Macroeconomic Impacts of Rhode Island Energy Efficiency Investments

REMI Analysis of National Grid's Energy Efficiency Programs

National Grid Customer Department

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EXECUTIVE SUMMARY

This study quantifies the macroeconomic impacts of National Grid's 2014 Energy Efficiency (EE) Program Plan for Rhode Island and provides updated economic impact multipliers to quantify the benefits of future EE programs in the Rhode Island economy. National Grid and the Energy Efficiency Resource Management Council (EERMC) currently use multipliers from an economic impact study conducted by Environment Northeast (ENE) in 2009[1]. The ENE Study did not address Combined Heat and Power (CHP) projects, which have since become incorporated into Rhode Island's EE plans. Therefore, this study also provides estimates of the economic development benefits of CHP projects.

National Grid and its customers will invest $112.5 million on EE electric and gas measures in Rhode Island under the 2014 Plan, as shown in Table ES-1[2]. This will create jobs in construction and other industries as EE materials and equipment are purchased and installed in homes and businesses. Once implemented, the EE measures will provide net cost savings (energy and non-energy) to customers over the fourteen-year life of the program. This will increase economic activity, incomes and employment in Rhode Island over the long-term. These economic impacts are estimated using the policy forecasting model by Regional Economic Models, Incorporated (REMI) as the difference between a base case with no EE program spending and the case with 2014 EE Plan spending[3]. Thus, all economic impacts greater than zero are attributable to the Plan. Both the ENE Study and National Grid used the REMI model to estimate the economic impact of Rhode Island EE program plans in this way.

Table ES-1
2014 Energy Efficiency Investment Spending ($m)

ELECTRIC	RESIDENTIAL	C&I	TOTAL
Program Budget	$33.7	$34.8	$68.5
Customer Contribution	$6.8	$9.3	$16.1
Total Electric	$40.6	$44.1	$84.64
GAS	RESIDENTIAL	C&I	TOTAL
Program Budget	$14.2	$8.2	$22.4
Customer Contribution	$3.2	$2.2	$5.4
Total Gas	$17.4	$10.4	$27.8
Total Electric and Gas	$58.0	$54.5	$112.5

Table ES-2 below shows the economic impact of the above spending targets based on REMI estimates. The 2014 Plan is expected increase employment by a total of 3,607 job years in Rhode Island over the next fourteen years (a "job year" is equal to one full-time job for a period of one year). Also, the Plan is expected to add $331 million to state gross domestic product (GDP), $224 million to personal income and $15 million to state

[1] Jamie Howland, Derek Murrow, Lisa Petraglia and Tyler Comings, "Energy Efficiency: Engine of Economic Growth, A Macroeconomic Modeling Assessment," Environment Northeast, October 2009 (referred to herein as the "2009 ENE Study" or "ENE Study").
[2] The Toray Plastics (America), Inc. Combined Heat and Power (CHP) project was removed from this analysis as this study examines the economic impacts of CHP separate from EE. Residential includes income eligible customers.
[3] REMI is owned by Regional Economic Models, Incorporated and leased to its clients. See www.remi.com for model description, applications, client lists and documentation.

tax revenue. This equates to an average annual impact of 258 jobs, $24 million in GDP, $17 million in personal income and $1.1 million in state tax revenue over the next fourteen years. These are net economic gains, after all program and participant costs have been paid.

Table ES-2, 2014 EEPP Net Economic Benefits

PROGRAM LIFETIME IMPACT (2014-2027)	ELECTRIC	NATURAL GAS	TOTAL
Job Years	3,093	514	3,607
GDP ($2014m)	$287	$44	$331
Personal Income ($2014m)	$211	$33	$244
State Tax Revenue ($2014m)	$13	$2	$15

AVERAGE ANNUAL IMPACT (2014-2017)	ELECTRIC	NATURAL GAS	TOTAL
Jobs	221	37	258
GDP ($2014m)	$20.5	$3.1	$24
Personal Income ($2014m)	$15.0	$2.4	$17
State Tax Revenue ($2014m)	$0.9	$0.1	$1.1

A major objective of the National Grid Study is to update the ENE spending multipliers to quantify the benefit of future EE Plans to the Rhode Island economy. In its 2009 study, ENE estimated that every $1.0 million in electric EE program spending in Rhode Island would create 36.2 job years while every $1.0 million in gas EE spending would create 38.5 jobs years. ENE also estimated impacts on Rhode Island GDP, output, value added and income.

However, changes in EE program benefits and costs since 2009 imply that these spending multipliers have changed. First, there has been a significant decline in natural gas prices, leading to lower benefit cost ratios for gas EE programs. This implies fewer economic benefits for every dollar spent on gas EE programs. Second, program offerings have evolved with changes in technology and markets. As a result, the distribution of spending, benefits and costs between residential and commercial and industrial (C&I) customers differs from what was assumed in the ENE Study. Since costs and benefits to C&I customers tend to have a larger economic impact than to residential customers, this also implies a change in the amount of economic benefits for every EE dollar spent. Benefit cost ratios can also change over time due to changes in technology, markets and program offerings, causing spending multipliers to change.

Table ES-3 below provides a comparison of the updated spending multiplier estimates on employment and GDP to those found in the ENE Study. These multipliers include the impact of program and participant spending, lifetime benefits, and program and participant costs.

Updated electric spending multipliers are higher than those from the ENE Study. Benefit cost ratios are close, but the 2014 electric plan has a higher share of C&I participants in total benefits and a lower share of C&I participants in total costs, implying a larger economic impact for every EE dollar spent. Updated gas spending multipliers are lower than the ENE Study. This is due to the drop in natural gas prices since 2009, which has reduced the benefit cost ratio of gas EE programs. In addition, the 2014 EE gas plan has a lower share of C&I participants in total benefits and a higher share of C&I participants in total costs compared to the ENE Study.

Table ES-3
COMPARISON OF RESULTS TO 2009 ENE STUDY

	Job Years / $ Million			GDP / $		
	Electric	Gas	Total	Electric	Gas	Total
2014 EE Program Plan Study						
Program Spending / Budget	45.1	23.0	39.7	4.2	1.9	3.6
Pgm and Part Spending / Pgm Cost	36.5	18.5	32.1	3.4	1.6	2.9
2009 ENE Study						
Program Spending / Budget	36.2	38.5	37.4	4.0	4.4	4.2
Pgm and Part Spending / Pgm Cost	27.0	25.5	26.3	3.0	2.9	3.0

Combined Heat and Power

The ENE Study did not address Combined Heat and Power (CHP) projects which have since become incorporated into Rhode Island's EE plans. CHP projects involve the installation of equipment to generate electricity and capture waste heat for productive uses such as facility heating and cooling. CHP projects must pass a benefit cost test to be included in National Grid's EE Plan, but economic development benefits may be included in the test. CHP economic benefits result from spending to install cogeneration equipment (positive construction impacts) and from energy cost savings to program participants, net of participant and ratepayer costs. National Grid and the EERMC currently use a rate of economic development benefit of $2.51 of lifetime GDP increase per dollar of CHP program investment. This multiplier was estimated by adjusting EE program multipliers from the 2009 ENE study to reflect the lower benefit cost ratios of most CHP projects.

However, given the inherent differences between EE and CHP projects, National Grid and the EERMC requested this study to determine a CHP multiplier based on actual spending, benefit and cost data from typical CHP projects. Massachusetts CHP data was used because it has a longer history with more projects than Rhode Island. In fact, Rhode Island currently has only one CHP project, Toray Plastics (America), Incorporated, which is much larger and somewhat atypical of most CHP projects.

Benefit, spending and cost data for six representative Massachusetts CHP projects are shown in Table ES-4. These are cogeneration projects in which gas-fired equipment is installed to simultaneously generate electricity and useful heat.

Table ES-4

MA Combined Heat and Power Project Data					
Number of Projects	6	**Project Spending**		**CHP Project Costs**	
Benefit Cost Ratio	1.92	Incentive	$1,565,250	Incentive	$1,565,250
Measure Life	20	Customer	$4,703,370	Customer	$4,703,370
Total Benefits	**$12,042,883**	**Total Spending**	**$6,268,620**	**Total Costs**	**$6,268,620**

Total benefits in Table ES-4 are lifetime electricity and heating cost savings, net of increased natural gas and O&M costs needed to run the cogenerating equipment. Spending consists of National Grid's incentive payment and customer contributions to purchase and install the CHP systems. Costs are equal to spending to purchase and

install the CHP systems, before federal tax credit and other state incentives.[4] The average lifetime of the CHP projects is 20 years and the average benefit cost ratio is 1.92.

CHP economic benefits are estimated using the REMI model for Rhode Island and the Massachusetts CHP data shown in Table ES-4. Results are summarized in Table ES-5 below as job year, GDP and income multipliers on total CHP program and participant spending. The multipliers reflect net CHP economic benefits after all costs have been taken into account, including the cost of fuel switching.

Table ES- 5
Combined Heat and Power Economic Benefits
Multipliers on Total Program and Participant Spending

Job Years / $m	**28.0**
GDP / $	**2.73**
Personal Income / $	**2.0**

At $2.73, the GDP multiplier on total CHP spending is close to the current estimate of $2.51 used by the EERMC. However, it is significantly higher than the GDP multiplier on total gas EE program spending shown in Table ES-3 above, $1.60. This is because low natural gas prices have reduced the value of energy savings from gas EE programs and hence the economic impact per dollar of gas EE program and participant spending. On the other hand, lower gas prices have increased cost savings that CHP programs bring to participants from switching to gas-fired cogeneration to provide electricity and heat. Moreover, Table ES-4 shows that the average measure life of the CHP programs is 20 years, which is 6 years more than the 14 year measure life of the gas EE programs, increasing CHP lifetime benefits relative to gas EE programs. Both factors lead to a higher benefit cost ratio for the representative Massachusetts CHP programs than for the gas EE programs.

[4]CHP projects in both Massachusetts and Rhode Island qualify for the federal investment tax credit. State incentives include the monetized value of renewable energy credits associated with electricity generated from CHP projects.