundled conductors) of each of these lines will tend to mutually cancel each other if their field vectors are oriented in opposite directions at the same time. The closer the conductors are spaced from one another, the greater the potential cancellation and the lower the fields. Thus, reductions in field levels can sometimes be achieved by selecting the phasing of new and rebuilt lines to enhance the cancellation of fields (i.e., phase optimization). This phase optimization has been proposed for this Project.

Q. Does the addition of the new 345 kV transmission line to this existing right-of-way produce a large increase in calculated EMF levels?

A. No. The 3124 transmission line will produce EMF similar to the existing transmission lines and other lower voltage lines on the ROW. For reasons explained below, it will have a negligible effect on the existing average and peak levels of EMF on the Project route as summarized in Appendix AG, report titled *Electric Field, Magnetic Field, Audible Noise, and Radio Noise Modeling in New Hampshire*.

Except for approximately four miles of the route between Hudson and Londonderry, the new line will be constructed close to the center of the ROW, which allows greater distance for the fields to diminish before reaching the edges of the ROW. On the eastern edge of the four-mile section of ROW, where the new line is closest to the edge, the electric field will increase by 1.1 kilovolts per meter (kV/m) to 1.2 kV/m, while remaining unchanged on the western edge of the ROW. The electric field at the edges of the ROW of all other sections is calculated to be unchanged, or to increase or decrease by a smaller amount (0.1 kV/m). Similarly, in the four-mile section of the ROW where the new line is closest to the edge, the magnetic field under average conductor height and average loading on the eastern ROW edge is calculated to increase by 8 milligauss (mG), but by just 0.5 mG on the western edge. In all other Segments of the route the greatest projected increase and decrease at the ROW edges is 2.9 mG and 5.0 mG, respectively.

In addition, an extensive analysis of the phasing options for the new 3124 line and the rebuilt Y-151 line suggested phasing options for these lines that would minimize the magnetic-field levels at the edge of the ROW in the majority of sections. In the remaining sections the phasing resulted in slightly less than optimal cancellation, but in these sections the magnetic field at the ROW edge changed from pre-project levels by a maximum of 2.9 mG.

Q. How do AC electric fields interact with organisms?

A. AC electric fields outside the body are perturbed by the presence of a conducting body. These induce oscillating charges on the surface of the exposed body, which induce currents inside the body. The electric fields inside the body are 100,000 to 1,000,000 times smaller than external electric fields.

Q. How do AC magnetic fields interact with organisms?

A. AC magnetic fields are not perturbed by the presence of a person's body; therefore, the field in the inside of the body is the same as on the outside. The presence of alternating magnetic fields causes weak electric fields and currents to flow in the body by induction.

Q. What are the potential effects of induced electric fields and currents?

A. Induced AC electric fields and currents, at high levels, may result in stimulation of excitable tissues, such as nerves and muscles; these effects are immediate and reversible. Compliance with ICNIRP and ICES limits on these parameters are designed to provide protection against such effects.

Q. Please describe ICNIRP and ICES and their functions.

A. ICNIRP is a body of independent scientific experts consisting of a main Commission of 14 members, Scientific Standing Committees covering Epidemiology, Biology, Dosimetry, and Optical Radiation, and a number of consulting experts. ICNIRP's exposure guidelines and its statements on particular topics are published in *Health Physics*, the journal of the Health Physics Society. While it is an independent scientific agency, ICNIRP is affiliated with the WHO and other national and international organizations.

ICES also has recommended standards for the safe use of electromagnetic energy in the range of 0 Hertz (Hz) to 300 Gigahertz, which includes the power frequency 60-Hz fields associated with the operation of the Project's transmission lines. ICES is sponsored by the IEEE and operates under its rules and oversight. ICES follows an open consensus process, with a balanced representation from the medical, scientific, engineering, industrial, government, and military communities. As of November 2014, ICES has approximately 209 members representing 27 different countries.

The purpose of these organizations is to develop guidelines and standards to protect against established adverse health effects of nonionizing electromagnetic fields.

Q. What limits on public exposure are recommended by ICNIRP and ICES?

A. ICNIRP and ICES have reviewed the scientific literature to identify adverse effects of exposure to EMF. Based on their reviews they have identified neurostimulation of tissues as a potential adverse effect, and after applying suitable safety factors, they derived limits on the level of the electric field to be induced in tissues, termed Basic Restrictions, to avoid such effects. To identify exposure levels for the general public that would not cause these limits to be exceeded at 60 Hz, ICNIRP provided Reference Levels of 4.17 kV/m and 2,000 mG (ICNIRP, 2010). Similarly, ICES identifies Maximum Permissible Exposures of 5 kV/m (10 kV/m on transmission line ROWs) and 9,040 mG as screening values (ICES, 2002). Exposure levels greater than these screening values are permitted if it can be shown by modeling that the Basic Restrictions are not exceeded. For the case of AC electric fields, published literature indicates that the Basic Restrictions would not be exceeded at levels up to 26.8 kV/m (Kavet, 2012).

Q. Will the calculated levels of EMF from MVRP and other lines on the proposed Project route comply with the ICNIRP and ICES limits on public exposure?

A. Yes. The calculated post-project EMF levels will be well below the ICNIRP and ICES limits on public exposure, thus providing protection against established health effects, which only occur at field levels far above the ICNIRP and ICES limits.

Q. Are there any applicable state or federal standards that the Project must meet with regard to electric or magnetic fields?

A. There are no federal standards for EMF from power lines, nor has New Hampshire adopted standards for EMF.

Q. Are there adverse effects of exposure to EMF at levels below the public exposure limits established by ICNIRP and ICES?

A. ICNIRP and ICES have reviewed the significant body of scientific research on this matter; neither agency has concluded that this research, taken as a whole, confirms the existence of adverse effects of exposure to EMF at levels below guideline values. For example, ICNIRP states "[i]t is the view of ICNIRP that the currently existing scientific evidence that prolonged exposure to low frequency magnetic fields is causally related with an increased risk of childhood leukemia is too weak to form the basis for exposure guidelines." (ICNIRP, 2010, p. 824).

Since the 1970s, large numbers of scientific studies have examined the potential for long term effects of EMF exposure. These studies include studies of human populations (epidemiologic studies), laboratory studies of animals (*in vivo*), and laboratory studies of tissues and cells (*in vitro*). The scientific investigations examined the potential link of both cancer and non-cancer outcomes among children and adults with occupational and residential exposures. To evaluate whether the scientific evidence overall suggests the existence of any potential long-term effects, the relevant scientific literature needs to be evaluated in its entirety. Individual studies may be subject to chance variation, potential biases, and confounding due to limitations in the study design, conduct of the study, or in the analyses and interpretation of the results. Thus, scientifically-valid conclusions about potential effects may not be drawn from individual studies. Section 3 of *Current Status of Research on Extremely Low Frequency Electric and Magnetic Field and Health Report*, Appendix AF, provides additional information on the methods used by scientists and health agencies to evaluate scientific research.

A number of panels of scientists assembled by scientific, health, and government agencies have evaluated the available scientific literature on potential EMF effects by the methods described in Section 3 of *Current Status of Research on Extremely Low Frequency Electric and Magnetic Field and Health Report,* Appendix AF. These agencies include the U.S. National Institute on Environmental Health in 1998, the IARC in 2002, the National Radiological Protection Board of the United Kingdom in 2004, the WHO in 2007, ICNIRP in 2010, and the Sceintific Committee on Emerging and Newly Identified

Health Risks (SCENIHR) in 2015. These agencies concluded that the evidence, overall, does not suggest the existence of any adverse long-term health effects in association with environmental exposure to EMF below scientifically-established exposure guidelines. While these agencies recognized the limited evidence based on a statistical association in some of the childhood leukemia epidemiologic studies, they all point out that these epidemiologic findings, for which chance, bias, and confounding could not be excluded as an explanation, are not supported by the lifetime exposure studies of multiple species of laboratory animals that report no increase in cancer from low or high exposures.

In addition, there are currently no known biophysical mechanisms that explain a potential carcinogenic effect. With respect to the overall evidence on potential long-term effects, the WHO currently states on its website[1] that "[b]ased on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields." They also conclude that "[w]ith more and more research data available, it has become increasingly unlikely that exposure to electromagnetic fields constitutes a serious health hazard, nevertheless, some uncertainty remains."

Q. Did Exponent review research subsequent to the WHO's assessment of EMF health research?

A. Yes. We have thoroughly reviewed this research and Section 5 of *Current Status of Research on Extremely Low Frequency Electric and Magnetic Field and Health*, Appendix AF, includes a summary and evaluation of approximately 90 of the relevant epidemiologic and *in vivo* studies published between August 2012 and November 2014 that included health outcomes evaluated by the WHO.

1 http://www.who.int/peh-emf/about/en/

Q. What was the overall conclusion of the review of recent research?

A. Our conclusion was that recent studies when considered in context of previous research do not provide evidence to alter the conclusion that ELF EMF exposure at the levels we encounter in our everyday environment including transmission lines is not a cause of cancer or any other disease process.

Q. Despite the lack of any conclusive scientific evidence for adverse effects caused by exposures to EMF encountered in daily life, have health agencies recommended that utilities and manufacturers take steps to minimize AC magnetic-field levels?

A. Some health agencies have made such recommendations, others have not. The recommendations were not to establish stricter exposure limits, but, rather, to consider siting measures that would reduce exposure. For example, the National Institute of Environmental Health Sciences (NIEHS) states,

> No regulatory action was recommended by or taken based on the NIEHS report … it suggested that power companies and utilities 'continue siting power lines to reduce exposures and … explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards' (NIEHS, 2002, p. 52).

Similarly, the WHO recommends in a fact sheet,

> [w]hen constructing new facilities … low-cost ways of reducing exposures may be explored. Appropriate exposure reduction measures will vary from one country to another. However, policies based on the adoption of arbitrary low exposure limits are not warranted (WHO, 2007).

In contrast, Health Canada has concluded from its evaluation of the research that

> Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELFs. There is no conclusive evidence of any harm caused by exposures at levels found in Canadian homes and schools, including those located just outside the boundaries of power line corridors (Health Canada, 2012).

Q. Is the proposal to construct a new transmission line on an existing ROW consistent with the recommendations of the WHO and NIEHS to minimize EMF?

A. Yes. Instead of locating the line on a new ROW, MVRP has taken advantage of an existing ROW suitable for the Project on which to route the 3124 transmission line exclusively on an existing ROW, which limits the geographic spread of sources in the area. In addition, along portions of the route where existing ROW space is not available near the center of the ROW, an existing 115 kV line will be relocated to permit the installation of the new line farther from the edges of the ROW. In addition, the phasing of the new and relocated lines is proposed to be selected to enhance the mutual cancellation of the fields from the existing and new lines. These siting and design features, which minimize potential EMF exposures at no or low-cost, are consistent with the recommendations of NIEHS and WHO.

<u>Conclusion</u>

Q. Dr. Bailey, on the basis of your assessment, please summarize your conclusion regarding whether the EMF levels modeled for MVRP will have an unreasonable adverse effect on public health.

A. The modeled EMF levels associated with the operation of MVRP are below limits on public exposure recommended by two international agencies derived from their assessments of health research studies. The WHO and other scientific and health agencies also have thoroughly considered research on EMF and have concluded that, on balance, the scientific weight of evidence does not support the conclusion that EMF causes any long-term adverse health effects. Our review of recent research does not provide evidence to alter this overall conclusion. The conclusions of the WHO and other agencies apply to all sources of ELF EMF in our environment, including power distribution lines, transmission lines, and electrical appliances. Thus, based on all of the information I have evaluated, my conclusion, to a reasonable degree of scientific certainty, is that the EMF associated with the operation of MVRP transmission line will not be harmful to human health and, therefore, will not result in an unreasonable adverse effect on public health and safety.

Q. Does this conclude your testimony?

A. Yes.

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ATTACHMENT A

RESUME OF WILLIAM H. BAILEY

Exponent
17000 Science Drive
Suite 200
Bowie, Maryland 20715

telephone 301-291-2500
facsimile 301-291-2599
www.exponent.com

William H. Bailey, Ph.D.
Principal Scientist

Professional Profile

Dr. William H. Bailey is a Principal Scientist in Exponent's Health Sciences practice. Dr. Bailey specializes in applying state-of-the-art assessment methods to environmental and occupational health issues. His 30 years of training and experience include laboratory and epidemiologic research, health risk assessment, and comprehensive exposure analysis. Dr. Bailey has investigated exposures to alternating current, direct current, and radiofrequency electromagnetic fields, 'stray voltage', and electrical shock, as well as to a variety of chemical agents and air pollutants. He is particularly well known for his research on potential health effects of electromagnetic fields and has served as an advisor to numerous state, federal, and international agencies. Currently, he is involved in research on exposures to marine life from submarine cables and respiratory exposures to ultrafine- and nanoparticles. Dr. Bailey is a visiting scientist at the Cornell University Medical College and has lectured at Rutgers University, the University of Texas (San Antonio), and the Harvard School of Public Health. He was formerly Head of the Laboratory of Neuropharmacology and Environmental Toxicology at the New York State Institute for Basic Research, Staten Island, New York, and an Assistant Professor and NIH postdoctoral fellow in Neurochemistry at The Rockefeller University in New York.

Academic Credentials and Professional Honors

Ph.D., Neuropsychology, City University of New York, 1975
M.B.A., University of Chicago, 1969
B.A., Dartmouth College, 1966

Sigma Xi; The Institute of Electrical and Electronics Engineers/International Committee on Electromagnetic Safety (Subcommitee 3, Safety Levels with Respect to Human Exposure to Fields (0 to –3 kHz) and Subcommittee 4, Safety Levels with Respect to Human Exposure to Radiofrequency Fields (3 kHz to 3 GHz); Elected member of the Committee on Man and Radiation (COMAR) of the IEEE Engineering in Medicine and Biology Society, 1998–2001

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Bailey WH. Methods to assess potential health risks of cell telephone electromagnetic fields. IBC Conference—Cell Telephones: Is there a Health Risk? Washington, DC, June 1997.

Bailey WH. Principles of risk assessment and their limitations. Symposium on Risk Perception, Risk Communication and its Application to EMF Exposure, International Commission on Non-Ionizing Radiation Protection, Vienna, Austria, October 1997.

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Presentations

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Bailey WH, Charry JM. Particle deposition on simulated VDT operators: Influence of DC electric fields. 10th Annual Meeting of the Bioelectromagnetics Society, June 1988.

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Bailey WH, Charry, JM. Dosimetric response of rats to small air ions: Importance of relative humidity. EPRI/DOE Contractors Review, November 1986. Charry JM, Bailey WH, Bracken TD (eds). DC electric fields, air ions and respirable particulate levels in proximity to VDTs. International Conference on VDTs and Health, Stockholm, Sweden, June 12–15 1986.

Charry JM, Bailey WH. Air ion and DC field strengths at 10^4 ions/cm^3 in the Rockefeller University Small Animal Exposure Chambers. EPRI/DOE Contractors Review, November 1985.

Charry JM, Bailey WH. DC Electrical environment in proximity to VDTs. 7th Annual Meeting of the Bioelectromagnetics Society, June 1985.

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Bailey WH, Charry JM. Measurement of neurotransmitter release and utilization in selected brain regions of rats exposed to DC electric fields and atmospheric space charge. 23rd Hanford Life Sciences Symposium, Richland, WA, October 1984.

Bailey WH, Charry JM, Weiss JM, Cardle K, Shapiro M. Regional analysis of biogenic amine turnover in rat brain after exposure to electrically charged air molecules (air ions). Society for Neuroscience, 1983.

Bailey WH. Biological effects of air ions: Fact and fancy. American Institute of Medical Climatology Conference on Environmental Ions and Related Biological Effects, October 1982.

Goodman PA, Weiss JM, Hoffman LJ, Ambrose MJ, Bailey WH, Charry, JM. Reversal of behavioral depression by infusion of an A2 adrenergic agonist into the locus coeruleus. Society for Neuroscience, November 1982.

Charry JM, Bailey WH. Biochemical and behavioral effects of small air ions. Electric Power Research Institute Workshop, April 1981.

Bailey WH, Alsonso DR, Weiss JM, Chin S. Predictability: A psychologic/ behavioral variable affecting stress-induced myocardial pathology in the rat. Society for Neuroscience, November 1980.

Salman SL, Weiss JM, Bailey WH, Joh TH. Relationship between endogenous brain tyrosine hydroxylase and social behavior of rats. Society of Neuroscience, November 1980.

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Bailey WH, Weiss JM. Effect of ACTH 4-10 on passive avoidance of rats lacking vasopressin (Brattleboro strain). Eastern Psychological Association, April 1976.

Prior Experience

President, Bailey Research Associates, Inc., 1991–2000
Vice President, Environmental Research Information, Inc., 1987–1990
Head of Laboratory of Environmental Toxicology and Neuropharmacology, New York State Institute for Basic Research, 1983–1987
Assistant Professor, The Rockefeller University, 1976–1983

Academic Appointment

- Visiting Fellow, Department of Pharmacology, Cornell University Medical College, New York, NY, 1986–present

Prior Academic Appointments

- Visiting Scientist, The Jackson Laboratory, Bar Harbor, ME, 1984–1985
- Head, Laboratory of Neuropharmacology and Environmental Toxicology, NYS Institute for Basic Research in Developmental Disabilities, Staten Island, NY, 1983–1987
- Assistant Professor, The Rockefeller University, New York, NY, 1976–1983
- Postdoctoral Fellow, Neurochemistry, The Rockefeller University, New York, NY, 1974–1976
- Dissertation Research, The Rockefeller University, New York, NY, 1972–1974
- CUNY Research Fellow, Dept. of Psychology, Queens College, City University of New York, Flushing, NY, 1969–1971
- Clinical Research Assistant, Department of Psychiatry, University of Chicago; Psychiatric Psychosomatic Inst., Michael Reese Hospital, and Illinois State Psychiatric Inst, Chicago, IL, 1968–1969

Teaching Appointments

- Lecturer, University of Texas Health Science Center, Center for Environmental Radiation Toxicology, San Antonio, TX, 1998
- Lecturer, Harvard School of Public Health, Office of Continuing Education, Boston, MA, 1995, 1997
- Lecturer, Rutgers University, Office of Continuing Education, New Brunswick, NJ, 1991–1995
- Adjunct Assistant Professor, Queens College, CUNY, Flushing, NY, 1978
- Lecturer, Queens College, CUNY, Flushing, NY, 1969–1974

Editorship

- Associate Editor, Non-Ionizing Radiation, *Health Physics*, 1996–present

Advisory Positions

- ZonMw – Netherlands Organization for Health Research and Development, 2012; 2007-2008, reviewer for National Programme on EMF and Health
- US Bureau of Ocean Energy Management, Regulation and Enforcement, 2009–2010
- Canadian National Collaborating Centre for Environmental Health, reviewer of Centre reports, 2008
- Island Regulatory and Appeals Commission, province of Prince Edward Island, Canada, 2008
- National Institute of Environmental Health Sciences/ National Institutes of Health, Review Committee, Neurotoxicology, Superfund Hazardous Substances Basic Research and Training Program, 2004
- National Institute of Environmental Health Sciences, Review Committee Role of Air Pollutants in Cardiovascular Disease, 2004
- Working Group on Non-Ionizing Radiation, Static and Extremely Low-Frequency Electromagnetic Fields, International Agency for Research on Cancer, 2000–2002
- Working Group, EMF Risk Perception and Communication, World Health Organization, 1998–2005
- Member, International Committee on Electromagnetic Safety, Subcommittee 3 - Safety Levels with Respect to Human Exposure to Fields (0 to 3 kHz) and Subcommitee 4 - Safety Levels with Respect to Human Exposure (3kHz to 3GHz) Institute of Electrical and Electronics Engineers (IEEE), 1996–present
- Invited participant, National Institute of Environmental Health Sciences EMF Science Review Symposium: Clinical and In Vivo Laboratory Findings, 1998
- Working Group, EMF Risk Perception and Communication, International Commission on Non-Ionizing Radiation Protection, 1997
- U.S. Department of Energy, RAPID EMF Engineering Review, 1997
- Oak Ridge National Laboratory, 1996

- American Arbitration Association International Center for Dispute Resolution, 1995–1996
- U.S. Department of Energy, 1995
- National Institute for Occupational Safety and Health, 1994–1995
- Federal Rail Administration, 1993–1996
- U.S. Forest Service, 1993
- New York State Department of Environmental Conservation, 1993
- National Science Foundation
- National Institutes of Health, Special Study Section—Electromagnetics, 1991–1993
- Maryland Public Service Commission and Maryland Department of Natural Resources, Scientific Advisor on health issues pertaining to HVAC Transmission Lines, 1988–1989
- Scientific advisor on biological aspects of electromagnetic fields, Electric Power Research Institute, Palo Alto, CA, 1985–1989
- U.S. Public Health Service, NIMH: Psychopharmacology and Neuropsychology Review Committee, 1984
- Consultant on biochemical analysis, Colgan Institute of Nutritional Science, Carlsbad, CA, 1982–1983
- Behavioral Medicine Abstracts, Editor, animal behavior and physiology, 1981–1983
- Consultant on biological and behavioral effects of high-voltage DC transmission lines, Vermont Department of Public Service, Montpelier, VT, 1981–1982
- Scientific advisory committee on health and safety effects of a high-voltage DC transmission line, Minnesota Environmental Quality Board, St. Paul, MN, 1981–1982
- Consultant on biochemical diagnostics, Biokinetix Corp., Stamford, CT, 1978–1980

Professional Affiliations

- The Health Physics Society (Affiliate of the International Radiation Protection Society)
- Society for Risk Analysis
- International Society of Exposure Analysis
- New York Academy of Sciences
- American Association for the Advancement of Science
- Air and Waste Management Association
- Society for Neuroscience/International Brain Research Organization
- Bioelectromagnetics Society
- The Institute of Electrical and Electronics Engineers/Engineering in Medicine and Biology Society
- Conseil International des Grands Réseaux Électriques

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

PRE-FILED TESTIMONY OF GARY B. JOHNSON, Ph.D.
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Q. Please state your name and business address.

A. My name is Gary B. Johnson. My business address is Exponent, 4580 Weaver Parkway, Suite 100, Warrenville, IL 60555.

Q. What is your position at Exponent?

A. I am a Senior Managing Scientist in Exponent's Electrical Engineering and Computer Science practice.

Q. Please describe your current responsibilities and professional experience.

A. Exponent is a research and consulting firm engaged in a broad spectrum of activities in science and technology. My work relates to electrical issues particularly involving the electrical environment of power systems. I have extensive experience in modeling and measuring EMF from transmission and distribution systems as well as the AN, RN, and other phenomena associated with high-voltage power systems. Among the projects that I have managed are those relating to the measurement and calculation of the electrical environment around DC and AC transmission lines.

<u>Education and Experience</u>

Q. Please summarize your education and research experience.

A. I obtained my Ph.D. in Electrical Engineering from the University of Illinois in 1979. I have an M.S. degree in Physics and a B.S. degree in Engineering Physics, also from the University of Illinois. From 1979 to 1996, I was employed at the High Voltage Transmission Research Center in Lenox, Massachusetts, where I performed research, measurements, and studies related to both AC and DC high voltage power lines and power systems. General Electric and the Electric Power Research Institute (EPRI) primarily operated the Center and performed studies for a number of clients, including utilities and state and federal agencies. Since 1996, I have been involved in investigations and research involving measurements, modeling and calculations related to the performance of power lines such as EMF, AN, RN, nuisance and ground currents, and stray voltage. I have also evaluated power lines for their compliance with the NESC, and estimated the levels of currents and voltages coupled onto vehicles near power lines.

Q. Have you served as a technical advisor or researcher to government agencies?

A. Yes. I worked for the Vermont Department of Public Service performing tests and measurements related to the ±450 kV high voltage DC transmission line that crosses Vermont from Canada into New Hampshire. I have worked on projects for the U.S. Department of Energy assisting the U.S. EMF RAPID Program in the identification and evaluation of engineering issues related to extremely low frequency EMF as part of its overall risk assessment program and also performing research related to DC transmission lines.

Q. Have you published any of the results of your research in engineering journals?

A. I have published or presented more than 35 papers on the transmission line environment and related subjects.

Q. Are you a member of any professional organizations?

A. Yes. I am a member of the IEEE Power Engineering Society, the American Association for the Advancement of Science, the Bioelectromagnetics Society, and Tau Beta Pi, a national engineering honor society.

Q. Is your educational and professional experience summarized elsewhere?

A. Yes. Additional details of my educational and professional experience are summarized in my *curriculum vitae*, which is attached as Attachment A.

Q. Have you ever appeared as a witness before regulatory agencies?

A. Yes. I have testified in regulatory proceedings before state and provincial public utility commissions and boards on behalf of project applicants and government agencies, including SEC Docket No. DSF-85-155, Hydro-Quebec Transmission System.

Q. What is your role in the Project?

A. NEP and PSNH requested that Exponent calculate the electrical environment associated with the operation of the Project in the context of adjacent existing, overhead AC lines along the proposed route. The results of these calculations are summarized below, with the details included in the report *Electric Field, Magnetic Field, Audible Noise and Radio Nosie Modeling in New Hampshire*, provided in Appendix AG.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to summarize the calculations of the electrical environment of the Project, and to offer the opinion that the audible noise from the Project transmission line will have a negligible impact on the existing audible noise levels.

Q. What is the electrical environment of a transmission line?

A. The electrical environment of a transmission line consists of EMF, AN, and RN. A transmission line carrying power from one location to another has its conductors energized at some voltage and those conductors carry electric current. The voltage on the conductors produces electric fields. The voltage on conductors can also produce corona which is an electrical discharge into the air due to the voltage on conductor surface irregularities. Corona activity on the conductors produces AN and RN. The current carried by the conductors produces magnetic fields.

Q. Did you calculate these characteristics of the electrical environment for the Project?

A. Yes.

Q. How did you calculate these characteristics associated with the operation of the proposed Project?

A. I used calculation algorithms, developed by the Bonneville Power Administration, and by EPRI at the High Voltage Transmission Research Center and incorporated in the EPRI TL (transmission line) Workstation, which have been validated and used by engineers and scientists for many years. The inputs to these models are line voltage, load flow, and the physical dimensions of the line (i.e., conductor diameter, spacing and height). NEP and PSNH provided the information on the design and routing of existing and proposed lines, as well as estimates of expected line loadings.

<u>Electrical Phenomena Associated with Transmission Lines</u>

Q. Please describe electric fields and magnetic fields?

A. Electric fields and magnetic fields are produced by the voltage and current flow on conductors. These fields describe properties of a location or point in space and its electrical environment, including the forces that would be experienced by a charged body in that space by virtue of its charge or the movement of charges. The voltage can be thought of as the pressure that moves the electricity through wires. The voltage also produces an electric field in the space surrounding the conductors. The electric current, which is a measure of how much electricity is flowing, produces a magnetic field. Thus, wherever electric current is flowing, there is both an electric field and a magnetic field. Naturally occurring electric fields are also produced by atmospheric conditions and natural occurring magnetic fields are produced by ferromagnetic ores and the flow of molten iron below the earth's crust.

The unit for measuring the strength of an electric field is volts per meter (V/m), or for larger electric fields, kilovolts per meter (kV/m). The unit in which magnetic-field levels are measured is mG. Electric fields and magnetic fields are both characterized by the frequency at which their direction and magnitude oscillate each second.

Q. In regards to the Project, what is EMF?

A. I use EMF to refer to the electric fields and magnetic fields associated with the operation of AC power lines.

Q. What frequencies of EMF will be associated with the operation of the Project?

A. The Project will be a source of EMF at 60 Hz like that of most electricity used in North America.

Q. What are typical sources of 60-HZ EMF?

A. Typical sources of these fields include power lines (both transmission and distribution lines), building wiring, home and office appliances, electrical tools, and electric currents flowing on water pipes. The importance of these sources to overall exposure varies considerably. For example, if a residence is very close to a transmission line or a distribution line (which runs near most residences), these sources could be the dominant, but not necessarily the only, source of magnetic fields in the home. Depending on the circumstances, other sources may be of equal or greater importance. For example, a random survey of 1,000 residences in the United States reported that electric currents flowing on water pipes and on other components of grounding systems in a house are twice as likely as outside power lines to be the source of the highest magnetic fields measured in homes (Zaffanella, 1993).

Q. What factors affect the level of EMF associated with a transmission line?

A. AC electric-field levels depend primarily on the AC line's voltage; the higher the voltage on the line, the higher the electric-field levels associated with that line. Little variation is expected with AC electric-field levels from an AC power line since its voltage does not vary significantly and it is not affected by weather or altitude. Conducting objects including fences, shrubbery, and buildings easily block electric fields, which also decrease rapidly with distance from the line.

Magnetic-field levels depend primarily on the electric current, or load, flowing on the line and as electricity demand increases so does current on the line. The increase in current will increase the magnetic-field levels associated with that particular line; however, if there are multiple lines on a corridor, an increase in current may actually result in a decrease in the magnetic-field level at the ROW edge and beyond depending on the geometry and phasing of the AC lines. Magnetic fields are not blocked by most materials, but do decrease rapidly with distance from the line.

Q. Can transmission lines like the Project produce AN?

A. Yes. AN results from corona. Corona is the partial electrical breakdown of the air around the conductors of a transmission line and is essentially a small spark in the air accompanied by a small audible snapping sound. If there is sufficient corona activity on a high voltage line, many small snaps from corona sources along a conductor may be sufficient, in combination, to produce discernable AN at the edge of the ROW. The AN from corona may be heard as a hissing, crackling sound.

Q. Can transmission lines like the Project produce RN?

A. Yes. RN also results from corona. Corona activity produces impulsive currents along a transmission line. These currents cause wide-band RF noise fields that can affect some radio reception (i.e., the static you may hear on your radio as a hissing or crackling sound). RN from transmission line corona can produce interference to an amplitude-modulated (AM) signal such as that from a commercial AM radio station (520-1720 kHz). Signals from frequency-modulated radio stations are generally not affected by RN from a transmission line. RN is also produced by electrical activity (lightning) in storm clouds and electrical equipment such as motors, spark plugs in engines, or electric fences, such as those used for animal confinement.

Project Evaluation

ELECTRIC AND MAGNETIC FIELDS

Q. For what operating conditions did you calculate the magnetic fields from the Project?

A. The magnetic fields from existing lines on the proposed route prior to the Project, and the magnetic fields from both the existing and proposed Project line after Project completion, were calculated for AAL and average conductor heights under normal operating conditions. The magnetic field was also calculated for peak load flow conditions and minimum conductor heights that might occur for a limited number of hours each year under normal system operating conditions for the existing lines in 2018 and existing and proposed lines in 2018 and 2023.

Q. What are the calculated magnetic field values for these conditions?

A. The magnetic field is highest under the conductors of the respective lines within the ROW, and decreases with distance from the lines. For the AAL condition, the magnetic field levels are

124 mG or less within the ROW and decrease to 24 mG or less by the edge of ROW. The highest magnetic field within the ROW along the Project route is 316 mG or less for peak loading and decreases to 44 mG or less at the edge of the ROW. For 16% of the proposed route, the levels at the ROW edge for the AAL condition will be lower than pre-Project levels and are higher than pre-Project levels for the remainder of the route. Details and profiles of the magnetic field for various cross-sections along the route are available in Appendix AG.

Q. What are the calculated electric field values?

A. The electric fields calculated for an assumed voltage 5% above the nominal AC operating voltage are highest under the conductors of the respective lines and decrease with distance from the lines. While the voltages on the lines are quite constant, the strength of the electric field directly below the conductors varies somewhat with line loading because higher line loading brings the conductors closer to the ground.

For AAL conditions when the lines are at average height, the electric-field level is 6.6 kV/m or less within the ROW and decreases to 1.3 kV/m or less at the edge of the ROW. At peak loading when the conductors are closest to the ground, the electric field within the ROW along the Project route is 8.6 kV/m or less and decreases to 1.2 kV/m or less at the edge of the ROW. The levels at the ROW edge along the Project route are either below pre-Project levels or are only slightly higher. Details and profiles of the electric field for various cross-sections along the route are available in Appendix AG.

Q. Are the calculated values of EMF below standards and guidelines?

A. Yes. The EMF levels calculated for the Project are below the limits provided by international agencies, ICNRP and ICES. Neither the federal government nor the State of New Hampshire has standards for EMF.

AUDIBLE NOISE AND RADIO NOISE

Q. Do the calculated AN levels from the Project and the adjacent existing lines meet relevant AN guidelines?

A. Yes. All calculated AN levels due to the lines at the edges of the ROW are below 55 dBA, the guideline level recommended by the U.S. Environmental Protection Agency (USEPA). This limit applies to the annual average day-night (i.e., L_{dn}) AN level in outdoor areas (USEPA, 1974). In computing this value, a 10 dB correction (penalty) is added to the night-time noise level contributed by a source between the hours of 10 PM and 7 AM. The AN level due to the line in fair weather at the edge of the ROW is 39 dBA or less while in foul weather the AN level along the ROW increases to 48 dBA or less depending on the cross-section. The higher transmission line AN levels calculated for foul weather will be masked by the wind and rain that typically occur during foul weather, which are themselves likely to generate levels of AN (41-63 dBA) that are similar to or exceed the levels of AN from the transmission line (Miller, 1978). Details and profiles of the AN for various cross-sections along the route are available in Appendix AG. There are no state limits for AN in New Hampshire for transmission lines.

Q. Do the calculated RN levels from the Project and the adjacent existing lines meet relevant RN guidelines?

A. Yes. The Applicants will follow good design practices to minimize RN (IEEE, 1971) and comply with the applicable Federal Communications Commission Rules and Regulations (Part 15, Section 15.25). Even though there are no state limits in New Hampshire for RN, the proposed line has been designed in a manner consistent with the IEEE Radio Noise Design Guide for High-Voltage Transmission Lines (IEEE, 1971), which suggests 61 dBμV/m in fair weather at a distance of 50 feet from an outside conductor as a design guide. The RN from the Project falls well below the guideline of

61 dBμV/m. Details and profiles of the RN for various cross-sections along the route are available in Appendix AG.

Q. How would you characterize the levels of AN and RN?

A. The levels of AN and RN are highest directly underneath the line conductors, and decrease with distance from the transmission line. The AN from the line will blend in with AN from other sources including wind, traffic noise, equipment operation, and the activities of insects, birds, and other animals. RN will be masked by equipment operation, and atmospheric conditions. In foul weather, when the AN and RN from corona on the AC conductors is greatest, the wind, rain, and atmospheric conditions can effectively mask AN and RN from sources, including a transmission line.

SAFETY

Q. Please describe how the Project will comply with relevant safety standards?

A. The proposed line is designed to meet the electrical safety requirements of the National Electrical Safety Code (NESC, 2011). Compliance with the NESC protects the public against harmful shocks from vehicles, equipment, or buildings near high-voltage power lines. Under some conditions much weaker shocks and currents may still be perceived, but they will be less than the current limit set in the NESC for safety concerns.

Q. In your professional scientific opinion, will the electrical environment created by the operation of the transmission lines that will be constructed and relocated during the Project, together with the operation of the existing adjacent transmission lines, cause any unreasonable adverse effect on public health and safety?

A. No.

Q. Does this conclude your testimony?

A. Yes.

ATTACHMENT A.

RESUME OF GARY B. JOHNSON, PH.D.

Exponent
Failure Analysis Associates

Exponent
4580 Weaver Parkway
Suite 100
Warrenville, IL 60555

telephone 630-658-7500
facsimile 630-658-7599
www.exponent.com

Gary B. Johnson, Ph.D.
Senior Managing Scientist

Professional Profile

Dr. Gary Johnson is a Senior Managing Scientist in Exponent's Electrical Engineering and Computer Science practice. Dr. Johnson specializes in electrically related issues particularly as they relate to the electrical environment of power systems. He has extensive experience with the electric and magnetic fields of transmission and distribution systems as well as the audible noise, radio noise, and ozone that may be produced by high voltage power systems. His work has involved the measurement, modeling, and mitigation of the electrical environment of transmission lines, transformer vaults, and underground/submarine cables. His power system experience includes issues dealing with lightning, electrical transients, ground currents, and stray voltage.

Dr. Johnson has testified on the corona and field effects of DC and AC transmission lines and been a lecturer at the EPRI Transmission Line Design Seminars. He has given numerous presentations and led several workshops on power line design and the electrical environment. He was a principal investigator in the EPRI research on magnetic field sources and methods of shielding.

Dr. Johnson has performed engineering studies related to power system fields, audible noise, radio noise, induced currents, and ground currents for clients including state and federal agencies, utilities, and site developers. Other areas of expertise include investigations of electrically-related fires in devices ranging from consumer appliances to industrial equipment, electrical injury, electrical faults, electronic component failure, code compliance, and facility wiring systems. Prior to joining Exponent, Dr. Johnson was the President of Power Research Engineering, where he worked on engineering issues related to the electrical environment and power quality.

Academic Credentials and Professional Honors

Ph.D., Electrical Engineering, University of Illinois, 1979
M.S., Physics, University of Illinois, 1976
B.S., Engineering Physics, University of Illinois (Highest Honors), 1974

Tau Beta Pi; Phi Kappa Phi

Publications and Presentations

Bishop J, Johnson G, Nilsson S, McNichol J. Performance of DC transmission line insulator strings. CIGRE Colloquium on HVDC and Power Electronic Systems Including Overhead Line and Insulated Cable Applications, San Francisco, CA, March 7–9, 2012.

Johnson G. Electrical environment: Conversion of an AC to a DC transmission line. CIGRE Colloquium on HVDC and Power Electronic Systems Including Overhead Line and Insulated Cable Applications, San Francisco, CA, March 7–9, 2012.

Bailey WH, Johnson GB, Bishop J, Hetrick T, Su S. Measurements of charged aerosols near ±500 kV DC transmission lines and in other environments. IEEE Transactions on Power Delivery 2012; 27:371–379.

Martens J, Johnson GB, So P. Design considerations for consumer products utilizing high voltage. Presentation and Conference Proceedings, IEEE Symposium on Product Safety & Compliance Engineering, IEEE Product Safety Engineering Society, Irvine, CA, October 23–24, 2006.

Bailey WH, Johnson GB, Bracken TD. Method for measuring charge on aerosol particles near AC transmission lines. Joint Meeting of the Biolectromagnetics Society and the European BioElectromagnetics Association, Dublin, Ireland, June 2005.

Johnson GB, Bracken TD, Bailey W. *Charging and Transport of Aerosols near AC Transmission Lines: A Literature Review*, EPRI, Palo Alto, CA, and National Grid Transco Plc., London, England: 2003. EPRI Report 1008148, Palo Alto, CA, December 2003.

Johnson GB, Guttman JL, Kavet R. Transient magnetic fields and currents in residences. Proceedings, IEEE International Symposium on Electromagnetic Compatibility, Montreal, Canada, August 2001; Vol 1: 227–232.

Guttman JL, Niple J, Kavet R, Johnson GB. Measurement instrumentation for transient magnetic fields and currents. Proceedings, IEEE International Symposium on Electromagnetic Compatibility, Montreal, Canada, August 2001; Vol 1: 419–424.

Kavet R, Ulrich RM, Kaune WT, Johnson GB, Powers T. Determinants of power-frequency magnetic fields in residences located away from overhead power lines. Bioelectromagnetics 1999; 20(5):306–318.

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Professional Affiliations

- Institute of Electrical and Electronic Engineers
- American Association for the Advancement of Science
- American Physical Society
- BioElectroMagnetics Society

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

PRE-FILED TESTIMONY OF ROBERT W. VARNEY
ON BEHALF OF
NEW ENGLAND POWER COMPANY AND
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

<u>Qualifications of Robert W. Varney</u>

Q. Please state your name and business address.

A. My name is Robert W. Varney and my business address is 25 Nashua Road, Bedford, NH 03110.

Q. Who is your current employer and what position do you hold?

A. I am employed by Normandeau Associates, Inc. (Normandeau) and hold the position of Executive Vice President.

Q. Please describe your background, experience and qualifications.

A. Since 2009, I have served as Executive Vice President at Normandeau, an environmental science consulting firm based in Bedford, NH. Founded in 1970, Normandeau is an employee-owned company serving a broad range of clients in the public and private sectors including: federal, state, and local governments; transportation agencies; energy generation and transmission companies and many others. Normandeau employs about 300 staff, with 18 offices in 12 states. Our professionals include marine, aquatic, wetland terrestrial ecologists, environmental and land use planners, fisheries biologists and limnologists, soil scientists, geologists, public involvement professionals, statisticians and GIS and data processing specialists.

Prior to joining Normandeau, I served eight years as Regional Administrator of the USEPA, New England, where I was responsible for implementation and enforcement of numerous federal environmental laws and programs and the review, evaluation and resolution of numerous high-profile complex Environmental Impact Statements (EIS) and permitting issues involving major highways, airports, energy facilities and developments within the six New England states. I also undertook many initiatives such as climate change, energy efficiency and renewables, integration of energy and environmental programs and restoration of rivers, lakes and coastal areas.

From 1989 to 2001 I served as Commissioner of the NHDES. By virtue of that position, I also served as a member and as Chairman of the NH SEC for that same 12 year period. Projects before the NH SEC during this period included the Portland Natural Gas Transmission (PNGTS) pipeline in Coos County, the Maritimes and Northeast gas pipeline in Rockingham County, the Newington Energy and Granite Ridge (Londonderry) power plants, the Tennessee Gas pipeline from Dracut to Londonderry, a NH Electric Cooperative electric transmission line in Carroll County, a PSNH electric transmission line in Carroll County, the Champlain Pipeline project in Cheshire County, and the Northeast Expansion Tennessee Gas pipeline project in southern New Hampshire.

I was appointed by the Governor as Director of the New Hampshire Office of State Planning (NHOSP) in 1989 before being appointed as NHDES Commissioner in that same year. NHOSP was responsible for local, regional and statewide planning, growth management and interagency coordination. It has since been merged with the former Governor's Energy Office, and is now the Office of Energy and Planning (OEP).

I have extensive experience with local and regional planning in New Hampshire, having served as Executive Director of the Nashua Regional Planning Commission for two years (1987-1989), as Executive Director of the Upper Valley Lake Sunapee Regional Planning Commission for four years (1983-1987), and as a local and regional planner at Lakes Region Planning Commission for four years (1979-1983). During this time I was involved in the preparation of numerous regional plans, and dozens of local land use ordinances and master plans.

I hold a BS degree in economics from the University of New Hampshire and a MS degree in urban planning from Michigan State University. A copy of my resume is attached as Attachment A.

Q. Are you involved with any organizations outside your duties as Executive VP of Normandeau?

A. Yes. I am on the Board of Trustees of The Nature Conservancy (TNC), the Board of the New Hampshire Lakes Association, and as a governor-appointed commissioner of the New England Interstate Water Pollution Control Commission. I also serve as a member of the Joint Public Advisory Council (JPAC), which I chaired in 2014. The JPAC is an independent tri-national committee which provides advice and promotes public involvement and transparency in the administration of the North American Free Trade Agreement (NAFTA) environmental side agreement through the Commission for Environmental Cooperation (CEC) and the governments of Mexico, Canada and the United States.

I am a member of numerous professional planning organizations, such as the American Planners Association (APA), New Hampshire Planners Association and Plan New Hampshire.

Q. What is the purpose of your testimony?

A. The purpose of this testimony is to provide the NH SEC with my assessment of potential impacts associated with the construction and operation of the Project on local land use, and the potential effects of the Project on the orderly development of the region, which will address the requirements of RSA 162-H and the NH SEC administrative rules.

<u>Local Land Use and Orderly Development of the Region</u>

Q. What was the methodology you used for developing your report?

A. I began my review with a thorough examination of existing land uses in each community along the Project corridor and conducted an in-depth review of local and regional long-range planning documents. I also considered comments received through the Applicants' public open houses, presentations to local boards, and discussions with local and regional planners.

In order to assess the impacts of construction and operations on local land use, I reviewed existing land use patterns, local master plans and zoning ordinances, and other land use data. Information was obtained principally from the Applicants, local communities, regional planning commissions, state agencies, and University of New Hampshire GRANIT, as well as from Google Earth, and a windshield survey conducted at key locations along the ROW. Input from discussions with local planners regarding existing land use, municipal master plans, and future development was also considered. My complete report, *Review of Land Use and Orderly Development, The Merrimack Valley Reliability Project*, is attached as Appendix AI.

To assess the orderly development of the region, I reviewed the recently completed regional plans from each of the regional planning commissions in the Project area. These plans present vision statements and goals for the orderly development of the region. They include recommendations and action strategies to implement the goals. The goals, objectives and recommendations in the regional plans are summarized and assessed in the full report. I also reviewed other plans that involve different aspects of land use, environment, energy and transportation infrastructure, as well as:

(1) a report by Chalmers & Associates, LLC, *High Voltage Transmission Lines and Real Estate Markets in New Hampshire: A Research Report*, Appendix AK, which demonstrates that the Project will not have discernable effects on property values or marketing times in local or regional real estate markets;

(2) findings made by Dr. Lisa Shapiro of Gallagher, Callahan & Gartrell, P.C., which indicates the Project will increase the property taxes paid to Project host communities, Rockingham and Hillsborough counties, and the state, with no expected increases in local, regional or state

expenditures which would offset the increase in local property taxes; and

(3) the report *Economic Impact of MVRP, REMI Analysis of Construction Spending and Property Taxes*, prepared by Alfred Morrissey of National Grid, Appendix AJ, which concludes that the Project will have positive impacts on employment and the economy locally, regionally, and state-wide.

I also reviewed the comments from outreach meetings that the Applicants conducted with local boards, commissions, town administrators and citizens in Londonderry, Windham, Hudson and Pelham, and engaged in discussions with the staff from the Nashua Regional Planning Commission and the Southern NH Planning Commission.

Q. Have you reviewed the Project with respect to the issues of land use planning and orderly development?

A. Yes. As stated above, I considered a wide range of information relating to land use planning and orderly development. Land uses along the corridor include forestry, agriculture, residential, commercial/ industrial, transportation, institutional/government, recreation areas, conservation, historical, and natural features such as rivers, wetlands, and wildlife habitat. This information was compiled into detailed existing land use descriptions for each community in the Project corridor, which are summarized in the attached report. For each community, I considered the potential impacts of construction and operation of the Project on the existing land use in or adjacent to the right-of-way and considered what effect that might have on the orderly development of the region.

Q. Have you reviewed this Project with respect to impacts on tourism?

A. Yes. I evaluated tourist-oriented attractions and facilities in the Project area as promoted by chambers of commerce, the State of New Hampshire, and local communities. This assessment revealed that the Project will not have an impact on tourism because there are no tourist-related resources in or near the Project corridor.

<u>Conclusions</u>

Q. Please summarize your conclusions.

A. Based on a careful review of the Project, the details of my assessment contained in a report entitled *Review of Land Use and Orderly Development, The Merrimack Valley Reliability Project* and in consideration of other information cited above, the following is a summary of my conclusions:

1. The electric transmission system in New Hampshire was developed beginning in the early 1900's and is part of the fabric of development patterns in the state. Many New Hampshire rights-of-way contain multiple transmission and/or distribution lines constructed at different times; in turn, many of these lines pre-date the rapid residential and commercial development that the state experienced in the latter half of the 20th century.
2. Siting a new transmission line in an already developed ROW is a sound planning principle because it reinforces local patterns of development and is consistent with local and regional land use planning policies.
3. Land uses along the Project corridor consist of forests, agriculture, residential, commercial, industrial, transportation, utilities, conservation, recreation, historic, archaeological, and natural resources, as well as government/institutional uses. There will be no changes to these land uses as a result of the Project.
4. The location of the residential and commercial development that has occurred in the past 30 years does not appear to be hindered by proximity to the existing ROW.

5. There will be no new crossings of local or state scenic roads by the Project. The crossing of the Apple Way, a state-designated scenic byway, at Elwood Road already exists within the ROW.
6. The Project corridor is several miles east of the Lower Merrimack River, which is designated in the state's River Management and Protection Program. There are no crossings of this river or its designated corridor.
7. The height of the proposed structures is consistent with the structures currently present in the ROW.
8. The potential impacts of the construction and operation of the Project on local land use are minimal because the Project ROW follows an existing electric utility corridor. Potential construction impacts associated with the Project are temporary in nature and include noise, traffic, erosion and sedimentation controls and laydown areas. The applicant will coordinate these issues with nearby residents and property owners, local government and relevant state and federal agencies prior to and during construction.
9. The operation of the new transmission line will not produce pollution, traffic, or glare and will not place any new or significant demands on local or regional services or facilities.
10. The long-range development goals and policies of the region have been considered by a thorough review of local and regional master plans and other planning documents. In most instances, these plans do not directly relate to the construction or operation of the Project; however, the Project is consistent with the general goals and objectives of those plans and will not interfere with implementation.

11. An examination of tourist attractions and facilities in the vicinity of the Project reveals that there will be no impact to tourism because there are no tourist-oriented activities in or near the Project corridor.
12. There is no evidence that the Project will have a discernible effect on property values or marketing times in local or regional real estate markets.
13. The Project will increase revenue generated from property taxes in local communities, within Rockingham and Hillsborough counties, and throughout New Hampshire.
14. Construction of the Project will have a positive impact on employment and the economy locally, regionally, and within the states of New Hampshire and Massachusetts. Operation and maintenance of the Project will not have an adverse impact to the local, regional or state economy or employment.

Q. Will the Project unduly interfere with the orderly development of the region?

A. No. Based on a careful review of the Project, and the materials cited herein I find that the construction and operation of the Project will have little impact on local land use, tourism or property values, and that positive impacts are anticipated for local, regional and state tax revenues and the economy. The Project will not unduly interfere with the orderly development of the region.

Q. Does this conclude your testimony?

A. Yes, it does.

ATTACHMENT A.

RESUME OF ROBERT W. VARNEY

ROBERT W. VARNEY

Executive Vice President

Considered one of the nation's most experienced and respected environmental leaders, Robert Varney is a former Environmental Protection Agency (EPA) New England Regional Administrator, who joined Normandeau Associates as a Vice President in 2009. He was the longest-serving regional administrator and the top environmental official in New England and is recognized for instituting many innovative approaches and policy initiatives that have served as national models. Prior to EPA, Mr. Varney was one of the longest-serving state environmental commissioners, appointed by three Governors of both political parties.

He is nationally recognized for his efforts on global climate change; energy efficiency and renewables; integration of energy and environmental programs, homeland security and preparedness; clean air, clean water and safe drinking water; superfund and brownfields cleanup and redevelopment; environmental justice and healthy communities; restoration of rivers, lakes and coastal areas; strong and consistent enforcement and compliance assistance; strengthening partnerships and improved agency management and performance. He has excellent relationships with all New England Governors and the New England Congressional Delegation, regional and HQ staff of federal agencies, state environmental commissioners and their staff, local officials as well as business, health and environmental organizations.

PROFESSIONAL EXPERIENCE

Normandeau Associates, Inc. (2009-present) – Mr. Varney serves as Executive Vice President of Normandeau Associates, Inc., managing one of the largest and most respected science-based environmental consulting firms in the United States serving both the private and public sectors. Founded in 1970, the company is well known for delivering sound, innovative scientific solutions to a global clientele. Normandeau's staff includes marine, aquatic, wetland, and terrestrial ecologists; environmental planners; fisheries biologists and limnologists; soil scientists, geologists, and hydrologists; engineers; regulatory specialists; public involvement professionals; statisticians and data processing specialists. Headquartered in Bedford, New Hampshire with 18 offices in 12 states, Normandeau is 100% owned by its employees. For more information please visit www.normandeau.com.

EPA, Region 1; New England (2001-2009) – Mr. Varney served as Regional Administrator of EPA
Region 1 in New England, where he managed a staff of 700 employees and a budget of $532 million. He was responsible for implementation of numerous federal environmental laws and programs such as the Clean Water Act, Clean Air Act, Safe Drinking Water Act, Superfund, brownfields redevelopment,

EDUCATION

M.S., Urban Planning, Michigan State University

B.A., Economics, University of New Hampshire

PROFESSIONAL EXPERIENCE

2009-Present	Executive Vice President, Normandeau Associates
2001-2009	Regional Administrator, EPA, Region 1: New England, Boston, MA
1989-2001	Commissioner, New Hampshire Department of Environmental Services, Concord, NH
1989	Director, New Hampshire Office of State Planning, Concord, NH
1987-1989	Executive Director, Nashua Regional Planning Commission, Nashua, NH
1983-1987	Executive Director, Upper Valley-Lake Sunapee Council, Lebanon, NH

PROFESSIONAL AFFILIATIONS

Current:

- *Chairman*, JPAC (U.S., Canada, Mexico, appointed by President Obama)
- *Board of Trustees*, The Nature Conservancy
- *Board of Directors*, Lakes Association of NH
- *Commissioner*, NE Interstate Water Pollution Control Commission

Previous:

- *President*, Environmental Council of the States (ECOS)
- *Chairman*, Federal Ozone Transport Commission (OTC)
- *Chairman*, Governmental Advisory Committee (advisory committee to EPA Administrator Carol Browner on environmental effects of NAFTA)
- *Chairman*, State/EPA Superfund Policy Forum, representing National Governors' Association

hazardous waste management, emergency response and preparedness, environmental justice, children's health, wetlands permitting and protection, stormwater controls, enforcement and compliance assistance, environmental sampling and laboratory analysis and grants to state and local governments. He also undertook many initiatives regarding energy efficiency and renewables, climate change, environmental justice, creation of a Healthy Communities Grant Program for disadvantaged communities, collaborative efforts to clean up the Mystic River and the Charles River, elimination of chronic beach closures, designation of all coastal waters as "no-discharge" areas, and development of innovative stormwater controls in significantly impaired watersheds. He helped achieve several high-profile settlements to clean up and restore the Charles River, South Boston beaches, Mt. Hope Bay, Portsmouth Harbor, and portions of the Connecticut, Merrimack, and Assabet rivers.

New Hampshire Department of Environmental Services (1989-2001) – As one of the nation's longest-serving state environmental commissioners, Mr. Varney was appointed by three governors of both political parties. He managed a state agency with over 450 employees and an annual budget of $100 million. The Department of Environmental Services is responsible for solid and hazardous waste management, air quality, dam inspections as well as operation, maintenance and reconstruction of State-owned dams, wetlands permitting and protection, water supply systems, wastewater treatment plants, septic system design and installation, laboratory analysis, rivers and lakes management, groundwater protection, geological studies, permitting and enforcement, emergency oil spill and chemical response and other associated environmental programs. During difficult economic times, Mr. Varney significantly increased revenue generated by the agency to make it more self-supporting, greatly improved internal management, successfully undertook several legislative initiatives including new State grant programs for municipal wastewater and drinking water infrastructure, landfill closures and protection of local water supply lands. He also greatly improved communication with the legislature, municipalities and professional groups. Bob was elected by his peers as President of ECOS, the national association of state environmental commissioners and served as chairman of numerous federal, regional and state commissions, boards and committees. He was widely credited with instituting many innovative approaches and policy initiatives that served as national models.

New Hampshire Site Evaluation Committee (1989-2001) – Mr. Varney has vast experience with the state energy facility siting process. For 12 years he served as Chairman of the New Hampshire Site Evaluation Committee where he was responsible for all aspects of the state's energy facility siting process; providing pre-application advice to applicants, chairing all public hearings and committee works sessions, coordinating multiple federal, state and local agencies, managing SEC staff and preparing documents and environmental permits for all energy facilities in the state within legislatively-prescribed timelines. Projects approved and successfully permitted during his tenure included several electric generation facilities, electric transmission lines and natural gas pipelines.

New Hampshire Office of State Planning (1/89-7/89) – As State Planning Director, Mr. Varney managed 40 employees and an $8.6 million annual budget and served in the Governor's Cabinet. Agency was responsible for local, regional and statewide planning, growth management and interagency coordination. He also was responsible for Coastal Zone Management Program, Great Bay National Estuaries Research Reserve program, Community Development Block Grant Program (housing, water, sewer, community facility, and economic development grants), coordination with regional planning commissions and local boards and officials, monitoring of federal funds in New Hampshire, administration of state's intergovernmental Review Process, statewide database management, preparation of population estimates and projections, and he initiated and designed the Governor's Recycling Grants Program.

Nashua Regional Planning Commission (1987-1989) – Mr. Varney directed New Hampshire's largest regional planning agency in one of the fastest growing areas of the country. NRPC is responsible for the regional Transportation Improvement Program, regional database management, water resource mapping and protection, development of local and regional plans, coordination of household hazardous waste collections and the solid waste district. Initiatives included preparation of the state's first Regional Recycling Plan and development of the Merrimack River Management Plan, the first such plan completed pursuant to the state's new river management and protection program. Other projects included the Nashua-Boston Passenger Rail Feasibility Study, an impact fee handbook and evaluation of Nashua's bus system, local water resource management and protection plans, and local conservation plans. Mr. Varney chaired the Route 101-A Bypass Study Steering Committee composed of federal, state and local officials. He initiated and chaired the Water Supply Task Force, a public/private partnership formed to prepare a long-range water supply plan for the rapidly growing southern tier of New Hampshire. A high percentage of these plans and proposals have been implemented.

Upper Valley-Lake Sunapee Council (1983-1987) – Mr. Varney directed a unique bi-state regional planning agency serving 31 communities in New Hampshire and Vermont. Recruited to revitalize a troubled agency contemplating abolishment. Within 18 months, membership doubled from 15 to 30 communities, and staffing grew from two to fourteen. Responsible for directing all council activities including local and regional planning, preparation and administration of grants for housing rehabilitation, economic development, community facilities, and wastewater and drinking water systems, environmental protection, historic preservation, transportation, downtown revitalization, industrial development, recreation planning and water resource management. Chaired Hanover-Lebanon Area Highway Study Committee.

Lakes Region Planning Commission (1979-1983) – Mr. Varney worked as a regional planner, economic development specialist and community development director at a regional planning commission serving 32 communities in the Lakes Region of New Hampshire. Duties included preparation of local master plans, downtown revitalization strategies, zoning ordinances and subdivision and site plan review regulations, regional economic development strategy, regional tourism plan and environmental impact assessments, coordination of the Concord-Lincoln Rail Study; and management of Franklin's CDBG loan program in the central business district.

AWARDS AND AFFILIATIONS

Mr. Varney's professional affiliations and honors are extensive. Mr. Varney has chaired the Environmental Council of the States (ECOS), State/EPA Superfund Policy Forum, Federal Ozone Transport Commission (OTC), Governmental Advisory Committee to the US Representative to the Commission for Environmental Cooperation (CEC), Gulf of Maine Council on the Marine Environment, New England Interstate Water Pollution Control Commission and New England Governors' Conference Environment Committee. He also was a member of EPA's Environmental Justice Advisory Council. Mr. Varney currently serves on the NH Board of Trustees for The Nature Conservancy (TNC) and was appointed by President Obama to the CEC Joint Public Advisory Committee (US, Mexico, Canada), an independent tri-national body which oversees the NAFTA environmental side agreement. Bob is the recipient of numerous environmental awards such as the EPA Lifetime Achievement Award, NE Water Works Association's John H. Chafee Award, Charles River Watershed Association's Anne Blackburn Award, Environmental Business Council of NE's Paul Keough Award and the ECOS Founder's Award.

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

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 <u>IEEE Transactions on Power Systems</u> (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 resumé.

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

A. No, I have not.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is provide the Committee with 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 a Study Report that accompanies your testimony?

A. Yes, the 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 AJ.

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?

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

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.

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 Study Report. Total planned spending on the Project is approximately $123 million from 2014 to 2017, with $82 million for the New Hampshire portion and $41 million for the Massachusetts portion. Of the New Hampshire portion, $60.7 million is planned for construction of the Project while $21.1 million is for materials and equipment. For Massachusetts, $30.6 million is for construction and $10.6 million is for materials and equipment. Labor accounts for approximately 74% of investment spending in both states.

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

A. Figure 2 (APM-2) in the Study Report 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 purchased.

Going forward, 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, $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 2017. The majority of this, $23.8 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 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.

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.

<u>Employment Impact</u>

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

A. Figure 3 (APM-3) in the 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 250 jobs per year on average from 2014 through 2017 (a “job year” is equal to one full-time job for a period of one year). Over 600 job years are supported in New Hampshire and approximately 400 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 Study Report shows that the Project is expected to support a total of 618 job years in New Hampshire over the four year construction period. That amounts to an average of 155 jobs per year in New Hampshire from 2014 to 2017. Figure 4 (APM-4) in the 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 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 Study Report shows employment impacts by New Hampshire industry. The largest impact is in construction, which accounts for 231 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 annual jobs, or 16% 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 Study Report, REMI estimates that the Project will raise real GDP in New Hampshire by $73.5 million during the construction period, or $18.4 million per year; and raise real personal income by $35.1 million, or $8.8 million per year. Finally, the Project is expected to raise state tax revenues by $1.3 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; raises New Hampshire GDP by $899,250; raises personal income by $429,433; and raises state tax revenues by $15,888. These multipliers are obtained by dividing total job years, GDP, personal income and state tax revenue over the 2014 to 2017 planning and construction period by total

New Hampshire Project spending. Note that these estimates are in line with other transmission project economic impact studies.[2]

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 the first year it is put in service.

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 increase in local government spending in New Hampshire will lead to the creation of 34 annual jobs, including direct, indirect and induced effects of the spending. Figure 7 (APM-6) in the 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.

2 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).

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. The sum of Eversource and National Grid's first year property tax impacts, $678,850 and $878,700, respectively, equals the $1,557,550 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 in Pelham, $4,198,102 in Hudson, and $11,687,004 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 for Pelham; $71,200 for Hudson; and $235,800 to Windham.

Q. Does that conclude your testimony?

A. Yes.

ATTACHMENT A.

RESUME OF ALFRED P. MORRISSEY, JR.

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.

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, <u>IEEE Transactions</u>, August, 1988 and presented at the <u>IEEE Summer Meeting</u> (Load Forecasting Session), 1987 paper 87 SM 488-0.

Numerous working papers, planning reports and presentations.

ATTACHMENT B.

PROPERTY TAX IMPACT ESTIMATE

nationalgrid

Property Tax Impact Estimate

Date: 11/13/2014

Date Requested: 11/12/2014

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:	$ 28,993,118
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 28,993,118
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 571,700
5-year Cumulative Tax effect	$ 2,844,900

nationalgrid

Property Tax Impact Estimate

Date: 11/13/2014

Date Requested: 11/12/2014

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:	$ 4,198,102
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 4,198,102
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 71,200
5-year Cumulative Tax effect	$ 351,100

nationalgrid

Property Tax Impact Estimate

Date: 11/13/2014

Date Requested: 11/12/2014

Company Name:

Project Name: Merrimack Valley Reliablity Project

Project Location:

State: **NH**

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

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Capital cost details:

Total Planned Capital Spending:	$ 11,687,004
Estimated book cost of associated retirements:	$ -
Estimated Net Increase to Plant in Service	$ 11,687,004
First Year Property Taxes will be Paid:	2018
Estimated 1st Year Property Tax Impact:	$ 235,800
5-year Cumulative Tax effect	$ 1,167,900

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

PRE-FILED DIRECT TESTIMONY OF LISA K. SHAPIRO, Ph.D.
ON BEHALF OF
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

Q. Please state your name, title and business address for the record.

A. My name is Lisa K. Shapiro and my business address is 214 North Main Street, Concord, NH 03301. I am Chief Economist at Gallagher, Callahan & Gartrell, P.C.

Q. Please briefly summarize your relevant background and employment experience.

A. I hold a Ph.D. in Economics from Johns Hopkins University and have approximately 15 years of experience in analyzing New Hampshire property taxes as part of my job. My doctoral dissertation was on property taxes and voting behavior with a case study of New Hampshire. I was the lead author on the seminal study on the then-proposed new statewide property tax enacted in New Hampshire. I also prepared the analysis of the estimated property taxes paid by the proposed Portland Natural Gas Transmission System. I have prepared property tax analyses for a variety of private and institutional organizations. I have consulted for utilities, merchant generators, and manufactures to assist with property tax analysis, including testifying and representation before the New Hampshire Legislature on legislative proposals regarding property taxes.

I have authored a number of economic impact studies, reports and presentations on the economic and fiscal impacts of infrastructure investments and public policies. I have provided expert economics testimony before the New Hampshire Public Utilities Commission, and I have also testified before the New Hampshire legislature on the economic and policy impacts of proposed legislation concerning electric industry restructuring, the Renewable Portfolio Standard (RPS), the Regional Greenhouse Gas Initiative (RGGI), pollution control tax exemptions, utility taxes, and other business and tax proposals.

I have also served on the boards of the Federal Reserve Bank of Boston's New England Public Policy Center Advisory Board, Josiah Bartlett Center for Public Policy, and was a member of Governor

Shaheen's New Hampshire Commission on Education Funding. For further information, please see my CV, attached hereto as Attachment A.

Q. What is the purpose of your testimony?

A. I have been retained by Public Service Company of New Hampshire d/b/a Eversource Energy (PSNH) to provide information on the estimated property taxes that would be generated by the Project's investments in the PSNH service territory in Londonderry and Hudson.

Q. Please briefly describe the proposed investment in the Merrimack Valley Reliability Project.

A. The MVRP is an approximately $123 million transmission system reliability project proposed in the Merrimack Valley. The MVRP is being jointly developed by National Grid and Eversource. Approximately one third of the investment is in Massachusetts and two-thirds is in New Hampshire. A little less than half of the investment in New Hampshire is estimated to be in PSNH service territory.

Q. Can you please provide an overview of the sources of data and the methodologies to develop the estimated Project property tax payments in the PSNH service territories?

A. The Project team provided information on the total cost of the Project, and the allocated costs to the Londonderry and Hudson communities. This allocated cost provides the basis for estimating the taxable value in the first full year. Data on tax rates, expenditures and tax bases were found in 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.

In order to develop an estimated range for the Project's first year annual tax payment post-construction, simulations were run using different assumptions on tax and growth rates, and the taxable value of the Project in each community.

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

A. The Project is estimated to cost approximately $31.4 million in Londonderry and $5.5 million in the PSNH section of Hudson. Attachment B shows the estimated Project allocated costs in each community, and as compared to the most recent (2014) town valuation.

Q. Can you please summarize the estimated Project local property tax payments for the first year post construction for the PSNH portion of the Project?

A. Actual taxes paid will depend on the fair market value of the Project property in the community, local spending, other sources of revenue, and the tax base. A number of simulations were run using different assumptions on the taxable value and tax rates to develop an estimated range for the new Project property tax payments. Attachment C reports the estimated range of Project first year property tax payments. Ranges are based on different simulations using current and actual tax rates and spending levels, different growth rate assumptions, and a discounted simulation on Project property value in a community to estimate a lower range of payment to provide a higher degree of confidence. Details on the specific assumptions and results for the nine different simulations that were run to develop the range are reported in Attachment D.

Q. Please explain what local property taxes are referred to when estimating the Project local property tax payments.

A. Local property taxes combine the municipal or city property tax with the local education property taxes.

Q. Are the estimated local property tax payments for the PSNH portion of the Project offset by any increase in local expenditures?

A. I am not aware of any increased expenditures on local services due to the addition of approximately $40 million in taxable base in Londonderry and Hudson. The Project development is not expected to cause any direct increase in the number of students, nor increased need for public safety protection services, nor other infrastructure investments or expenses for roads, water, sewer or fire protection. Thus, it is not expected that the Project estimated property tax payments are offset by any direct increased demand for and expenditures on local services.

Q. Does the addition of the approximately $40 million for the PSNH portion of the Project to taxable property in the proposed host communities provide fiscal benefit to other communities?

A. Yes, through the payment of county property taxes in the two counties, Rockingham and Hillsborough, and statewide through the distribution of state aid for education.

Q. Please summarize the estimated Project property tax payments in the first year after construction to the county and state governments.

A. Project property is proposed to be located in two different counties – Rockingham and Hillsborough. Project tax payments to Rockingham County are estimated at between $22,000 and $35,000 and to Hillsborough from between $6,500 to $7,200. County budgets to be raised from property taxes are allocated to each community in a county based on the total equalized value of property in that community. Because of this shared responsibility for county budgets, all communities within each of the two counties share in the benefit from the new Project taxable property county tax payments.

Utility property also pays the state utility education tax directly to the state. Utility property does not pay the state property tax at the community level, but pays the state directly at a higher fixed rate of $6.60 per thousand of assessed value. The estimated first year utility education property tax Project payment is estimated at about $240,000 to $250,000. The state uses these revenues to distribute back to communities throughout the state for state aid to education.

Q. Did you provide an estimate of Project property taxes paid over the life of the Project?

A. No I did not. The Project will continue to pay property taxes through the life of the Project. The actual payments will depend on a number of different factors – the fair market value of the Project property over time, local and county spending levels, the total tax base, and other sources of revenue.

Q. Please summarize the results of your analysis.

A. The results of simulation analysis estimate that in the first year of operation, the Project will pay approximately $760,000 to $1.1 million in total property taxes. This overall estimate can be broken down into the following categories:

- $491,000 and $796,000 to the two local communities;
- $28,500 to $42,200 to the two counties; and
- $240,000 to $250,000 to the State for redistribution to local school districts through state aid.

The Project would also pay property taxes during the construction based on what is completed each year. The Project will continue to pay annual property tax payments throughout the life of the Project.

Q. Does that conclude your testimony?

A. Yes.

ATTACHMENT A

RESUME OF LISA K. SHAPIRO, Ph.D.

ATTACHMENT A.
RESUME OF LISA SHAPIRO, Ph.D.

CURRICULUM VITAE

LISA SHAPIRO, Ph.D.
Gallagher, Callahan & Gartrell
214 North Main St.
Concord, NH 03301
shapiro@gcglaw.com
phone (603) 228-1181
fax (603) 226-3477

EDUCATION

Ph.D. in Economics, June, 1995. Johns Hopkins University, Baltimore, Maryland.
T. Rowe Price Memorial Fellowship, 1990-1991.

M.S. in Agricultural and Resource Economics, August, 1990. University of Maryland, College Park, Maryland. Research Fellowship funded by the Economic Research Service, U.S. Department of Agriculture.

Bachelor of Arts Degree in Sociology, cum laude, August, 1985. Cornell University, Ithaca, New York, (transferred from the University of New Hampshire, Durham, New Hampshire, 1983).

PROFESSIONAL EXPERIENCE

Chief Economist, Gallagher, Callahan & Gartrell, P.C., Concord, New Hampshire, October 1994 – present. Analyze economic and industry trends of interest to the firm's clients, regulators and others with whom the firm interacts. Work on complex economic and financial projects in public and private settings. Issues include energy and communications markets, healthcare policies, taxation, infrastructure development, environmental economics, labor markets and the financial services industry. Work with businesses and nonprofit organizations on strategic economic issues, legislative and regulatory matters.

Economist, Tellus Institute, Boston, Massachusetts, January 1993 – September 1994. Researched and wrote reports, worked with clients, supervised researchers, wrote proposals. Topics included electricity pricing, and electric utility planning.

Research Director, Arnesen for Governor Campaign, New Hampshire, April – November, 1992.

Consultant, LandCare Associates, Dover, New Hampshire, September 1991 – March 1992. Created computerized billing and accounting systems. Prepared financial statements.

Researcher, University of Maryland, College Park, Maryland, Dr. Kenneth McConnell, August 1987 – August 1988. Managed ongoing database of fishing quality in the Chesapeake Bay and prepared statistical analysis.

Research Fellow, Energy Conservation Coalition, Washington D.C., March – September 1987.

BOARDS, COMMISSIONS & MEMBERSHIPS

Governor Hassan's Cost Containment Commission for Retiree Health Plans. (September - December 2013).

Chairman of the Board of Trustees of the New Hampshire Retirement System. (February 2008 – July 2013).

Commission to Make Recommendations to Ensure the Long-term Viability of the New Hampshire Retirement System, Chair of Benefits Subcommittee, (August – December 2007).

Federal Reserve Bank of Boston's New England Public Policy Center Advisory Board. (March 2007 to September 2011).

Josiah Bartlett Center for Public Policy, Board member. (1999 – 2005).

Governor Shaheen's New Hampshire Commission on Education Funding. (2000).

Governor Shaheen's Business Commission on Child Care and Early Education. Staff. Prepared and presented economic analysis report. (1999).

Leader of the Economic Perspectives Technical Work Group of the New Hampshire Comparative Risk Project. (1998).

President, Board of Directors, Concord Cooperative Market, Concord, New Hampshire, October 1992 – October 1994 (Board Member, October 1991 – 1996. Member of the Finance Committee, October 1996 to 2000).

Campaign for Ratepayer's Rights (CRR), Board Member. September 1993 – September 1994.

New Hampshire Community Reinvestment Association, Member. September 1993 – September 1994.

Agricultural and Resource Economics Graduate Students Association, President. University of Maryland, College Park, Maryland, June 1988 – May 1989.

Member of the American Economic Association, the National Association for Business Economics, and the National Tax Association.

Above & Beyond Award from the Business & Industry Association of New Hampshire, May 2002.

TESTIMONY & EXPERT WITNESS APPEARANCES

Testified on energy bills to the New Hampshire State Legislature over the past 15 years including RPS, RGGI, electric industry restructuring, equipment & utility taxes, and renewable energy and planning policies.

Testified on other business and tax issues, healthcare, housing policy, taxation, and land use planning policy on behalf of industry groups, business clients, and not-for-profits.

Prepared testimony and testified as an Expert Witness on the economic impacts of the Power Purchase Agreement between Public Service of New Hampshire and Laidlaw Berlin Biopower, LLC. New Hampshire Public Utilities Commission DE-10-195.

Prepared testimony and testified as an Expert Witness on the economic impacts of the construction phase of the scrubber at Merrimack Station. New Hampshire Public Utilities Commission DE-11-250.

Expert witness in private arbitration renewable energy case.

REPORTS

Proposed Northern Pass Transmission Project, Economic Impact Update, Estimated New Hampshire Jobs During 3 Year Construction Phase, prepared for Northern Pass Transmission LLC with Heidi Kroll, April 2011.

Preliminary Economic and Fiscal Impacts of the Proposed Northern Pass Transmission Project, prepared for Northern Pass Transmission LLC with Heidi Kroll, October 2010.

Preliminary Economic and Fiscal Impacts of the Proposed Northern Pass Transmission Project, Franklin Converter Station and Line Work, prepared for Northern Pass Transmission LLC with Heidi Kroll, October 2010.

The Economic Impacts of Constructing a Scrubber at Merrimack Station, prepared for Public Service Company of New Hampshire with Heidi Kroll, March 13, 2009.

The Economic Impacts of Greater Investments in New Hampshire's Transportation Infrastructure Funded by an Increase in the Gas Tax, prepared for the Aggregate Manufacturers of New Hampshire with Heidi Kroll, February 17, 2009.

Estimated Economic Impacts of Childhood Lead Poisoning in New Hampshire, prepared for Child Health Services with Heidi Kroll, October 3, 2008.

Land Use Regulations in New Hampshire, prepared for the New Hampshire Public Policy Alliance for Housing, the Home Builders & Remodelers Assoc. of New Hampshire, and the New Hampshire Housing Finance Authority with Heidi Kroll, January 2007.

Housing New Hampshire's Workforce, prepared for the New Hampshire Workforce Housing Council with Heidi Kroll, March, 2005.

Public Opinion Poll Results in the Study of Select Economic Values of New Hampshire Lakes, Rivers, Streams and Ponds-Phase III Report, prepared for the New Hampshire Lakes Association with Heidi Kroll, December 2004.

Estimates of Select Economic Values of New Hampshire Lakes, Rivers, Streams and Ponds–Phase II Report, prepared for the New Hampshire Lakes Association with Heidi Kroll, June, 2003.

The New Hampshire Forum On Higher Education–Recommended Strategy Going Forward, prepared for The New Hampshire Forum On Higher Education with Heidi Kroll, October 30, 2002.

Transmission Transition: Toward an Efficient Electricity Grid, Energy User News, October, 2002.

Budget Deficits and Business Taxes in New Hampshire, prepared for the New Hampshire Bankers Association, with Charles Connor and Heidi Kroll, May 9, 2002.

A Study of the Economic Values of the Surface Waters of New Hampshire–Phase I Report - Preliminary Assessment of the Existing Literature, Data, and Methodological Approaches to Estimating the Economic Value of Surface Water, prepared for the New Hampshire Lakes Association with Heidi Kroll, August 1, 2001.

2001 NH Local Impact Assessment Project - Economic Statistics on LIAP Forestry and Water Issues, prepared for the Society for the Protection of New Hampshire Forests with Heidi Kroll, May, 2001.

Energy Issues and the Economy, A presentation to the N.H. Electric Utility Oversight Committee, February 20, 2001, and to the N.H. Senate Ways and Means Committee, February 14, 2001.
Making Economic Sense of Electricity Price Spikes, Energy User News, December, 2001.

Workforce Opportunity Council (WOC) Information and Data Gathering Initiative, prepared for the Demand Committee of the Workforce Opportunity Council, October, 2000.

The Economic Impacts of the New Hampshire Housing Finance Authority Tax Exempt Bond Programs, with Richard England, prepared for The New Hampshire Housing Finance Authority, August, 2000.

New Choices Mean New Rules for the Electricity Market, June, 2000.

Access to Capital in a Changing Economy, INTERFACE TECH NEWS, May 2000, p. 33.

Short-term Economic and Fiscal Impact Analysis of Senate Bill 401 – The Establishment of the Land and Community Heritage Investment Program – Testimony before the House Finance Committee on Senate Bill 401, prepared for the Society for the Protection of New Hampshire Forests, May, 2000.

Vermont's Digital Economy and Government Regulation of Access – Comments on House Bill 817, prepared for AT&T, April, 2000.

Local Fiscal Impact Study for the Proposed Mall at Long Wharf, City of New Haven, Connecticut, prepared for the Connecticut Economic Resource Center, Inc., January, 2000.

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TEACHING EXPERIENCE

Adjunct Faculty, Introduction to Microeconomics, University of New Hampshire, Manchester, Fall Semester, 1998.

Adjunct Faculty, Graduate Introduction to Public Policy, University of New Hampshire, Whittemore School of Business and Economics, Fall Semester, 1997.

Instructor, Introductory Statistics, Technical College at Berlin, New Hampshire, August – December, 1992.

Teaching Assistant, Graduate Macroeconomics, Johns Hopkins University, January – May 1991.

Instructor, Introductory Microeconomics, Johns Hopkins University, September – December 1990.

PRESENTATIONS

Presentation before the **New Hampshire House Ways & Means Committee's "Revenue Structure Informational Session**," October 21, 2009.

"Adjusting to a Challenging Economy," **Greater Somersworth Chamber of Commerce - Tri-Chambers Breakfast Forum**, Somersworth, New Hampshire, September 10, 2008.

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"Budget Deficits and Business Taxes in New Hampshire," **New Hampshire Bankers Association Spring CEO Meeting**, The Inn at Mill Falls, Meredith, NH, May 9, 2002.

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"New Hampshire Tax Options," **New Hampshire Bankers Association Spring CEO Meeting**, Woodstock, VT, May, 2001.

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"Electric Restructuring in New Hampshire: Outlook and Options," **Dollars & Sense of Electric Competition, Business & Industry Association of New Hampshire**, April 9, 2001.

"An Open Forum Between Providers and Users to Discuss New Hampshire Specifics," Moderator, **Telecommunications in the Year 2000 and Beyond, New Hampshire Public Utilities Commission**, March 17, 2000.

A Presentation of the Study – *"The Economic and Fiscal Impacts of a Uniform Statewide Property Tax,"* **Current Issues in U.S. Property Taxation, National Tax Association 92nd Annual Conference on Taxation**, Atlanta, Georgia, October 24-26, 1999.

"The Economic Impact and Looking to the Future," Moderator, **Reading, Writing and Revenues Post Claremont, Josiah Bartlett Center for Public Policy**, Concord, New Hampshire, October 14, 1999.

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"What is the Future for Electric Rates in New Hampshire?" **Josiah Bartlett Center for Public Policy**, Concord, New Hampshire, September 15, 1999.

Keynote Speaker, Annual Conference and Trade Show, **New Hampshire Telecommunications Association**, Manchester, New Hampshire, June, 1999.

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"PUC & FCC Annual Regulatory Seminar" **New Hampshire Telecommunications Association**, Bedford, New Hampshire, December 17, 1998.

"*The Economics of On-Site Generation Under Regulatory Uncertainty*," **Producing Your Own Electricity On-Site Conference and Exhibition, Governor's Energy Office and Others**, West Lebanon, New Hampshire, November 17, 1998.

"Investment Opportunities," **Northern New England Community Reinvestment Conference, Granite State Community Reinvestment Association, Federal Reserve Bank of Boston**, October 6, 1998.

"The Myths and Reality Behind Energy Resale," **Telecom Business Conference**, Jacob Javitz Center, New York, New York, September, 1998.

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"Demystifying Electric Industry Restructuring," **New Hampshire North Country Council**, Lincoln, New Hampshire, July, 1997.

"Centralized Versus Decentralized State Fiscal Systems," **New Hampshire's Fiscal Foundation: Granite or Quicksand, Josiah Bartlett Center for Public Policy**, Concord, New Hampshire, April 11, 1997.

ATTACHMENT B.

MERRIMACK VALLEY RELIABILITY PROJECT
ESTIMATED INVESTMENT VALUES

ATTACHMENT B.

Merrimack Valley Reliability Project Estimated Investment Values

Community	Estimated MVRP Allocated Cost by Community	2014 Town Valuation	MVRP expressed as percentage growth in 2014 Town Valuation
Londonderry	$31,417,720	$3,556,514,649	0.88%
Hudson (Eversource Section Only)	$5,498,280	$2,570,693,633	0.21%
Total	$36,916,000		

Sources and Notes:
Estimated MVRP Allocated Cost by Community may not sum to the totals reported due to rounding.

Actual taxes paid will depend on value of the Project property in the community, spending, other sources of revenue, and the tax base. Ranges are based on different simulations using current actual current tax rates and spending levels, different growth rate assumptions, and a discounted assumption on the Project property value in a community to estimate a lower range payment to provide a higher degree of confidence.

ATTACHMENT C.

MERRIMACK VALLEY RELIABILITY PROJECT
ESTIMATED LOCAL PROPERTY TAX PAYMENTS FOR
FIRST FULL YEAR OF OPERATION

ATTACHMENT C.
Merrimack Valley Reliability Project Estimated Local Property Tax Payments for First Full Year of Operation

Community	Estimated MVRP Allocated Cost by Community	Range	
Londonderry	$31,417,720.00	$423,000.00	$700,000.00
Hudson (Eversource Section Only)	$5,498,280.00	$68,000.00	$96,000.00
Total	$36,916,000.00	$491,000.00	$796,000.00

Sources and Notes:
Estimated MVRP Allocated Cost by Community may not sum to the totals reported due to rounding.

Actual taxes paid will depend on value of the Project property in the community, spending, other sources of revenue, and the tax base. Ranges are based on different simulations using current actual current tax rates and spending levels, different growth rate assumptions, and a discounted assumption on the Project property value in a community to estimate a lower range payment to provide a higher degree of confidence.

ATTACHMENT D.

SUMMARY OF MVRP FIRST YEAR PROPERTY TAX ESTIMATES

ATTACHMENT D.
Summary of MVRP First Year Property Tax Estimates

A. Local Property Taxes (Municipal plus Local Education)

	Range		Midpoint	MVRP Estimated Local Property Tax Payments First Full Year								
				s1	s2	s3	s4	s5	s6	s7	s8	s9
Londonderry	$423,000	$700,000	$561,500	$565,205	$636,336	$629,938	$423,904	$472,454	$668,152	$699,969	$501,114	$524,977
Hudson (Eversource Section Only)	$68,000	$96,000	$82,000	$94,076	$91,979	$91,781	$70,557	$68,836	$96,578	$101,177	$72,433	$75,882
Local Totals	$491,000	$796,000	$643,500	$659,280	$728,314	$721,720	$494,460	$541,290	$764,730	$801,146	$573,547	$600,859

Assumptions for Simulations

s1 Project cost allocation with 2014 local tax rates
s2 Project cost allocation with 2013 equalized tax rates
s3 Project cost allocation with 2013 equalized tax rates partially adjusted lower for same level of spending
s4 Seventy-five percent of project cost allocation with 2014 local tax rates (.75*s1)
s5 Seventy-five percent of project cost allocation with 2013 equalized tax rates (.75*s2)
s6 Projected cost allocation with 2013 equalized tax rates grow at about 1 percent per year(5 percent total)(1.05*s2)
s7 Projected cost allocation with 2013 equalized tax rates grow at about 2 percent per year(10 percent total)(1.1*s2)
s8 Seventy-five percent of projected cost allocation with 2013 equalized tax rates grow at about 1 percent per year (5 percent total)
s9 Seventy-five percent of projected cost allocation with 2013 equalized tax rates grow at about 2 percent per year (10 percent total)

B. County Property Taxes

	Range		Midpoint	MVRP Estimated County Property Tax Payments First Full Year					
				s1	s2	s4	s5	s6	s7
Rockingham	$22,000	$35,000	$28,500	$29,218	$32,286	$21,914	$24,214	$33,900	$35,514
Hillsborough (Eversource Section Only)	$6,500	$7,200	$6,850	$6,763	$6,595	$5,072	$4,946	$6,924	$7,254
County Total	$28,500	$42,200	$35,350	$35,981	$38,881	$26,986	$29,160	$40,825	$42,769

Assumptions for Simulations

s1 Project cost allocation with 2014 local tax rates
s2 Project cost allocation with 2013 equalized tax rates
s4 Seventy-five percent of project cost allocation with 2014 local tax rates (.75*s1)
s5 Seventy-five percent of project cost allocation with 2013 equalized tax rates (.75*s2)
s6 Projected cost allocation with 2013 equalized tax rates grow at about 1 percent per year(5 percent total)(1.05*s2)
s7 Projected cost allocation with 2013 equalized tax rates grow at about 2 percent per year(10 percent total)(1.1*s2)

Summary of MVRP First Year Property Tax Estimates

C. State Education Property Taxes (paid directly to the state and redistributed to communities through state aid)

MVRP Estimated State Education Property Tax Payments First Full Year

	Range		Midpoint
Total State education property tax (Eversource Section Only)	$240,000	$250,000	$245,000

D. Total Estimated Property Taxes First Year

	Range		Midpoint
Total	$759,500	$1,088,200	$923,850

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

PRE-FILED TESTIMONY OF JAMES CHALMERS, Ph.D.
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 James Chalmers. I am the Principal of Chalmers & Associates, LLC whose business address is 616 Park Lane, Billings, MT 59102.

Q. Briefly summarize your educational background and work experience.

A. I received the BS degree in economics from the University of Wyoming in 1963 and the Ph.D. in economics from the University of Michigan in 1969. In addition, I am a Certified General Real Estate Appraiser licensed in several states.

From 1969 to1978, I was an economics professor at Amherst College, Thammasat University in Bangkok, Thailand and Arizona State University.

Beginning in 1974 on a part-time basis, and from 1978 to present on a full-time basis, I was a real estate consultant with Mountain West Research, Inc., Coopers & Lybrand, LLC, PricewaterhouseCoopers, LLC and Chalmers & Associates, LLC.

I have specialized in assessing the effects of externalities (contamination, pipelines, highways, transmission lines, and others) on the value of real estate. I have also managed several large multi-discipline assessments of energy related projects including the damage assessment for the U.S. Nuclear Regulatory Commission (NRC) of the accident at Three Mile Island and the assessment of the proposed High Level Nuclear Waste Repository at Yucca Mountain for the State of Nevada.

Please see my resume as Attachment A.

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

A. No, although I will be submitting testimony for the Seacoast Reliability Project and the Northern Pass Transmission Project in the near future.

Q. What is the purpose of your testimony?

A. My purpose is to provide my professional opinion with respect to the possible effects of the NH portion of the Merrimack Valley Reliability Project ("Project") on both property values and marketing times in local and regional real estate markets.

Q. What is your role in the Project?

A. I was initially retained by Northern Pass Transmission, LLC to assess the state of knowledge with respect to property value effects of high voltage transmission lines (HVTL) and to supplement existing research with New Hampshire-specific initiatives as appropriate. I was subsequently retained by New England Power Company d/b/a National Grid (NEP) and Public Service Company of New Hampshire d/b/a Eversource Energy (PSNH) in connection with the Seacoast Reliability Project and the Merrimack Valley Reliability Project. I have summarized the published research and the new, New Hampshire-specific research initiatives in a report titled High Voltage Transmission Lines and New Hampshire Real Estate Markets: A Research Report (the "Research Report"), Appendix AK, and then applied the findings summarized in the Research Report to the Project.

The Research Report

Q. Please describe the objectives of the Research Report.

A. The objectives of the Research Report are threefold: (1) to summarize existing knowledge on the effects of HVTL on real estate markets, (2) to supplement that knowledge with New Hampshire-specific research initiatives, and (3) to draw conclusions with respect to the New Hampshire-specific initiatives and evaluate the consistency of the New Hampshire findings with the broader national literature.

Q. Please describe the elements of the Research Report?

A. I first analyzed the core of the professional literature, including a total of 12 residential, two commercial/industrial, five vacant land and six attitudinal studies. I then reported on three New Hampshire-specific research initiatives. They include the Case Studies—an analysis of 58 individual residential sales of properties crossed by, or bordered by, a HVTL;[1] the Subdivision Studies—analyzing the timing and pricing of lot sales in 13 subdivisions where some lots in a subdivision are crossed by, or are bordered by, an HVTL and others are not; and the Real Estate Market Activity Research—a review of sale price to list price ratios and days on market for residential sales in different locational zones relative to an HVTL corridor.

Literature Review

Q. Please summarize the literature review that you conducted.

A. The published literature is extensive. It is based on comparing the sales of properties potentially affected by an HVTL to the sale of properties unaffected by HVTL. These studies are carried out using different methods (statistical studies, subdivision studies, case studies). The findings of these studies can be summarized as follows. For residential properties, about half of the studies found some measure of negative proximity effects, and the other half found none. Where effects were found, they tended to be small, usually in the 1-6% range. Additionally, where they were found, they tended to decrease rapidly with distance from the HVTL. Effects seldom extended beyond 500 feet

1 According to the New Hampshire Public Utilities Commission, power lines at or above 69 kV are considered transmission lines and lines less than 69 kV are considered to be distribution lines. This Report is focused on the potential effect of transmission lines on real estate markets but four of the 58 Case Studies and two of the 13 Subdivision studies involve properties that abut, or are crossed by, a ROW containing 34.5 kV lines. When speaking generally about the research, we will continue to use the acronym HVTL but when discussing the particular cases with the 34.5 kV lines, they will be referred to as distribution lines.

from the HVTL. Two of the studies found that where there were effects, they dissipated over time as well. Once proximity was accounted for, visibility generally had no additional, independent effect in the statistical studies. Finally, encumbrance frequently had no effect on market value. Where there was an effect, it was small relative to the size of the encumbrance.

For commercial /industrial properties, there were no effects unless development of the site was constrained in a way that reduced the income producing potential of the property.

For vacant land, there were generally no effects. Exceptions include properties where development of the land was constrained by the ROW or where the HVTL were the principal differentiating feature of otherwise very similar parcels.

There is also published literature on attitudinal studies based on survey research methodology. Homeowners report concerns with HVTL on health effects, aesthetics and property value issues. Of those buyers of homes affected by HVTL, two of the studies found that over 70% of the respondents reported that their purchase decision and the price paid were not affected by the lines.

Q. Does the existing knowledge base with respect to the effects of HVTL on real estate markets have relevance to New Hampshire?

A. Yes. The results are sufficiently consistent across geographies and development patterns that one would expect applicability. In addition, two of the studies have particular relevance because the study area investigated is close to New Hampshire.

Dr. Frank Voorvaart and I carried out statistical studies of over 1,600 property sales in four neighborhoods in Connecticut and Massachusetts and found no market value effects associated with either proximity to, or visibility of, HVTL. The areas studied have similarities to many parts of southern New Hampshire.

Similarly, Dr.William Kinnard analyzed both home sales and raw land sales in Penobscot County, Maine. This was a statistical study that concluded no market value effects of HVTL proximity.

Q. What additional research did you undertake to address possible HVTL effects on New Hampshire real estate markets?

A. As identified briefly above, there were three initiatives—Case Studies, Subdivision Studies and Market Activity Analysis.

The Case Studies

Q. What was the methodology used in the Case Studies research?

A. The Case Studies research is based on an analysis of 58 individual sales of properties either crossed by, or abutting, an HVTL ROW. HVTL corridors were selected that represented much of the State of New Hampshire. These included two major north/south HVTL corridors (referred to below as Corridor #1 and Corridor #2) as well as several short corridors in and around Portsmouth (referred to as Study Area #3). All recent sales in each corridor were identified from either assessor tax cards or multiple listing services. The universe of sales was then filtered to eliminate sales that did not meet the definition of a "fair market sale", defined as an arm's length transaction between knowledgeable and typically motivated parties. The sales most frequently eliminated included foreclosures, "short" sales, liquidation sales and sales between related parties.

Each of the remaining sales was then the subject of a case study that had four basic components— the facts of the sale, the physical relationship of the property to the HVTL, interviews with transaction participants, and appraisal evidence based on an estimate of value at the time of sale

("Retrospective Appraisal") absent the influence of HVTL, i.e. using comparable sales not influenced by HVTL.

Based on these four categories of evidence, conclusions were drawn with respect to the effect, if any, of the HVTL on the sale price and the marketing period in the transaction.

Q. What were the findings of the Case Studies research?

A. The findings of the Case Studies for the three study areas were as follows. Sale price effects in the 24 Corridor #1 Case Studies were infrequent, small and only occurred where there was very close proximity, i.e. less than 100 feet from the house to the edge of the ROW, combined with clear HVTL visibility. Proximity of that degree in the absence of clear visibility appeared not to be an issue nor was substantial visual intrusion in the absence of very close proximity. Marketing time effects were even less frequent. In only two cases did marketing time appear to be affected by the HVTL. There were several comments with reference to reduction in buyer interest due to the HVTL, but rarely did there appear to be any material effect on the marketing period. Further, there were references to several buyers who saw the corridor as an asset to the property.

Sale price effects in the 28 Corridor #2 Case Studies were also infrequent and only occurred where there was a combination of very close proximity and clear HVTL visibility. Like Corridor #1, proximity without clear visibility and clear visibility without proximity did not result in sale price effects. Marketing time effects were found in seven cases and suggested as possible in three others. In eighteen cases it was found that the HVTL did not affect marketing time.

Of the six case studies in Study Area #3, there were sale price effects in two cases and sale price effects were suggested as possible in one other. Effects on marketing time were found in one case and suggested as possible in one other. The results are similar to those for Corridors #1 and #2. The two properties for which sale price effects were found were located adjacent to the ROW in one case and 11 feet distant in the other, with both properties having clear visibility of the HVTL.

Q. Overall, what conclusions can be drawn from the New Hampshire Case Studies?

A. The Case Studies represent a broad spectrum of properties crossed by, or adjacent to, an HVTL in New Hampshire. There is variety in terms of property location, size and value and in the way in which the property is physically affected by the HVTL. While the results of any single case study are necessarily anecdotal, useful generalizations can be drawn when considering the results from all 58 case studies. These include the following. Sale price effects are infrequent—10 cases out of 58 found a sale price effect with another 11 cases suggesting a possible sale price effect. Thirty-seven cases or 64% found no sale price effect. Where sale price effects were found, they appear to have been small. Sale price effects decrease very rapidly with distance. Only one of the 10 cases had a house located more than 100 feet from the edge of the ROW (it was 106 feet from the edge of the ROW) and seven were within 30 feet. With only one exception, close proximity had to be combined with clear visibility of the HVTL for there to be a sale price effect. Of those properties that combined close proximity and clear visibility, eight of the 14 had a sale price effect and six did not. The cases with sale price effects not only had homes close to the ROW but they were often forced to be close to the ROW because the developable portion of the lot was constrained by the location of the ROW on the property. Marketing time effects were also infrequent. In 41 of the 58 cases, there was no marketing time effect of the HVTL.

<u>The Subdivision Studies</u>

Q. How do the Subdivision Studies differ from the Case Studies?

A. The Case Studies focus on individual sales of improved residential properties, i.e. properties on which homes have been built. The Subdivision Studies analyze the sale of unimproved lots before homes have been built. They analyze the original sale of the lots by the subdivision developer. Subdivisions are selected where some of the lots are crossed by, or abut, an HVTL while others are not.

Q. What was the methodology used in the Subdivision Study research?

A. An attempt was made to identify a subdivision in each of the towns crossed by Corridor #2 that had reasonably homogeneous lots, some crossed or abutting an HVTL, some not. No more than one subdivision was selected in any one town and a total of ten were identified. Corridor #1 did not lend itself to Subdivision Studies because of the more rural character of the area it crosses. In addition, an attempt was made to identify candidate subdivisions in the towns in Study Area #3. A total of three was identified.

A representative group of crossed or abutting ("Subject") lots and lots not crossed or abutting ("Control") were identified for each subdivision. Chain of title was established for each lot back to the original sale of the unimproved lot by the developer. The date and sale price for the original lot sale was recorded. This provided the basis for analyzing differences, if any, in the pricing and marketing time of the Subject lots relative to the Control lots.

Q. What were the findings of the Subdivision Study research?

A. For the 10 subdivisions crossed by Corridor #2, 133 lot sales were identified. Fifty-one of these sales involved encumbered or abutting lots. Seven of the 51 were abutting and 44 were encumbered. Five of the 10 subdivisions had some sales after the year 2000 while the others were fairly evenly divided between the 1970's, 80's and 90's. The extent of the encumbrance varied but there were several instances of lots encumbered in the 30% to 70% range.

Of the 51 lots either encumbered or abutting the ROW of Corridor #2, only four showed any evidence of price effects. In three of the cases where there was an effect, development of the lots was severely compromised by the ROW. Further, in every case, the percentage discount was less than the percentage of the lot encumbered. In seven of the subdivisions, the encumbered or abutting lots sold at the same rate, or in some cases faster, than the Control lots.

In Study Area #3, there were 34 lot sales in the three subdivisions identified for study; 22 of these lots were encumbered by a ROW.[2] The time periods involved included the early 1990's, the late 1990's and the early 2000's. In two of the subdivisions, there were price effects for the encumbered lots although the price effects were small compared to the reduction in the development area of the affected properties. Overall, the lots in Study Area #3 were smaller (one to two acres), were of greater value and did not have acreage in addition to the home site (what we called excess acreage) which was characteristic of many of the subdivisions studied in Corridor #2.

Timing effects were observed at two of the three subdivisions studied. In those two subdivisions, the heavily encumbered lots sold less quickly than the unencumbered lots.

2 Two of the subdivisions in Study Area #3 were encumbered by a 100 foot wide ROW containing a 34.5 kV distribution line. The other subdivision in Study Area #3 and all 10 of the subdivisions in Corridor #2 were crossed or bordered by HVTL.

Q. Overall, what conclusions can be drawn from the New Hampshire Subdivision Studies?

A. Lot sales were studied at 13 subdivisions where some lots were crossed or bordered by an HVTL ROW and others were not. The response of the market to the two categories of lots was analyzed both in terms of sale price and marketing time. Investigation of the lot sale history along Study Corridor #2 indicates a general lack of marketability issues associated with lots encumbered by, or abutting, an HVTL ROW. Timing issues were apparent in three of the ten subdivisions and two of those were minor. Price effects were even less frequent.

The absence of price and timing effects in the Corridor #2 subdivisions appears to be due to the fact that the used and value generating portion of the lot is generally a small enclave at the front of the lot where the residence is developed. The rear of the lot plays little role in the value calculation and, therefore, the presence of an HVTL ROW in the rear portion of the lot apparently has little impact on the marketability of the lot. In each of the four cases where there was a price effect, the lot was bisected and the development area of the remaining portion of the lot between the ROW and the lot frontage was constrained.

The findings for the three subdivisions in Study Area #3 appear to reflect the reality in the Portsmouth area of smaller lots, higher land prices and a general lack of lower valued, “excess” land. In the two subdivisions where price effects were observed, the encumbered lots sold for 10% to 30% less than the unencumbered lots despite the fact that their development area was 60% to 70% smaller. The ratio of land value to property value is variable, but if land value averaged one-third of the overall property value, this would translate into property value effects in the 3% to 10% range. Consistent with the Corridor #2 findings, it appears that there have to be serious constraints on the development options for a site before HVTL ROW encumbrance becomes a price issue. Or, put another way, the encumbrance has to impinge on the portions of the lot important to the siting of the home for there to be an impact on value.

With respect to marketing time, there was no effect identified in eight of the 13 subdivisions studied. In the five subdivisions where there was an effect, the effects in two were small and the other three subdivisions had lots that were heavily encumbered by the HVTL ROW or by a combination of the HVTL ROW and wetlands.

Q. If the value of a lot is adversely affected by an HVTL, does the land owner at the time the easement was purchased, or do subsequent buyers of the lot, suffer economic damage?

A. No. The existence of market value effects does not imply economic damages to the property owner. The owner at the time of easement purchase would have been compensated for market value effects. Further, if there were market value effects, subsequent owners would have purchased the property at a discount, so they would have suffered no economic damage.

The Market Activity Research

Q. What is the Market Activity Research?

A. The Market Activity Research is a third New Hampshire-specific initiative that examines Multiple Listing Service data to see if there is evidence of market resistance to "for sale" properties based on their location relative to an HVTL corridor.

Q. What was the methodology used in the Market Activity Research?

A. MLS data was collected for all residential property sales within one mile of Corridor #2 ROW beginning on January 1, 2013 and continuing through 2014. Data were initially collected for all sales occurring in towns for which some portion of the town falls within the one mile criterion of the research. The location of the property sold was determined and straight line distance to the ROW was measured from satellite imagery. The sales were categorized by distance into three groups—encumbered or abutting, one foot to 500 feet and 500 feet to one mile.

Two measures of market activity shed light on pricing and timing issues. The MLS data describe both the listing price of the property and the sale price. The ratio of the sale price to the listing price (SP/LP) is taken as an indication of the strength of the market with significant shortfalls of sale prices relative to listing prices indicative of buyer resistance. Second, the MLS data describe the days the property was on the market (DOM) under the current listing and again, relatively high DOM would be an indication of buyer resistance. Quarterly averages were calculated for both measures for sales occurring in each of the three locational zones.

Q. What were the findings of the Market Activity Research?

A. The sales of the encumbered or abutting properties tend to have the same or higher SP/LP ratio than either of the other two location groups. The proximate properties (one to 500 feet) have a more mixed relationship to the more distant properties, lower in some quarters, similar in several and higher in others. The number of observations in each quarter is small so not too much should be read into these results, but there is no indication of a systematic market disadvantage of the encumbered properties or the proximate properties relative to the more distant group.

In six of the eight quarters, average DOM was the same or lower for the abutting/encumbered properties compared to the other two groups. The proximate properties have lower DOM than the more distant properties about half the time and higher DOM about half the time. Again, caution must be used in drawing conclusions based on relatively small numbers of observations, but there appears to be no systematic tendency for the DOM of the abutting, encumbered or proximate properties to be greater than for properties at a greater distance from the HVTL.

<u>Conclusions</u>

Q. Having completed the Research Report, do you have an opinion on the possible effect of HVTL on real estate markets in New Hampshire?

A. Yes. Everything I have learned from the research we have carried out over the past 18 months as documented in the Research Report is consistent with the basic conclusions of the professional literature, namely: there is no evidence that HVTL result in consistent measurable effects on property values, and, where there are effects, the effects are small and decrease rapidly with distance.

Q. To what do you attribute the general absence of property value effects?

A. The behavior of real estate market participants is a function of a large number of considerations that influence different people in different ways. Therefore, the only reliable method of assessing effects is to observe the result of the interactions of all the participants as they are revealed in actual transactions. Nevertheless, based on the perspective gained from the Case Studies and Subdivision Studies research, we are able to identify considerations that may be responsible for the absence of property value effects.

HVTL corridors are often screened by vegetation or topography. Despite significant encumbrance, HVTL corridors often only affect the rear of lots that contribute little utility or value to the property. The character and condition of the improvements to the property (house, yard, etc.) tend to dominate the attributes of the lot in determining the market value of the property. With many of the larger rural acreages, other lot characteristics (access, views, vegetation, water, etc.) dominate the HVTL effects. HVTL effects are most likely in the situation where there are similar properties except for the HVTL. This condition seldom holds in New Hampshire due to variability of terrain and the generally heterogeneous housing stock. Finally, the HVTL corridors have positive attributes, such as preserving open space.

My conclusion is that even though the presence of an HVTL corridor is generally perceived to be a negative attribute of a property, the weight attached to this particular attribute compared to all the other considerations that go into market decisions is apparently too small to have any consistent measurable effect on the market value of real estate.

Q. Are you familiar with the proposed Project?

A. Yes, I am.

Q. Does your opinion on HVTL effects on the market value of New Hampshire real estate and the evidence on which it is based also apply to the Project?

A. Yes.

Q. Please explain.

A. Nothing in the Research Report indicates any reason to expect property value effects of the Project to be more common than reported in the published literature or in our New Hampshire research. On the contrary, the research indicates that when effects occur, proximity of the house to the

ROW combined with clear visibility of the HVTL are the critical variables. For the Project, the new HVTL is in an existing ROW so proximity of homes with respect to the existing ROW will not change.

Based on the research, those properties that could potentially be affected are homes very close to the ROW that do not have clear visibility of the existing lines but will have clear visibility of existing, new or relocated lines after the Project is constructed. The number of properties potentially affected is small.

There are two sections of the Project where visibility effects could occur. There is a 7.6 mile Segment from the Massachusetts border heading north through Pelham to Hudson just north of Bockes Road where an existing 115 kV line (Y-151) is relocated to within 30 feet of the west boundary of the ROW. It will be on steel poles that are typically 75 feet above grade. The new 345 kV line (3124 Line) will be built on steel H-frame structures that are typically 80 feet in height in the former location of Line Y-151. The relocation of Y-151 will require some clearing on the west side of the ROW. There are 27 homes within 100 feet of the west edge of the ROW that could potentially have changed visibility of lines in the corridor as a result.

The second section is 3.8 miles long from the point in Hudson where the National Grid and Eversource corridors merge to the point in Londonderry where the corridors separate. Throughout this section, the new line (3124 Line) is built 85 feet from the east edge of the combined ROW and there will be significant clearing to accommodate it. It will be on steel H-frame structures typically 87 feet above grade. There are 25 properties with homes within 100 feet of the east edge of the ROW that could potentially have changed visibility of lines in the corridor as a result.

Q. Will all 52 of these properties experience changed visibility of HVTL as a result of the Project?

A. No. Many already have clear visibility of HVTL before the Project so they will experience no change. Others will have been screened before the Project and will continue to be screened after the Project so visibility will not change for them either.

Q. Will all of the remaining properties with homes close to the ROW and with a change in visibility of the HVTL experience market value effects?

A. No. Based on the results of the Case Studies, I anticipate that some homes will experience market value effects and some will not. However, as noted above, where there are effects, such effects will be small.

Q. Would this rise to the level of an adverse effect on the local or regional real estate market?

A. No. A count of the number of affected properties would require property-specific consideration but the number of properties potentially affected is small and would represent a highly localized, property-specific issue that would not be discernible in the local real estate market as a whole and certainly not the regional market.

Q. Please explain the apparent inconsistency between your opinions and the intuitive feeling that some observers have that HVTL must have an effect on real estate values?

A. Many have an intuitive feeling that HVTL must have an effect on real estate values. If you focus purely on HVTL, most people would expect the direction of the effect on market value to be negative. However, it does not follow that there is a discernible effect on market value. The effect on market value, if any, depends on the weight given the HVTL effect relative to all the other positive and negative variables that shape a property purchase decision. All other things equal, the property without the HVTL would generally be preferred, but all other things are never equal. We have intuition with respect to the direction of the effect but not the weight it is given by buyers and sellers of homes. Ultimately that has to be inferred from market data.

Q. How do you account for public concern with respect to property value effects?

A. I think it helps to keep in mind that people come to this issue from several different perspectives. There is the "Market Value" perspective which investigates whether the price arrived at in a fair market sale is affected by an HVTL. This is an objective concept based on market data. This is the perspective addressed in the Research Report and is the basis for the opinions I have offered here.

A second perspective is the "Owner" perspective. This is the subjective perspective of the owner of an affected property who has an opinion of the personal implications of the HVTL. This might include a scenario where the removal of a tree could have great personal significance or where a portion of an HVTL structure becoming visible causes tremendous harm in the subjective opinion of an individual property owner. In both of these scenarios, however, it is entirely possible that a prospective buyer, or, more generally, the market, would be oblivious to the change.

A third perspective is that of a non-owner who enjoys an affected resource (hiking or driving for example) and feels that their use/enjoyment of that resource is impaired by the HVTL. This perspective can be referred to as the "Public" perspective.

Both the Owner and the Public perspectives are genuine and must be respected, but those coming from these perspectives often confuse the issue by claiming market value effects. In fact, they may claim market value effects that are of magnitudes similar to the effects they suffer from a subjective or public perspective, e.g. "the value of my property will be destroyed." This may be true from their personal, subjective perspective, but the market value issue is an empirical question that must be answered with market data.

Q. Please provide your ultimate opinion on the issue of the Project's potential effect on real estate markets.

A. In my opinion, there is no basis in the published literature or in the New Hampshire-specific research initiatives as described in the Research Report to expect that the Project would have a discernible effect on property values or marketing times in local or regional real estate markets.

Q. Do you have any additional comments you would like to add?

A. No.

Q. Does that conclude your testimony?

A. Yes.

ATTACHMENT A.

RESUME OF JAMES CHALMERS, PH.D.

JAMES A. CHALMERS

POSITION

Principal, Chalmers & Associates, LLC

EDUCATION

Ph.D. - Economics, University of Michigan - 1969
B.A. - Economics, University of Wyoming - 1963

EXPERIENCE

I. ECONOMICS

Broad range of experience in quantitative economic analysis and problem solving applied to regional and urban growth issues, public planning, economic modeling, fiscal analysis, industry economics and socioeconomic impact assessment. Selected engagements are described below:

Regional/Urban Economics

- City of Phoenix. Economic and residential development strategies for newly annexed peripheral areas.
- Maricopa Association of Governments. Official population, employment and land use projections for Metropolitan Phoenix at the traffic analysis zone (1300 zones) level of analysis.
- Arizona Department of Economic Security. Demographic and employment projections for each county in Arizona, adopted as the State's official planning projections.
- U.S. Bureau of Reclamation. Effect on California's Central Valley economy of limiting water rights to farms no larger than 160 acres.

Economic Development/Site Selection

- Governor's Blue Ribbon Task Force. Assisted the State of Arizona in preparing a proposal to site the U.S. West Advanced Technology core research facility in Arizona.
- Clark County, NV. Market studies of heavy industry demand, land absorption projections, and implementation program for APEX Heavy Industry Park outside Las Vegas.
- Greater Phoenix Economic Council. Competitive city operating cost comparisons for six different industrial sectors.

Impact Assessment

- Colorado Cumulative Impact Task Force. Project director for consortium of energy companies and local governments to establish database, standards for impact analysis, and common analytic tools for assessing socioeconomic and fiscal impacts of oil shale projects in six-county, western Colorado region.
- U.S. Bureau of Land Management. Economic and fiscal impacts of coal development in 40 county region of eastern Montana and western North Dakota.
- U.S. Nuclear Regulatory Commission. Case studies of the impacts of 12 nuclear power plants on their host communities across the United States.

Litigation Services

- Shughart, Thomson & Kilroy, Kansas City, MO. Prepared testimony with respect to redevelopment of Union Station in Kansas City, Missouri.
- Clifford Chance, London. Provided expert testimony with respect to market conditions in the interdealer broker industry in the late 1980's.

II. REAL ESTATE

Experienced in applying economic and financial analysis together with relevant market data to real estate development, investment counseling, asset management, and real property valuation. Projects include large, urban, mixed-use projects, single use projects of all types, and large master-planned community studies. Selected engagements include the following:

Development Consulting

- Belmont Corporation. Designed and managed research to investigate feasibility of master-planned community in western Maricopa County.
- Evans-Withycombe. Carried out market and feasibility analyses for proposed high-density residential developments.
- National Golf Foundation. Advised with respect to market forces affecting participation and frequency of play.
- Summa Corporation. Advised with respect to timing and market positioning of commercial and industrial development in Las Vegas, Nevada.
- Symington Company. Evaluated commercial office market conditions for purposes of evaluating both proposed and existing projects.

Investment Counseling

- Bay State Milling. Provided ongoing counseling with respect to the redevelopment options for the Hayden Flour Mill property in downtown Tempe, Arizona.
- Arizona State University - West Campus. Evaluated market conditions relative to privatization of 70 acres of the ASU West Campus.
- Banning-Lewis Ranch. Evaluated and provided development counseling for 25,000 acre property in Colorado Springs.

- Scottsdale School District. Advised the Scottsdale School Board regarding alternative scenarios for disposition of the 38-acre Scottsdale High School site located in downtown Scottsdale.

Workout/Disposition Counseling

- Cole Equities. Evaluated loan restructuring options for large office complex.
- Kidder Peabody. Prepared due diligence for securitization of $250 million apartment portfolio.
- Denro, Ltd. Developed and analyzed repositioning strategies for 1,300 acre, golf-oriented master planned community.
- Resolution Trust Corporation. Developed asset management alternatives for 2,500 acre mixed-use commercial and master planned residential community in Mesa, Arizona.

Litigation Services

- Baker & Botts, Houston. Provided an analysis of overall trends in values of office, industrial, multi-family, hotel and raw land properties in several Arizona markets.
- Lewis & Roca, Phoenix. Analyzed distribution of benefits from a proposed special improvement district.
- Bodman, Longley & Dahling, Detroit. Produced evidence on alternative development concepts for a golf course community in Michigan.
- Mariscal, Weeks, McIntyre and Friedlander, Phoenix. Provided testimony with respect to appropriate due diligence procedures in a commercial real estate fraud case.
- Morrison & Foerster, San Francisco. Developed evidence with respect to evolution of multi-family market conditions in the southwestern United States since 1980.

III. ENVIRONMENTAL DAMAGES QUANTIFICATION/ REAL PROPERTY VALUATION

Have applied real estate and economics background to litigation oriented engagements focused on environmental damages in the context of valuation of contaminated property, valuation of property affected by hazard or risk, natural resource damages and value of real property in the context of eminent domain. Selected engagements include:

Valuation of Contaminated Property

- Faulkner, Banfield, Doogan & Holmes, Anchorage, AK. Defense of major oil company with respect to property value diminution claims associated with storage of heavy industrial equipment.
- Aspey, Watkins & Diesel, Flagstaff, AZ. Quantified damages to property owners stemming from the malfunction of a lake in a master-planned community in northern Arizona.
- Holme Roberts & Owen, Denver, CO. Assessment for a major oil company of damages to real property from groundwater contamination.

- Streich Lang, Phoenix, AZ. Quantification of damages to building supply business stemming from property contamination by a previous owner.
- Coffield Ungaretti & Harris, Chicago, IL. Damage assessment for midwestern manufacturing client with respect to groundwater contamination claim by an adjacent property owner.
- Morgan, Lewis & Bockius, Los Angeles, CA. Quantified damages to an industrial property from ground water contamination from an adjacent property.
- Dickstein, Shapiro & Morin, Washington, D.C. Quantified damages to industrial land developer from lost sale due to soil and groundwater contamination from adjacent industrial facility.
- Shughart, Thomson & Kilroy, Kansas City, MO. Estimate diminution of value to large, industrial property due to smelter tailings and lead paint related contamination.
- Paul, Weiss, Rifkind, Wharton & Garrison, New York. Review documents pertaining to diminution of value to resort property affected by petroleum spill.
- Arnold & Porter, Los Angeles, CA. Evaluated diminution of value claims for an industrial property in the Long Beach area.
- McCarter & English, Newark, NJ. Quantified damages to industrial property due to soil contamination.
- Graham & James, Los Angeles, CA. Quantified damages to a property in Los Angeles resulting from a leaking UST.
- Powell, Goldstein, Frazer & Murphy, Atlanta, GA. Evaluated diminution of value claims for industrial property in South Carolina.
- Smith, Gill, Fisher & Butts, Kansas City, MO., and Whitman, Breed, Abbott & Morgan, Newark, NJ. Evaluated diminution of value claims for residential property in the Midwest.
- Jackson, DeMarco & Peckenpaugh, Irvine, CA. Evaluated diminution of value claims for industrial property in Southern California.
- Shaw, Pittman, Potts & Trowbridge, Washington, DC. Evaluated diminution of value claims for industrial property in Colorado.
- Day, Berry & Howard, Hartford, CT. Evaluated diminution of value claims for industrial property in Connecticut.
- Howrey & Simon, Washington, DC. Quantified damages to a property in Virginia due to soil and groundwater contamination.
- Paul, Hastings, Janofsky & Walker, Washington, DC. Quantified damages to a property in Orange County, California.
- Jones, Day, Reavis & Pogue, Los Angeles, CA. Analyzed property value diminution due to soil contamination at a manufacturing and warehousing facility in central Los Angeles.

- McClintock, Weston, Benshoof, Rochefort, Rubalcava & MacCuish, Los Angeles, CA. Analyzed residential market conditions relative to a damages claim at a large mixed-use property in Riverside County, CA.
- McClintock, Weston, Benshoof, Rochefort, Rubalcava & MacCuish, Los Angeles, CA. Analyzed property value diminution claims for an office/industrial property in Sunnyvale, CA affected by petroleum and VOC contamination.
- Union Pacific Railroad Company. Investigated diminution in value claims associated with commercial property in Riverside County, CA affected by lead contamination.

Valuation of Hazard Impacted Property

- U.S. Nuclear Regulatory Commission. Assessed the full range of economic damages associated with the accident at Three Mile Island.
- Latham & Watkins and Fadem & Douglas, Los Angeles, CA. Produced evidence for Howard Hughes Properties with respect to damages stemming from proximity to a major, high-pressure, interstate gas transmission line.
- Nevada Nuclear Waste Project Office. Project director for the State of Nevada for a five year, $8 million study of the effects of a proposed high level nuclear waste repository on the State of Nevada.

Natural Resource Damage Assessment

- State of Wisconsin – Provided technical oversight for Fox River NRDA.

Eminent Domain

- U.S. Attorney's Office, Phoenix. Analyzed highest and best use for lands surrounding Lake Pleasant, north of Phoenix.
- Burch & Cracciolo, Phoenix. Provided testimony on behalf of landowner whose property was taken for a city hall expansion.
- City of Chandler. Provided testimony with respect to highest and best use and market value of a small office building in the redevelopment area of Chandler, Arizona.
- Fadem & Douglas, Los Angeles. Provided evidence with respect to master-planned community from which land was taken for a recreation area and reservoir.
- US Attorney’s Office, Phoenix, AZ. Impact of transmission lines on residential property.
- Nevada Attorney General. Prepared evidence relating to the highest and best use of a large commercial parcel that was partially taken for purposes of highway improvement.
- Fadem & Douglas, Los Angeles. Valued abandoned railroad ROW in Manhattan Beach, California in the context of inverse condemnation action.
- Lewis, Babcock & Hawkins, Columbia, S.C. Prepared testimony with respect to master planned community on Hilton Head Island impacted by freeway alignment.

- U.S. Attorney's Office, Salt Lake City. Prepared market, financial feasibility and highest and best use evidence in several cases stemming from the creation of the Jordanelle reservoir.
- Arizona Attorney General. Provided testimony with respect to development timing and highest and best use on lands impacted by freeway development.
- Michigan Department of Transportation. Prepared evidence to support litigations in the M-59 corridor, northeast of Detroit.
- Northeast Utilities. Impact of 345 kV transmission lines on residential property values.

PROFESSIONAL AND BUSINESS HISTORY

Chalmers & Associates, LLC, Principal, 7/02 to present.

PricewaterhouseCoopers LLP, Principal, Financial Advisory Services. 7/98 to 6/02.

Coopers & Lybrand L.L.P. Principal, Financial Advisory Services. 1990 to 6/98.

Mountain West: 1974 to 1989. President and Economic Consultant.

Arizona State University: 1972 to 1979. Faculty of Economics, College of Business.

Rockefeller Foundation: 1970 to 1972. Special field staff at Thamasatt University, Bangkok, Thailand.

Amherst College: 1966 to 1970. Faculty of Economics.

TESTIMONY

I. COURT

Alabama Circuit Court
- Jefferson County

Arizona Superior Court
- Coconino County
- Maricopa County
- Pima County

California Superior Court
- Contra Costa County
- Los Angeles County
- Santa Clara County

Colorado District Court
- Adams County
- Eagle County

England, High Court of Justice, Queen's Bench Division

Florida Circuit Court
- Charlotte County

Georgia Superior Court
- Cobb County

Georgia State Court
- Fulton County

Louisiana District Court
Parish of Calcasieu
Massachusetts Superior Court
Essex County
Missouri Circuit Court
Jackson County
New Jersey Superior Court
Passaic County
United States District Court
Anchorage, Alaska
Baltimore, Maryland
Charleston, South Carolina
Las Vegas, Nevada
Los Angeles, California
Rome, Georgia
Salt Lake City, Utah
Southern Division, District of Maryland
Southern District of New York
Virginia Circuit Court
Loudoun County

II. OTHER

California Energy Commission
Connecticut Siting Council
Contra Costa County, California
Board of Supervisors
Fairfax County, Virginia
Board of Equalization
Nevada Commission on Nuclear Projects

CERTIFICATIONS

Arizona: General Real Estate Appraiser #30487
New Jersey: Certified General Appraiser #42RG00193400
New Hampshire: Certified General Appraiser #NHCG-878

PUBLICATIONS

Books Published

One Hundred Centuries of Solitude - Redirecting America's High-Level Nuclear Waste Policy (with James Flynn, Doug Easterling, Roger Kasperson, Howard Kunreuther, C.K. Mertz, Alvin Mushkatel, K. David Pijawka and Paul Slovic) Westview Press (1995).

Economic Principles: Macroeconomic Theory and Policy (with Fred R. Leonard) MacMillan (1971).

Selected Articles Published

"Transmission Line Impacts on Rural Property Value", Right of Way, May/June 2012; 32-36.

"High Voltage Transmission Lines and Rural, Western Real Estate Values", The Appraisal Journal, Winter 2012: 30-45.

"High Voltage Transmission Lines: Proximity, Visibility and Encumbrance Effects", The Appraisal Journal, Vol. 77, No. 3, Summer 2009; 227-245.

"Recent Developments in Natural Resource Damage Claims: Smoke or Fire?" (with Suzanne M. Stuckwisch), Environmental Compliance & Litigation Strategy, Vol. 15, No. 10, March 2000.

"Creating Value--and Profits--from Contaminated Real Estate" (with William V. Trefethen), Workouts & Asset Management, Vol. 5, No. 1, October 1996.

"Risk Factors in the Appraisal of Contaminated Property" (with Thomas O. Jackson), The Appraisal Journal, Vol. 64, No. 1, January 1996; 44-58.

"The Emerging Market in Contaminated Real Property," California Environmental Compliance Monitor, Vol. 5, No. 24, 320-322, October 16, 1995.

"Quantifying Contamination's Effects on Residential Property Values" (with Sue Ann Adams), Environmental Compliance & Litigation Strategy, September 1995; 4-6.

"Valuation Issues - Assessing Value of Environmentally Impaired Properties" (with Jeffre Beatty and Robert Ecker), as a chapter in Environmental Aspects of Real Estate Transactions, published by the ABA Section of Natural Resources, Energy and Environmental Law, 1995.

"Supporting Appropriate Adjustments in Large Scale Condemnation Actions" (with Daniel Sorrells), The Appraisal Journal, October 1994.

"Property Value Diminution: Residential and Commercial Cases Demand Different Approaches" (with Jeffre B. Beatty), Environmental Compliance & Litigation Strategy, February 1994; 4-7.

"Issues in the Valuation of Contaminated Property" (with Scott A. Roehr), The Appraisal Journal, Vol.61, No.1, January 1993; 28-41.

"Perceived Risk, Stigma, and Potential Economic Impacts of a High-Level Nuclear Waste Repository in Nevada" (with Paul Slovic et al), Risk Analysis, Vol. II, No. 4, 1991; 683-696.

"A Methodology for Valuing Contaminated Property" (with Steve Pritulsky, Scott Roehr, and Dan Sorrells), Land Rights News, November 1991.

"Contributions of Real Estate Economics to Right-of-Way Acquisition and Valuation" (with S. Pritulsky and D. Sorrells), Right-of-Way, June 1991; 8-13.

"Impacts of Nuclear Generating Plants on Local Areas" (with D. Pijawka), Economic Geography, Vol. 59, No. 1, January 1983; 66-80.

"Evaluation of Underutilized Resources in Water Resource Development" (with J.R. Threadgill), Water Resources Research, 1981.

"Integrating Planning and Assessment through Public Involvement" (with James L. Creighton and Kristi Branch), Environmental Impact Assessment Review, Vol. 1, No. 4; 349-353, April 1981.

"An Empirical Model of Spatial Interaction in Sparsely Populated Regions" (with E.J. Anderson, T. Beckhelm, and W. Hannigan), International Regional Science Review, Vol. 3, No. 1, Fall 1978.

"Some Thoughts on the Rural to Urban Migration Turnaround" (with M.J. Greenwood), International Regional Science Review, Vol. 2, No. 2, Spring 1978.

"The Role of Spatial Relationships in Assessing Social and Economic Impacts of Large-Scale Construction Projects," National Resources Journal, Vol. 17; 209-222, April 1977.

"Shift and Share and the Theory of Industrial Location" (with T. Beckhelm), Regional Studies, Vol. 10; 15-23, 1976.

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