Appendix AJ

Economic Impact of the Merrimack Valley Reliability Project, REMI Analysis of Construction Spending and Property Taxes, June, 2015

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Economic Impact of the Merrimack Valley Reliability Project

REMI Analysis of Construction Spending and Property Taxes

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Introduction

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

Methodology

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

REMI Model Overview

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

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

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

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

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

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

Project Expenditures

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

Of the total $122.9 million in project spending, $91.2 million is allocated to labor and $31.7 million to materials. For New Hampshire, which accounts for 66% of total spending, $60.7 million is allocated to labor and $21.1 to materials. For Massachusetts, $30.6 million is allocated to labor and $10.6 million to materials. The share of total spending devoted to labor is approximately 74% for both states.

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

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

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

	2014	*2015*	*2016*	*2017*	Total
Labor: Planning thru Construction					
Hillsboro NH	$0.4	$1.4	$7.1	$20.5	$29.3
Rockingham NH	$0.8	$1.6	$6.1	$22.9	$31.4
NH Total	$1.1	$3.0	$13.2	$43.4	$60.7
Essex MA	$0.0	$0.2	$1.0	$2.8	$4.0
Middlesex MA	$0.2	$1.1	$6.1	$19.1	$26.5
MA Total	$0.3	$1.3	$7.1	$21.9	$30.6
Total Project Labor	**$1.4**	**$4.3**	**$20.3**	**$65.2**	**$91.2**
Materials and Equipment					
Hillsboro NH	$0.0	$0.0	$2.2	$7.1	$9.4
Rockingham NH	$0.0	$0.0	$2.8	$8.9	$11.7
NH Total	$0.0	$0.0	$5.0	$16.1	$21.1
Essex MA	$0.0	$0.0	$0.3	$0.9	$1.2
Middlesex MA	$0.0	$0.0	$1.8	$7.6	$9.4
MA Total	$0.0	$0.0	$2.1	$8.6	$10.6
Total Project Materials	**$0.0**	**$0.0**	**$7.1**	**$24.6**	**$31.7**
Total Project Spending					
Hillsboro NH	$0.4	$1.4	$9.4	$27.6	$38.7
Rockingham NH	$0.8	$1.6	$8.9	$31.8	$43.1
NH Project Total	$1.1	$3.0	$18.2	$59.4	$81.7
Essex MA	$0.0	$0.2	$1.3	$3.7	$5.3
Middlesex MA	$0.2	$1.1	$7.8	$26.7	$35.9
MA Project Total	$0.3	$1.3	$9.2	$30.4	$41.2
Project Grand Total	**$1.4**	**$4.3**	**$27.4**	**$89.8**	**$122.9**

Source: Eversource and National Grid current spending projections.

Construction Phase Benefits

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

Allocation of Expenditures to Industries

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

Going forward, the 2015 amount of spending on professional services, $4.3 million, continues through 2016 to 2017 as construction begins and spending ramps up. The remaining amount of labor spending, $77.0 million, is allocated to the power and communication structures construction industry with 5.0% allocated to waste management and remediation services, based on prior transmission project experience.

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

Industry	***2014***	***2015***	***2016***	***2017***	Total
Professional Services					
New Hampshire	$1.1	$3.0	$3.0	$3.0	$10.0
Essex MA	$0.0	$0.2	$0.2	$0.2	$0.6
Middlesex MA	$0.2	$1.1	$1.1	$1.1	$3.6
Total	$1.4	$4.3	$4.3	$4.3	**$14.2**
Power and Communication Structures Construction					
New Hampshire	$0.0	$0.0	$9.6	$38.2	$47.8
Essex MA	$0.0	$0.0	$0.8	$2.4	$3.2
Middlesex MA	$0.0	$0.0	$4.6	$17.0	$21.6
Total	$0.0	$0.0	$15.0	$57.7	**$72.7**
Waste Management and Remediation Services					
New Hampshire	$0.0	$0.0	$0.7	$2.2	$2.8
Essex MA	$0.0	$0.0	$0.1	$0.1	$0.2
Middlesex MA	$0.0	$0.0	$0.3	$1.0	$1.3
Total	$0.0	$0.0	$1.0	$3.3	**$4.3**
Electrical Apparatus					
New Hampshire	$0.0	$0.0	$3.8	$12.0	$15.8
Essex MA	$0.0	$0.0	$0.2	$0.7	$0.9
Middlesex MA	$0.0	$0.0	$1.3	$5.7	$7.1
Total	$0.0	$0.0	$5.3	$18.5	**$23.8**
Concrete and Other Materials					
New Hampshire	$0.0	$0.0	$1.3	$4.0	$5.3
Essex MA	$0.0	$0.0	$0.1	$0.2	$0.3
Middlesex MA	$0.0	$0.0	$0.4	$1.9	$2.4
Total	$0.0	$0.0	$1.8	$6.2	**$7.9**
Grand Total	**$1.4**	**$4.3**	**$27.4**	**$89.8**	**$122.9**

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 jobs, income, GDP and tax revenue because this category consists largely of equipment purchased from outside of the state.

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

Construction Phase Impact Study Results

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

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

Calendar Year	*2014*	*2015*	*2016*	*2017*	**Total**
Total					
Employment (job years)	21	61	238	693	**1,013**
Regional GDP ($2015m)	$2.1	$6.2	$29.1	$90.3	**$127.6**
Personal Income ($2015m)	$1.2	$3.6	$14.2	$43.1	**$62.0**
State Tax Revenue ($2015m)	$0.1	$0.2	$0.7	$2.1	**$3.0**
New Hampshire					
Total Employment (jobs)	16	42	145	415	**618**
Regional GDP ($2015m)	$1.5	$3.9	$16.6	$51.6	**$73.5**
Personal Income ($2015m)	$0.8	$2.2	$8.1	$24.0	**$35.1**
State Tax Revenue ($2015m)	$0.0	$0.1	$0.3	$0.9	**$1.3**
Massachusetts					
Total Employment (jobs)	6	20	93	278	**396**
Regional GDP ($2015m)	$0.7	$2.3	$12.4	$38.7	**$54.1**
Personal Income ($2015m)	$0.3	$1.3	$6.1	$19.2	**$26.9**
State Tax Revenue ($2015m)	$0.0	$0.1	$0.4	$1.2	**$1.7**

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

Investment spending is expected raise real GDP by $73.5 million in New Hampshire and $54.1 million in Massachusetts during the four-year planning and construction phase.

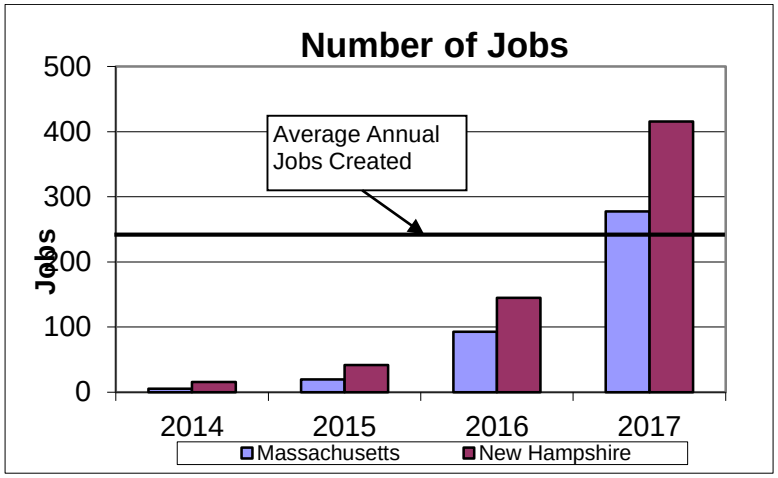
[3] The total number of annual jobs supported over the 2014 to 2017 construction period is also referred to as "job years." A job year is equal to one job for a period of one year.

The impact on real personal income is $35.1 million in New Hampshire and $26.9 million in Massachusetts.

The increase in economic activity is also expected to generate more state tax revenue. This is estimated using 2013 state tax revenues from all sources as a percent of personal income.[4] This yields an effective tax rate on personal income of 3.7% for New Hampshire and a 6.4% for Massachusetts. Applying these percentages to the increase in personal income projected by REMI yields the state tax revenue impacts shown in Figure 3. State tax revenue impacts total $1.3 million for New Hampshire and $1.7 million for Massachusetts during the planning and construction phase.

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

Figure 4 – Job Impacts by State



Because of their close proximity, Massachusetts project spending is expected to impact both the Massachusetts and New Hampshire economies, and vice versa. For example, some labor for the Massachusetts portion of the project may be supplied from New Hampshire, especially since the project takes place in Essex and Middlesex counties, which border southern New Hampshire. Because of these economic linkages, REMI estimates that Massachusetts project spending accounts for 18 annual jobs in New Hampshire. For Massachusetts, New Hampshire project spending adds 84 annual jobs to the total.

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

Employment Impacts by Industry

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

Figure 5 – Employment Impacts by Industry and State

	2014	*2015*	*2016*	*2017*	Total
New Hampshire					
Construction	2	5	50	175	231
Manufacturing	0	0	13	42	55
Wholesale Trade	0	0	2	5	7
Retail Trade	1	3	10	30	44
Transportation and Warehousing	0	0	1	3	5
Finance, Insurance, Real Estate	1	4	7	15	27
Professional Services	8	21	27	42	98
Administrative and Waste Mgt	0	1	6	17	24
Accommodation and Food Services	0	1	4	11	16
Other Services	2	6	25	73	106
Mining and Utilities	0	0	1	2	4
Total New Hampshire	**16**	**42**	**145**	**415**	**618**
Massachusetts					
Construction	0	2	19	64	85
Manufacturing	0	0	12	43	56
Wholesale Trade	0	0	2	7	9
Retail Trade	0	1	6	17	24
Transportation and Warehousing	0	0	1	5	6
Finance, Insurance, Real Estate	1	2	7	21	31
Professional Services	2	8	15	34	58
Administrative and Waste Mgt	0	1	7	20	29
Accommodation and Food Services	0	1	3	10	15
Other Services	1	4	19	57	81
Mining and Utilities	0	0	0	1	2
Total Massachusetts	**6**	**20**	**93**	**278**	**396**

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

Impacts Per $ Million Spending

Figure 6 shows employment, GDP, personal income and state tax revenue impacts per million dollars of total project spending by state. REMI estimates that each $1.0 million in annual New Hampshire project spending will support 7.6 annual jobs in the State while each $1.0 million of annual spending in Massachusetts will support 9.6 annual jobs in that State. These estimates are in line with other transmission project economic impact studies.[5] Project spending tends to have a relatively greater impact in Massachusetts than New Hampshire because RPCs tend to increase with the size of the region.

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

	New Hampshire	Massachusetts
Job Years	7.6	9.6
GDP	$899,250	$1,313,026
Personal Income	$429,403	$653,855
State Tax Revenue	$15,888	$41,847

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

Economic Impact of Property Taxes

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

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

These property tax revenues are entered into REMI as an increase in local government spending order to estimate their potential economic impact. REMI estimates that a $1,557,550 annual increase in local government spending in New Hampshire will lead to the creation of 34 annual jobs, including direct, indirect and induced jobs. A $794,300 annual increase in local government spending in Massachusetts will lead to the creation of 13 annual jobs. Like the property tax revenues themselves, these impacts are expected

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

to gradually diminish over time as the equipment depreciates. Figure 7 summarizes the projected first year annual economic impact due to increased property tax revenue to local governments.

Figure 7 – Impact of Increased Property Tax Revenue

	New Hampshire	Massachusetts
Increased Property Tax Revenue	$1,557,550	$794,300
Annual Jobs Created	34	13
Personal Income ($2015)	$1,800,000	$844,000

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

Other Long-Term Economic Impacts

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

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

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

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