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.

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. This is because 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.

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 credits 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.

INTRODUCTION

National Grid has been implementing energy efficiency (EE) programs in Rhode Island since 1987. These programs produce benefits long after all program and participant costs have been paid as measure lifetimes are in the 12 to 15-year range. In addition to electricity and gas savings, the programs provide other benefits such as reduced oil and water consumption, lower operation and maintenance costs, increased productivity and lower emissions. While the above benefits are the driving force behind National Grid's EE programs, there are also significant economic development benefits that make them even more valuable.

Macroeconomic Impacts of Energy Efficiency Programs

Energy efficiency programs impact the local economy in three ways. First, program and participant spending represents a direct investment in Rhode Island EE infrastructure. This creates jobs in construction and other industries as the programs are planned, and materials and equipment are purchased and installed. This is known as the "construction impact," taking place during "construction phase" of the Plan. The full impact is typically felt in the single year that the EE investment is made and the program is implemented.

Second, program savings to residential and business customers have positive economic impacts over the life of the EE measures. Residential savings put more money in consumer's pockets, boosting spending on local goods and services. This leads to more activity and hiring, especially in service sector industries such as retail. Commercial and industrial (C&I) cost savings increase regional competitiveness, allowing firms to sell more in competitive markets. This leads to increased output and hiring.

Third, rate increases and customer contributions needed to pay for the measures raise business costs and reduce consumer spending on other goods and services, lowering EE program economic benefits. This is a short-term impact. Program costs are paid for in a single year by the energy efficiency program charge to all electric and gas customers. Customer costs are usually paid off in 1 to 3 years.

Methodology

The total economic impact of EE programs equals the sum of the program and participant spending (construction phase), savings and cost impacts. The sections below explain how each of these economic impacts are estimated in REMI for both the 2014 EEPP and for the representative CHP projects. The final section summarizes results for each of these economic impacts and adds them up to obtain the total impacts shown in the Tables ES-2, ES-3 and ES-5 of the Executive Summary. The final section also explains how use of multipliers on the individual economic impacts of EE programs and CHP projects may provide a more robust evaluation of future plans than the use of total spending multipliers only.

Estimating Construction Impacts

To estimate EE program construction impacts, program and participant spending is entered into REMI as an exogenous increase in final demand in the industries where the money is expected to be spent. Allocation of residential and C&I spending to these

industries is taken from the ENE Study[5]. This includes separate allocations for program and participant spending by customer segment, residential and C&I.

EE spending by industry is shown on Table 1. Although most spending is expected to take place in the construction industry, a significant amount of spending is also expected in machinery manufacturing, which includes heating, ventilation and air conditioning equipment, as well as commercial refrigeration equipment; electrical equipment manufacturing, which includes lighting fixtures and appliances; professional services, which includes planning and engineering; retail trade, and utilities.

Table 1
ELECTRIC AND GAS, PROGRAM AND PARTICIPANT SPENDING, BY RI INDUSTRY

	Electric					Gas					Total
	Program		Participant		Electric	Program		Participant		Gas	Elec & Gas
	Res	C&I	Res	C&I	Total	Res	C&I	Res	C&I	Total	Total
Wood Products	$0.3	$0.0	$0.1	$0.0	$0.4	$0.1	$0.0	$0.0	$0.0	$0.2	$0.6
Nonmetallic mineral product mfg	$0.3	$0.3	$0.1	$0.1	$0.8	$0.1	$0.1	$0.0	$0.0	$0.3	$1.0
Paper	$0.7	$0.0	$0.1	$0.0	$0.8	$0.3	$0.0	$0.1	$0.0	$0.3	$1.2
Machinery mfg	$1.0	$3.3	$0.2	$1.0	$5.5	$0.4	$0.8	$0.1	$0.2	$1.5	$7.0
Computer, electronic prod mfg	$0.3	$1.0	$0.1	$0.3	$1.7	$0.1	$0.2	$0.0	$0.1	$0.5	$2.2
Electrical equip, appliance mfg	$0.7	$3.8	$0.1	$1.1	$5.8	$0.3	$0.9	$0.1	$0.3	$1.5	$7.3
Plastics, rubber prod mfg	$0.7	$0.6	$0.1	$0.1	$1.5	$0.3	$0.1	$0.1	$0.0	$0.5	$2.0
Wholesale trade	$0.3	$0.7	$0.1	$0.2	$1.3	$0.1	$0.2	$0.0	$0.0	$0.4	$1.7
Construction	$20.9	$18.2	$4.8	$5.5	$49.3	$8.8	$4.3	$2.3	$1.3	$16.6	$66.0
Retail	$5.1	$0.0	$1.2	$0.0	$6.2	$2.1	$0.0	$0.5	$0.0	$2.7	$8.9
Prof. Services	$1.3	$4.9	$0.0	$1.0	$7.2	$0.6	$1.1	$0.0	$0.2	$2.0	$9.2
Utilities	$2.0	$2.1	$0.0	$0.0	$4.1	$0.9	$0.5	$0.0	$0.0	$1.3	$5.5
Total	$33.7	$34.8	$6.8	$9.3	**$84.6**	$14.2	$8.2	$3.2	$2.2	**$27.8**	**$112.5**

Direct, Indirect and Induced Impacts

Jobs created during the construction phase of EE programs result from the direct, indirect and induced impact of EE investment spending. Direct impacts are tied directly to the program, for example, the number of contractors hired to install efficiency measures in businesses and homes, as well as program administrators. Indirect impacts are felt in the local supply chain, that is, industries providing goods and services for the projects. 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 total economic impact of EE spending during the construction phase is the sum of the direct, indirect and induced impacts. REMI estimates the total impact of EE spending, including the direct, indirect and induced impacts, but does not disentangle them.

Construction Phase Economic Impact Results

Table 2 shows the total economic impact of EE spending during the construction phase. Job year, GDP and income impacts shown are for the program and participant spending targets in Table ES-1 of the Executive Summary, above. REMI estimates that the $112.5 million spending plan will create 1,044 job years in Rhode Island in 2014, before

[5] 2009 ENE Study, Appendix 1.

program and participant costs are taken into account. This amounts to 9.3 job years for every $1 million of EE program and participant spending, including the direct, indirect and induced impacts.

This is independent of the job years created as a result of the program benefits, such as energy cost savings, which are discussed below. The 2014 impact on Rhode Island GDP and real personal income is $72.6 million and $51.6 million, respectively.

Table2

SUMMARY OF 2014 CONSTRUCTION IMPACTS

Jobs Impact	Electric		Natural Gas		Total	
	Job Years	Job Yrs / $m Spending	Job Years	Job Yrs / $m Spending	Job Years	Job Yrs / $m Spending
Program Spending	623	9.1	212	9.5	835	9.2
Participant Spending	155	9.6	55	10.1	209	9.7
Total	777	9.2	267	9.6	1,044	9.3

GDP Impact ($2014m)	Electric		Natural Gas		Total	
	GDP	GDP / $ Spending	GDP	GDP / $ Spending	GDP	GDP / $ Spending
Program Spending	$43.6	0.6	$14.8	0.7	$58.4	0.6
Participant Spending	$10.6	0.7	$3.7	0.7	$14.3	0.7
Total	$54.1	0.6	$18.5	0.7	$72.6	0.6

Personal Income Impact ($2014m)	Electric		Natural Gas		Total	
	Income	Income / $ Spending	Income	GDP / $ Spending	Income	GDP / $ Spending
Program Spending	$30.9	0.5	$10.4	0.5	$41.3	0.5
Participant Spending	$7.6	0.5	$2.7	0.5	$10.3	0.5
Total	$38.5	0.5	$13.1	0.5	$51.6	0.5

Estimating the Impact of Program Savings

EE program cost savings to businesses and consumers include the value of reduced electricity and gas consumption (including avoided transmission and distribution costs and capacity savings associated with reduced energy consumption), other fossil fuel savings, water savings and non-energy savings, such as reduced O&M costs and productivity improvements. As discussed above, these savings boost local purchasing power and increase regional competitiveness, leading to increased economic activity and employment.

To estimate their economic impact, residential cost savings are entered into REMI as a consumption reallocation increase and spread to Rhode Island counties based on population. C&I cost savings are entered as a production cost decrease and spread to Rhode Island C&I industries based on output. The savings amounts themselves are taken as lifetime benefits from the Total Resource Cost test performed for the 2014 EE Plan, net of the discount rate. These savings amounts, presented in Table 3 below, are

divided equally among measure life years, 2014 through 2027, and entered into REMI in 2014 dollars.

Table 3

ELECTRIC AND GAS PROGRAM SAVINGS BY CUSTOMER SEGMENT

($2014M)

	Electric	Gas	Total
Residential	$80.5	$29.5	$110.0
C&I	$178.4	$20.4	$198.8
Total	$258.9	$49.9	$308.8

Source: RI Energy Efficiency Program Plan for 2014, Table E-6 and G-6 (net of discount rate). Includes the value of own fuel savings, other fuel savings, water savings and non energy savings from the 2013 Avoided Cost Study. Excludes Toray Benefits.

Estimated employment impacts due to EE program savings are shown in Table 4, totaling 3,253 job years over the lifetime of the measures. This is a subset of the total employment impact of the 2014 Plan presented in Table ES-2, 3,607 job years, which includes the construction phase impacts discussed in the previous section and the negative economic impact of program and participant costs, discussed below. Table 4 also summarizes the impact of lifetime cost savings on GDP and income. The multipliers show impacts per dollar of savings. For example, each $1.0 million in total residential and C&I lifetime savings is estimated to create 10.5 job years. Each $1.0 of total savings creates $1.0 of GDP and raises personal income by $0.7. Note that the multipliers in Table 5 are on the dollar value of program *savings* not program *spending.*

Table 4

ELECTRIC AND GAS PROGRAM SAVINGS -- ECONOMIC BENEFITS (BEFORE COSTS)

Employment Impacts	Electric		Natural Gas		Total	
	Job Years	Job Yrs / $m Savings	Job Years	Job Yrs / $m Savings	Job Years	Job Yrs / $m Savings
Residential Savings	363	4.5	135	4.6	499	4.5
C&I Savings	2,474	13.9	281	13.8	2,754	13.9
Total	2,837	11.0	416	8.3	3,253	10.5

GDP Impact ($2014m)	Electric		Natural Gas		Total	
	GDP	GDP / $ Savings	GDP	GDP / $ Savings	GDP	GDP / $ Savings
Residential Savings	$28.9	0.4	$10.8	0.4	$39.7	0.4
C&I Savings	$247.2	1.4	$28.1	1.4	$275.3	1.4
Total	$276.1	1.1	$38.9	0.8	$315.0	1.0

Personal Income Impact ($2014m)	Electric		Natural Gas		Total	
	Income	Income / $ Savings	Income	Income / $ Savings	Income	Income / $ Savings
Residential Savings	$21.3	0.3	$8.3	0.3	$29.7	0.3
C&I Savings	$177.2	1.0	$20.0	1.0	$197.3	1.0
Total	$198.6	0.8	$28.4	0.6	$226.9	0.7

Impact of Program and Participant Costs

EE program and participant costs to residential and C&I customers have negative economic impacts, reducing the positive economic benefits described above. To estimate the economic impact of 2014 EEPP costs, residential program and participant costs are entered into REMI as a consumption reallocation decrease, while C&I costs are entered as a production cost increase.[6] Results are summarized in Table 6 below. Costs of the 2014 EEPP reduce total economic benefits by 691 job years and $57 million in GDP. This yields the net job year and GDP gains of 3,607 and $331 million, respectively, as shown in Table 6.

CHP Project Impacts

CHP projects have the same kind of economic impacts as EE programs. First, program and participant spending creates jobs in construction and other industries as the projects are planned, and equipment is purchased and installed. However, for CHP projects a large portion of total spending is often used to purchase cogeneration equipment that is produced outside of the region and has no local economic impact. Second, net lifetime energy cost savings to C&I participants lower their business costs, allowing them to sell more into competitive markets. This has a positive impact on local economic activity as these firms are able to increase output and hiring. Third, rate increases to cover the incentive payment and customer contributions to pay for the measures raise business costs, reducing the above benefits. The total economic impact of CHP projects equals the sum of the positive spending and savings impacts and the negative cost impacts.

CHP project economic benefits are estimated based on the Massachusetts CHP data presented in Table ES-4 and the Rhode Island REMI model. CHP project *spending* benefits are estimated by entering 60% of the program (incentive) and participant spending amounts shown in Table ES-4 into REMI as a 2014 exogenous increase in final demand in the construction industry. This is the portion of total CHP spending used to install cogeneration equipment at C&I facilities, based on the Massachusetts CHP data. The remaining 40% of spending is assumed to be used to purchase equipment from outside of the region, as is typical for Massachusetts CHP projects, and is not considered in the analysis.

To estimate the economic impact of CHP energy cost savings to participants, lifetime benefits from Table ES-4 are divided equally among measure life years, 2014 to 2032, and entered into REMI as a production cost decrease, in 2014 dollars. Note that these benefits are lifetime electricity and heating cost savings, net of increased natural gas and O&M costs needed to run the cogenerating equipment.

To estimate the impact of CHP project costs, customer costs from Table ES-4 are entered into REMI as a 2014 production cost increase. Incentive costs from Table ES-4 are split between the residential and C&I customer segments based on the 2014 electric EEPP split of the SBC charge between residential and C&I. The residential portion is entered as a consumption reallocation decrease while the C&I portion is entered as a production cost increase.

[6] Residential and C&I costs were taken from Tables E-1 and G-1 of the 2014 EEPP and are summarized in Table 6 below.

Results are summarized in Table 5 below. Construction spending in Table 5 equals 60% of total CHP project spending from Table ES-4, which is the percent assumed for installation of the CHP equipment. Total savings (lifetime benefits) and total costs are both taken directly from able ES-4. The job year, GDP and income multipliers are applied to these amounts to show estimated Rhode Island economic impacts from the CHP construction spending, savings and costs. These are summed to show the total economic impact that the representative Massachusetts CHP projects would have in Rhode Island, after all costs are taken into account.

Total CHP project spending is divided by the job year, GDP and income totals yielding the total spending multipliers at the bottom of the table and reproduced in Table ES-5 of the Executive Summary. Both GDP and income are in 2014 dollars and "income" is measured as personal income.

Table 5

CHP PROJECT ECONOMIC MULTIPLIERS							
CHP Project Data		Job Years/$m	Job Years	GDP/$	GDP	Income/$	Income
Construction Spending	$3,761,172	12.4	47	0.8	$3,034,363	0.6	$2,244,149
Total Savings	$12,042,883	14.1	170	1.5	$17,568,939	1.1	$12,703,018
Total Cost	$6,268,620	-6.6	-41	-0.5	-$3,506,352	-0.3	-$2,126,284
		Total	175	Total	$17,096,950	Total	$12,820,883
TOTAL SPENDING MULTIPLIERS							
		Jobs/$m	Job Years	GDP/$	GDP	Income/$	Income
Total Spending	$6,268,620	28.0	175	2.73	$17,096,950	2.0	$12,820,883

Summary and Conclusions

This study provides (1) an analysis of the economic impact of the 2014 EEPP; (2) what the economic impact of representative Massachusetts CHP projects would be in Rhode Island; (3) updated spending multipliers for use in evaluating future EE plans and CHP projects in Rhode Island; and (4) a description of how each component of the total EE program and CHP economic impact is estimated.

While the updated spending multipliers in Table ES-3 and ES-5 are appropriate for evaluating the expected economic impact of EE programs and CHP projects with similar benefit cost ratios and program offerings to the 2014 EEPP and representative Massachusetts CHP project data, respectively, these factors could change over time, reducing the accuracy of the total spending multipliers. To avoid this problem, it is preferable to use separate multipliers for each component of the total EE program and CHP economic impact and add them up. This will account for changes in benefit cost ratios and program offerings over time that could result from changes in energy prices, technology and markets.

For CHP projects, multipliers for each component of the total economic impact are shown in Table 5 above. For the 2014 EEPP, these component multipliers are provided below in Table 6. The components are program spending, participant spending, residential benefits, C&I benefits, residential costs and C&I costs, as shown under the heading "EE Program Component." The dollar value of each of these components is shown under the heading "2014 EE Plan ($m)" while corresponding job year and GDP multipliers, by EE program type (electric and gas), are shown to the right of these dollar amounts. Multiply the dollar amount for each EE program component by the

corresponding job year and GDP multiplier to obtain job year and GDP impacts for each component. Add up the resulting job year and GDP impacts on each of these components to get total EE program job year and GDP impacts.[7] Note that total EE spending may be divided by these totals for comparison to the spending multipliers shown in Table ES-3 of the Executive Summary.

Table 6
Economic Impact Multipliers by EE Plan Component

EE Program Component	2014 EE Plan ($m)		Job Years/$ Million		Job Years		GDP / $		GDP ($m)	
	Elec	Gas	Elec	Gas	Elec	Gas	Elec	Gas	Elec	Gas
Program Spending	$68.5	$22.4	9.1	9.5	623	212	0.6	0.7	$43.6	$14.8
Participant Spending	$16.1	$5.4	9.6	10.1	155	55	0.7	0.7	$10.6	$3.7
Sub Total	**$84.6**	**$27.8**	**9.2**	**9.6**	**777**	**267**	**-0.6**	**-0.7**	**$54.1**	**$18.5**
Residential Benefits	$80.5	$29.5	4.5	4.6	363	135	0.4	0.4	$28.9	$10.8
C&I Benefits	$178.4	$20.4	13.9	13.8	2,474	281	1.4	1.4	$247.2	$28.1
Sub Total	**$258.9**	**$49.9**	**11.0**	**8.3**	**2,837**	**416**	**-1.1**	**-0.8**	**$276.1**	**$38.9**
Residential Costs	$35.4	$13.8	-5.4	-5.4	-192	-75	-0.4	-0.4	-$14.6	-$5.7
C&I Costs	$49.3	$14.1	-6.7	-6.7	-330	-94	-0.6	-0.6	-$28.3	-$8.1
Sub Total	**$84.6**	**$27.8**	**-6.2**	**-6.1**	**-522**	**-169**	**0.5**	**0.5**	**-$42.9**	**-$13.8**
				Total	**3,093**	**514**		**Total**	**$287.3**	**$43.7**
				Grand Total		**3,607**		**Grand Total**		**$331.0**

Note: Residential includes income eligible program participants.

Although use of the detailed multipliers in Tables 5 and 6 will take into account short-term changes in energy prices, benefit cost ratios and program offerings, even these estimates should be updated at least every 3-5 years. Multipliers on benefits, costs and spending will change gradually over time with changes in the mix of Rhode Island industries and the responsiveness of businesses and consumers to price changes.

[7] Note that doing this yields the total job year and GDP impacts shown in Table ES-2.