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August 1, 2013

Mark D. Marini, Secretary
Commonwealth of Massachusetts
Department of Public Utilities
One South Station
Boston, MA 02110

Re: Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 13-__

Dear Secretary Marini:

On behalf of Fitchburg Gas and Electric Light Company d/b/a Unitil (“Unitil” or the “Company”), enclosed please find the Company’s 2012 Annual Energy Efficiency Report for the Company’s gas energy efficiency program offerings. This report is being submitted pursuant to the Order in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127 (2010).

Thank you for your attention to this matter. If you have any questions regarding this filing, please do not hesitate to contact me.

Very truly yours,



Kevin F. Penders

Enclosures

cc: Jonathan Goldberg, Hearing Officer
Steven Venezia, Department of Energy Resources
Matthew Saunders, Office of the Attorney General
Jerrold Oppenheim, Low-Income Energy Affordability Network

**THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES**

D.P.U. 13-__

**ON BEHALF OF FITCHBURG GAS AND
ELECTRIC LIGHT COMPANY d/b/a UNITIL**

APPEARANCE OF COUNSEL

In the above referenced proceeding, I the undersigned hereby appear for and on behalf of Fitchburg Gas and Electric Light Company d/b/a Unitil.

Respectfully Submitted,



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Dated: August 1, 2013



*Fitchburg Gas and Electric
Light Company*

Annual Energy Efficiency Report for 2012

Filed with the Massachusetts
Department of Public Utilities and
Department of Energy Resources

August 1, 2013

Fitchburg Gas and Electric Light Company d/b/a Unitil
2012 Energy Efficiency Annual Report

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I. INTRODUCTION

During program year 2012, the final year of implementation under the 2010-2012 three-year energy efficiency plans, the Massachusetts Energy Efficiency Program Administrators¹ (the “Program Administrators” or “PAs”) continued to build on the nationally acclaimed successes of program years 2010 and 2011. Among the many awards and accomplishments achieved during program year 2012, the American Council for an Energy-Efficient Economy (“ACEEE”) ranked Massachusetts number one in the nation for its energy efficiency efforts for the second year in a row.

Most notably in 2012, the PAs successfully delivered on their very ambitious goals for the program year, as reviewed and approved by the Massachusetts Department of Public Utilities (the “Department”) in D.P.U. 09-116 through 09-127 and as submitted in each PA’s 2012 Mid-Term Modification dated October 28, 2011. The PAs were able to attain historic levels of energy savings while maintaining budgetary control and complying with the directive of the Green Communities Act to seek all cost-effective energy efficiency opportunities. The 2012 goals were intentionally designed to be very challenging stretch goals, and achievements in savings and benefits reached unprecedented levels in Massachusetts for residential, low-income, and commercial and industrial (“C&I”) programs. The PAs successfully implemented the programs in the field while also continuing this unprecedented ramp up of spending and savings levels for energy efficiency programs to meet goals not just for program year 2012, but for the full life of the three-year plans, and to sow the seeds for additional savings going forward.

The accomplishments of 2012 were achieved despite a slower than expected recovery in the economy, low natural gas prices, and a significant increase in savings goals. In the wake of these challenges, the PAs continued to proactively work toward developing new delivery methods to reach more customers and to encourage customers to move forward with greater commitments and investments in energy efficiency. For example, during 2012, the PAs focused on refining their marketing approach to achieve deeper savings from participating customers, and worked diligently to reach a broader range of customers to implement all cost-effective program offerings. The PAs also continued to develop new technologies and new initiatives in 2012 in order to expand programming efforts and achieve their goals.

The Program Administrators also continued to engage in very high levels of integration, coordination and cooperation – all of which are hallmarks of the 2010-2012 three-year energy efficiency plan. Examples of this statewide coordination in 2012 include the establishment of consistent guidelines and protocols for delivery of the Voluntary Accelerated Rebate Pilot, which will be implemented in 2013, and continued expansion of upstream product offerings.

In 2012, the Program Administrators created the Evaluation Management Committee (“EMC”) similar to the successful C&I and Residential Management Committees. The EMC, comprised of PA representatives and the Massachusetts Energy Efficiency Advisory Council (“EEAC” or

¹ The Massachusetts Program Administrators are: Bay State Gas Company d/b/a Columbia Gas of Massachusetts, The Berkshire Gas Company, Blackstone Gas Company, Cape Light Compact, Fitchburg Gas and Electric Light Company d/b/a Unitil, National Grid, New England Gas Company, NSTAR Electric Company, NSTAR Gas Company, and Western Massachusetts Electric Company.

“Council”) consultants, serves as a steering committee for statewide evaluation issues. The EMC plans, prioritizes and delineates the research studies to be undertaken. The PAs worked together to engage in 25 studies across a wide span of program sectors in 2012, underscoring the fact that the evaluation, measurement and verification (“EM&V”) of these program offerings remains a critical and vital tool for both Program Administrators and interested stakeholders in an ever changing marketplace.

The Program Administrators also continued to be actively engaged with the EEAC and worked collaboratively with the EEAC’s consultants to meet detailed reporting and data collection deadlines in 2012. The PAs reviewed and expanded upon many areas of policy and reporting, including continuing accurate data development, evaluation and measurement of successes and areas in need of modification, transparent codes and standards, and building the framework necessary to ensure the ability to continue to offer successful and sustainable energy efficiency programs in the Commonwealth.

In addition, the PAs were also at the forefront of creating a culture of sustainability through public education. In May 2012, the PAs hosted an Appreciative Inquiry Summit, the first of its kind for energy efficiency in Massachusetts, which provided a venue for a diverse array of nearly 300 key stakeholders, including customers, civic leaders, contractors, key trade allies, energy efficiency experts, and others to provide the PAs with insights to guide efforts designed to continue to create a culture of sustainability in the Commonwealth. The PAs also hosted an Energy Efficiency Conference and Expo in 2012, which featured a full day of programming focused primarily on business and municipal customers.

Throughout 2012 the PAs continued their efforts to integrate gas and electric energy efficiency services and expand statewide marketing efforts, which, through the use of the Mass Save brand, continued to be an integral part of promoting energy efficiency programs in Massachusetts. The 2012 marketing campaign introduced a renewed, simplified Mass Save message.

Simultaneously with the activities and achievements noted above, the Program Administrators also devoted considerable time and effort in 2012 to developing their 2013-2015 energy efficiency plans. During the 2013-2015 planning process, each PA focused on increasing savings goals and reducing costs, streamlining the participation process in all sectors and realigning outreach and delivery efforts to be more customer-focused, all of which built on the achievements and lessons learned from 2010-2012.

Given the unprecedented nature of these efforts, and the ambitious goals established in the 2010-2012 plans, program year 2012 performance has been an outright success for energy efficiency in Massachusetts. Over the three years of the 2010-2012 energy efficiency plans, the Program Administrators have achieved unprecedented levels of savings and benefits within budget, and look forward to continuing these efforts and achieving additional successes going forward.

A. Purpose of Annual Report

The Company is pleased to provide its Energy Efficiency Annual Report (“Annual Report”) for 2012. The purpose of the Annual Report is to:

- Provide a comparison of the Company’s planned, preliminary year-end, and evaluated (where applicable) expenses, savings, and benefits at the portfolio, sector, and program levels for the program year.
- Identify significant² variances between the Company’s planned and evaluated costs, savings, and benefits for the program year, and discuss reasons for such variances.
- Discuss how program performance during the program year informs the Company’s proposed modifications to program implementation, if any, during upcoming years.
- Describe the EM&V activities undertaken by the Company that have not been included in previous Annual Reports, and explain how the results of the EM&V studies impact program cost-effectiveness.
- Describe the performance incentives that the Company proposes to collect.

B. Organization of Annual Report

The Company’s 2012 Annual Report is organized as follows:

- Section I.C provides summary information on program performance at the portfolio and sector levels.
- Section II provides detailed information on program performance at the sector and program levels for the residential, low-income, and C&I sectors.
- Section III provides detailed information on the EM&V studies included in the Annual Report for each sector.
- Section IV addresses statutory budget requirements.
- Section V addresses the performance incentives the Company proposes to collect.
- Section VI addresses energy efficiency audits conducted during the past five years.
- Section VII consists of Appendices A through F which provide further detailed supporting documentation for this report.

C. Summary of Program Portfolio

The purpose of this section is to provide summary information on program performance at the portfolio and sector levels.

² Unless otherwise noted, “significant” variances are defined throughout this Annual Report as variances of +/-20 percent or more between the stated values.

Tables³ I.A and I.B provide summary information on program performance at the portfolio and customer sector levels, respectively.

Table I.A

Program Portfolio Summary							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 1,202,293			\$ 1,382,820		15%
Performance Incentive	\$	\$ 55,263			\$ 65,558		19%
Savings and Benefits							
Gas							
Lifetime	Th	3,123,209	8,571,250	174%	9,340,908	9%	199%
Annualized	Th	158,752	421,803	166%	469,118	11%	196%
Electric							
Annualized Energy	kWh	1,525	-	-100%	-	0%	-100%
Annualized Demand							
Summer	kW	0.73	-	-100%	-	0%	-100%
Winter	kW	0.13	-	-100%	-	0%	-100%
Non-Gas/Electric Benefits (Life)	\$	\$ 876,841	\$ 1,237,558	41%	\$ 2,708,622	119%	209%
Cost-Effectiveness							
TRC Benefits	\$	\$ 3,604,373			\$ 13,407,603		272%
TRC Costs	\$	\$ 1,747,693			\$ 2,324,379		33%
Net Benefits	\$	\$ 1,856,680			\$ 11,083,225		497%
BCR		2.1			5.8		180%

Note: The Planned Values in Table I.A and all subsequent tables that contain Planned Values in this Annual Report (except as otherwise noted) were originally submitted to the Department on October 28, 2011 in Fitchburg Gas and Electric Light Company d/b/a Unutil, D.P.U. 11-111.

As shown in Table I.A, above, significant² variances exist at the portfolio level for Lifetime and Annualized Therm Savings, Annualized Electric Energy and Demand Savings and Lifetime Non-Gas/Non-Electric Benefits, as well as TRC Benefits, Costs and Net Benefits.

Each sector contributed to these variances as follows:

- Residential: Residential TRC benefits accounted for 6% of total TRC benefits; TRC costs account for 25% of total TRC costs; and net benefits account for 2% of total net benefits. Please reference section II.A.1 for a more detailed discussion of the cause of the variances for this sector.
- Low Income: Low Income TRC benefits accounted for 14% of total TRC benefits; TRC costs account for 17% of total TRC costs; and net benefits account for 13% of total net benefits. Please reference section II.B.1 for a more detailed discussion of the cause of the variances for this sector.

³ The Company is also providing the Department with working Microsoft Excel spreadsheets for all of the tables included in this Annual Report. Such tables include all formulas and functions used in each table.

- C&I: C&I TRC benefits accounted for 81% of total TRC benefits; TRC costs account for 59% of total TRC costs; and net benefits account for 85% of total net benefits. Please reference section II.C.1 for a more detailed discussion of the cause of the variances for this sector.

Table I.B

Customer Sector Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential				
TRC Benefits	\$	\$ 891,026	\$ 773,117	-13%
TRC Costs	\$	\$ 565,915	\$ 569,669	1%
Net Benefits	\$	\$ 325,111	\$ 203,448	-37%
BCR		1.6	1.4	-14%
Low-Income				
TRC Benefits	\$	\$ 1,227,920	\$ 1,819,413	48%
TRC Costs	\$	\$ 411,011	\$ 383,874	-7%
Net Benefits	\$	\$ 816,909	\$ 1,435,539	76%
BCR		3.0	4.7	59%
Commercial & Industrial				
TRC Benefits	\$	\$ 1,485,426	\$ 10,815,073	628%
TRC Costs	\$	\$ 770,767	\$ 1,370,835	78%
Net Benefits	\$	\$ 714,660	\$ 9,444,237	1222%
BCR		1.9	7.9	309%
Total				
TRC Benefits	\$	\$ 3,604,373	\$ 13,407,603	272%
TRC Costs	\$	\$ 1,747,693	\$ 2,324,379	33%
Net Benefits	\$	\$ 1,856,680	\$ 11,083,225	497%
BCR		2.1	5.8	180%

Table I.B provides a summary of the sector-level planned and evaluated results for 2012. Significant variances exist for the following metrics: Residential Net Benefits; Low Income TRC Benefits, Net Benefits and BCR, C&I TRC Benefits, TRC Costs, Net Benefits and BCR.

- Within the Residential sector, the MassSave (RCS)/Weatherization program was the primary contributor to the variance between planned and evaluated Net Benefits. Please reference section II.A.1 for further details.
- Within the Low Income sector, the Low Income Multi-Family Retrofit Program was the primary contributor to the variance between planned and evaluated values. Please reference section II.A.1 for a more detailed discussion of the cause of the variances for this sector.
- Within the C&I sector, all programs contribute to the variance between planned and evaluated values, but the Large Retrofit program was the most significant. Please reference section II.A.1 for a more detailed discussion of the cause of the variances for this sector.

PA-Specific Highlights:

During 2012, the Company continued to offer, as it has for over twenty years, a comprehensive portfolio of programs and initiatives that provided substantial benefits to residential, low income, and commercial and industrial customers. The Company expanded its programs to procure deeper and broader savings beginning in 2010. These cost effective programs promoted energy efficiency, assisted in transforming energy efficiency markets, and helped customers achieve permanent energy savings. In doing so, the Company continued to build upon established marketplace relationships, refined the focus of its programs to meet market-oriented objectives, and coordinated its activities with the other Program Administrators and market players. In addition, the Company's energy efficiency programs and services maximize the usage of competitive procurement processes and support the development of an enhanced energy services delivery infrastructure in Massachusetts. In implementing and administering these programs and services, Unitil's overall goal continues to be to help its customers understand their energy consumption and use energy more efficiently.

In 2012, the Company's energy efficiency programs provided direct services to 61 single and multi-family customers in the residential sector. In addition to providing direct services, the Company's residential market transformation programs provided 155 HVAC rebates. The Company served 185 customers in the low income sector. In the commercial and industrial sector the Company served 8 large commercial customers and provided rebates for 38 HVAC and direct-install measures.

Overall, 2012 was a good year for the Company's gas energy efficiency programs, achieving a very healthy BCR of 5.8 at the portfolio level. While the Company's costs were 33% above planned levels, benefits were more than 270% over planned levels – the result of significant therm savings for Unitil's gas customers.

Specifically, the residential sector was slightly under target for benefits, costs, and BCR results, in part due to the continuing economic challenges in the Company's service territory. Despite this, the sector still saw significant natural gas savings compared to previous years.

While also influenced by the economic climate, two large, cost-effective multifamily projects were completed through the Low Income Retrofit program during 2012. These projects enabled the sector to finish the year strongly, achieving substantial savings while maintaining costs below planned levels.

The C&I sector also achieved remarkable results during 2012. The Company worked closely with a number of customers to develop cost-effective projects. One large, very cost-effective project in particular produced significant savings, helping to drive this sector's benefits and BCR results.

For further details, please reference sections II.A.1 through II.C.1.

II. PROGRAM PERFORMANCE

A. Residential Sector Programs

1. Summary

During 2012, the Company implemented the following residential programs and residential pilots:

Residential Programs

- Residential New Construction and Major Renovation
- Residential Heating and Water Heating
- Residential Mass Save/Weatherization
- Residential Multi-Family Retrofit

Residential Pilots

- Deep Energy Retrofit

Tables II.A.1 and II.A.3 provide summary information on the performance of the residential programs at the sector and program levels, respectively. Please note the gas Program Administrators do not track data by end-use, and, therefore, are not required to provide the information provided by electric utilities in Table II.A.2.

Table II.A.1

Residential Sector Summary							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 365,669			\$ 397,658		9%
Performance Incentive	\$	\$ 13,417			\$ 6,314		-53%
Savings and Benefits							
Gas							
Lifetime	Th	663,804	880,878	33%	476,303	-46%	-28%
Annualized	Th	32,012	41,742	30%	26,716	-36%	-17%
Electric							
Annualized Energy	kWh	1,525	-	-100%	-	0%	-100%
Annualized Demand							
Summer	kW	0.73	-	-100%	-	0%	-100%
Winter	kW	0.13	-	-100%	-	0%	-100%
Non-Gas/Electric Benefits (Life)	\$	\$ 330,229	\$ 359,122	9%	\$ 150,562	-58%	-54%
Cost-Effectiveness							
TRC Benefits	\$	\$ 891,026			\$ 773,117		-13%
TRC Costs	\$	\$ 565,915			\$ 569,669		1%
Net Benefits	\$	\$ 325,111			\$ 203,448		-37%
BCR		1.6			1.4		-14%

Table II.A.3

Residential Program Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential New Construction & Major Renovation				
TRC Benefits	\$	\$ 122,232	\$ 89,291	-27%
TRC Costs	\$	\$ 78,378	\$ 36,939	-53%
Net Benefits	\$	\$ 43,853	\$ 52,352	19%
BCR		1.6	2.4	55%
Residential Heating and Water Heating				
TRC Benefits	\$	\$ 466,242	\$ 527,392	13%
TRC Costs	\$	\$ 302,765	\$ 333,096	10%
Net Benefits	\$	\$ 163,477	\$ 194,296	19%
BCR		1.5	1.6	3%
Residential MassSAVE (RCS) / Weatherization - 1-4 Units				
TRC Benefits	\$	\$ 200,574	\$ 77,940	-61%
TRC Costs	\$	\$ 115,478	\$ 145,266	26%
Net Benefits	\$	\$ 85,095	\$ (67,326)	-179%
BCR		1.7	0.5	-69%
Residential Multifamily Retrofit - 5+ Units				
TRC Benefits	\$	\$ 101,978	\$ 78,494	-23%
TRC Costs	\$	\$ 45,808	\$ 45,476	-1%
Net Benefits	\$	\$ 56,170	\$ 33,018	-41%
BCR		2.2	1.7	-22%
Hard-To-Measure Initiatives				
TRC Costs	\$	\$ 23,485	\$ 8,893	-62%
Total				
TRC Benefits	\$	\$ 891,026	\$ 773,117	-13%
TRC Costs (incl HTM Initiatives)	\$	\$ 565,915	\$ 569,669	1%
Net Benefits	\$	\$ 325,111	\$ 203,448	-37%
BCR		1.6	1.4	-14%

Sections II.A.2 and II.A.3 provide more detailed information on the performance of each residential program and pilot, respectively.

Residential Sector Performance Highlights

During 2012, the Program Administrators built upon existing residential programs and significantly expanded initiatives to increase participation. Selected highlights are presented below:

- Residential New Construction and Major Renovation⁴ – In 2012, with 121 communities adopting the Stretch Energy Code throughout the Commonwealth, this program faced a market in which energy codes continued to change. Single-family development picked up from previous years, but opportunities to capture future energy savings became increasingly difficult due to evolving and more stringent code requirements. To address these barriers, the Program Administrators offered technical assistance as well as incentives to exceed the

⁴ Prior to 2012, this program was called Massachusetts New Construction with ENERGY STAR.

rising baseline. The PAs also increased market penetration while providing energy savings for residents. During 2012, the Program Administrators provided multiple trainings and participated in several recruitment events targeted at builders and trade allies new to performance-based construction. It is expected that builders will continue to look to the Program Administrators to provide training, technical assistance and incentives to meet the requirements of the new energy codes. As of the end of 2012, over 40 Home Energy Rating System (“HERS”) companies participated in the program. Finally, the Program Administrators in western Massachusetts continued to participate in the *Western Massachusetts Storm Recovery Program*. This storm recovery program contacted all of the communities affected by the 2011 tornado and distributed thousands of flyers to builders, building code offices, homeowners, tornado relief centers, town meetings/events and churches.

- Residential Heating and Water Heating - In 2012, the PAs collectively achieved over 100 percent of their annual savings goals within budget due to attractive customer incentives. Through the program, the Program Administrators reached out to 300 supply houses and over 1,000 contractors throughout Massachusetts and New England. The PAs continued to successfully utilize extensive contractor outreach via supply houses and big box retailers, which contributed to increased participation levels in this program. PAs sponsored and participated in 25 training events in 2012. On September 20, 2012, the PAs sponsored their 12th Annual GasNetworks[®]/Mass Save Fall Conference and Trade Show in Randolph, MA. Attendees included over 400 HVAC contractors, trainers, and inspectors from the across the Commonwealth, as well as 32 exhibitors. The Program Administrators coordinated a full-day agenda of training sessions and seminars on the latest high efficiency natural gas HVAC technologies and installation and maintenance practices. Participants also learned about opportunities to save energy and participate in PA programs. The Program Administrators continued their integration efforts with the electric Residential Cooling and Heating Equipment (“Cool SmartSM”) program and incorporated breakout sessions to include such topics as electronically commutated motors, brushless fan motor technology, hydronic heating, on-demand water heating, condensing and modulating boilers, near boiler piping, system sizing, renewables and codes and standards updates.
- Mass Save/Weatherization – Program Year 2012 was the first full year of the new market model. Two groups of Mass Save participating contractors, Home Performance Contractors (“HPCs”) and Independent Installation Contractors (“IICs”), with over 90 contractor companies statewide, provided services in addition to those offered by the lead vendors.

The Contractor Best Practices Working Group continued to highlight the PAs’ commitment to ongoing communication with participating contractors in the program. The group served as a forum to provide an open line of communication between HPCs, IICs, lead vendors and PAs to discuss any matters related to the program with an independent third-party facilitator.

In 2012, the HEAT Loan program continued to offer loans (\$500-\$25,000), and

the offerings were expanded to include central air conditioning and residential electric customers in individually metered condominium units. PAs saw an increase in both the average loan amount and the number of customers financing multiple measures. In addition, the PAs implemented various initiatives throughout the year including pre-weatherization and early boiler replacement incentives, sales and technical trainings, and marketing bonuses.

- Multi-Family Retrofit – At the conclusion of 2012 most PAs were close to or exceeded program goals. Energy efficient lighting, instant savings measures, and weatherization continued to be in high demand. The multi-family working group, consisting of representatives from both residential and C&I, coordinated between the two sectors to deliver comprehensive and whole facility energy efficiency services. Statewide, the Multi-Family Market Integrator continued to be an invaluable resource to the multi-family program in 2012 as illustrated in a year-over-year increase of 25 percent in incoming calls for multi-family services. This trend of successfully enrolling facilities can be credited to capitalizing on previously established relationships with facility owners/property managers, as well as the increased effort to create brand recognition through statewide marketing efforts.

A more detailed discussion of each of the above programs follows.

2. Residential Programs

a. Residential New Construction and Major Renovation

Purpose/Goal: The purpose of the Residential New Construction and Major Renovation program was to capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy consumption.

Targeted Customers: The target market for this program included homebuilders, contractors, architects/designers, trade allies, HERS raters, homebuyers, REALTORS[®], developers, low-income and affordable housing developers, code officials, and consumers in the market for new homes or major renovations.

Definition of Program Participant: A participant is defined as a unit completed under this program.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Heating
- Air Duct
- Hot Water
- Envelope

Delivery Mechanism: The program was administered by each Program Administrator in its service territory and coordinated regionally through the Joint Management Committee (“JMC”). The JMC contractor was responsible for tracking and reporting program activity and advised the JMC on necessary program changes and enhancements. A separate third-party vendor conducted quality assurance/quality control of field activities. The JMC utilized a market-based network of trained contractors who offered energy efficiency and rating services to homebuilders.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program was discussed in detail in the Company’s 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. *See* Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.A.4⁵ provides information on the performance of the Residential New Construction and Major Renovation program.

Table II.A.4

Residential New Construction & Major Renovation							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 34,677			\$ 36,082		4%
Performance Incentive	\$	\$ 1,575			\$ 619		-61%
Participants	Units	11			12		9%
Program Cost / Participant	\$	\$ 3,152			\$ 3,007		-5%
Savings and Benefits							
Gas							
Lifetime	Th	87,621	34,119	-61%	34,119	0%	-61%
Annualized	Th	3,594	1,876	-48%	1,876	0%	-48%
Average Measure Life	Yrs	24	18	-25%	18	0%	-25%
Electric							
Annualized Energy	kWh	1,525	-	-100%	-	0%	-100%
Annualized Demand							
Summer	kW	0.73	-	-100%	-	0%	-100%
Winter	kW	0.13	-	-100%	-	0%	-
Non-Gas/Electric Benefits (Life)	\$	\$ 44,269	\$ 48,502	10%	\$ 48,502	0%	10%
Cost-Effectiveness							
TRC Benefits	\$	\$ 122,232			\$ 89,291		-27%
TRC Costs	\$	\$ 78,378			\$ 36,939		-53%
Net Benefits	\$	\$ 43,853			\$ 52,352		19%
BCR		1.6			2.4		55%

⁵ For each program and pilot program, the Company has defined “participant”, and updated the “units” column in the program or pilot program table to be consistent with that definition.

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Performance Incentive:** The majority of the Company's Performance Incentive is earned through the Savings and Values components which are allocated to individual programs based on the percent each program contributes to the Company's total TRC Benefits and Net Benefits, respectively. The C&I sector's actual 2012 results were substantially above target, thus receiving a greater portion of the earned Savings and Value incentives compared to the other two sectors. In addition, the achieved therm savings and associated benefits for the residential sector were below target. As a result, the residential Performance Incentives associated with the residential savings and value components were below expectations.
- **Gas Savings:** Overall, the Company's gas savings are lower than planned due lower incremental thermal savings claimed within the program versus building code. The project completed in 2012 was a 12 unit MF which came in at 15% better than code.
- **Measure Life:** The variance between the planned and actual measure life is due to a higher proportion of per unit savings attributed to water heating which has a lower measure life than shell heating. Planned savings assumed a higher proportion of savings would be from shell heating.
- **Electric Savings:** The Company planned for a small number of appliances to be installed in homes completed in this program; however, there were no appliances claimed for the program.
- **TRC Benefits/TRC Costs/Net Benefits/BCR:** Benefits are lower than planned due to savings coming in below target. The actual BCR is higher than planned because the components of the TRC Costs including incremental costs, customer incentive, and performance incentive were lower than planned.

EM&V Studies included in this Annual Report that apply to the **Residential New Construction & Major Renovations Program:**

- *MA RNC Program Incremental Cost Report*
This report provides estimates of the incremental costs per square foot involved in building high efficiency homes that meet the criteria of the MA RNC Program. Incremental costs (costs above those of typical homes built outside the program) are estimated for single family, low-rise multifamily buildings of three or fewer stories, and mid- to high-rise multifamily buildings of four stories or more for each incentive option offered by the Program. The study had no impact on savings. The study is discussed in more detail in Section III, Study 1.
- *Lighting Onsite Inventory and Saturation Study*
The objective of this study was to perform lighting inventories and estimate socket saturations in Massachusetts homes. The study also examined lighting purchase behavior and searched for evidence of incandescent bulb stockpiling. Saturation increased for of all energy-efficient light bulbs, including CFLs, LEDs, and fluorescent tubes, and was estimated to be 39% in 2013. The results of this

study will increase energy savings by increasing the number of bulbs found in indoor fixtures. The study is discussed in more detail in Section III, Study 7.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

b. Residential Heating and Water Heating

Purpose/Goal: The purpose of the Residential Heating and Water Heating program was to overcome market barriers to the installation of energy efficient heating/hot water equipment and to increase program awareness among consumers, plumbing/heating contractors, and home builders/developers, by means of rebates, marketing, and training courses.

Targeted Customers: The program targeted residential home owners with natural gas heating/hot water heating equipment (both new construction and existing homes), home designers/architects, engineers, plumbing and HVAC contractors and technicians, high efficiency heating equipment and related parts/accessory suppliers, manufacturers, and distributors, and new home building and remodeling contractors.

Definition of Program Participant: A participant is defined as the number of measures installed.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses: The end-uses targeted by this program were space and water heating fueled by natural gas.

Delivery Mechanism: The program was administered by each Program Administrator in its service territory and coordinated regionally through the GasNetworks collaborative. GasNetworks utilized a third-party contractor secured through a competitive bidding process to administer rebate processing. This vendor was also responsible for tracking and reporting program activity to the Program Administrators. The program also has a second third-party contractor who provided trade ally outreach and program participant training to supply houses and manufacturers of natural gas high efficiency heating and water heating equipment.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See Fitchburg Gas and Electric Light Company d/b/a Unutil, D.P.U. 09-127.

The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.A.5 provides information on the performance of the Residential Heating and Water Heating program.

Table II.A.5
Residential Heating and Water Heating

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 168,500			\$ 191,358		14%
Performance Incentive	\$	\$ 5,751			\$ 3,813		-34%
Participants	Products	134			155		16%
Program Cost / Participant	\$	\$ 1,257			\$ 1,235		-2%
Savings and Benefits							
Gas							
Lifetime	Th	308,073	300,663	-2%	340,914	13%	11%
Annualized	Th	16,509	15,734	-5%	18,785	19%	14%
Average Measure Life	Yrs	19	19	2%	18	-5%	-3%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ 211,954	\$ 223,844	6%	\$ 81,786	-63%	-61%
Cost-Effectiveness							
TRC Benefits	\$	\$ 466,242			\$ 527,392		13%
TRC Costs	\$	\$ 302,765			\$ 333,096		10%
Net Benefits	\$	\$ 163,477			\$ 194,296		19%
BCR		1.5			1.6		3%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Performance Incentive:** The majority of the Company's Performance Incentive is earned through the Savings and Values components which are allocated to individual programs based on the percent each program contributes to the Company's total TRC Benefits and Net Benefits, respectively. The C&I sector's actual 2012 results were substantially above target, thus receiving a greater portion of the earned Savings and Value incentives compared to the other two sectors. In addition, the achieved therm savings and associated benefits for the residential sector were below target. As a result, the residential Performance Incentives associated with the residential savings and value components were below expectations.
- **Non-Gas/Electric Benefits:** The variance between planned and actual non-gas benefits is due to the application of evaluation results which impacted the non-energy impacts (NEIs) claimed for measures installed through this program.

EM&V Studies included in this Annual Report that apply to the **Residential Heating and Water Heating Program:**

- *Residential Heating and Water Heating 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing*
The study updated Net-to-Gross (“NTG”) ratios for certain prescriptive equipment available in the Residential Heating & Water Heating and Residential Cooling & Heating Equipment Programs. It also analyzed net market effects (“NME”) and looked into the timing of equipment replacement. Results indicate that NTG ratios are slightly higher than previously estimated for many measures. Further, NME analyses and data provide qualitative evidence to support this finding. The study also found program induced accelerated replacement of equipment that was not being captured in savings estimates, however the level of replacement varied by equipment being installed. The net effect for the Company was to increase energy savings and decrease benefits for the 2012 evaluated results. The study is discussed in more detail in Section III, Study 2.
- *Massachusetts Residential Non-Energy Impacts (NEIs): Deemed NEI Values Addressing Differences in NEIs for Heating, Cooling, and Water Heating Equipment that is Early Replacement Compared to Replace on Failure*
This memorandum provides adjusted deemed NEI values that address the differences in NEIs for residential heating, cooling, and water heating equipment that is early replacement compared to replace on failure. These deemed NEIs update the NEIs provided in the residential NEI report submitted to the PAs on August 15, 2011. The results of this study decreased net lifetime benefits for 2012 evaluated results. The study is discussed in more detail in Section III, Study 25.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2015. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

c. Residential Mass Save/Weatherization

Purpose/Goal: The purpose of the Mass Save/Weatherization program (also known as the Homes Energy Services (“HES”) program) was to provide residential customers with energy efficiency recommendations and incentives that enable them to identify and initiate the process of installing cost-effective energy efficiency upgrades.

Targeted Customers: The HES target market is all non-low-income residential customers living in single-family houses or one- to four-unit buildings that are not part of a larger site

where an association exists (such as a condominium association with multiple four-unit buildings). The program aims to reach the aforementioned customers who are interested in making their homes more energy efficient. The HES program is fuel-blind.

Definition of Program Participant: A participant is defined as the number of audits completed.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Building Envelope (Deeper Retrofit Measures)
- HVAC/mechanical systems
- Hot Water

Delivery Mechanism: The Mass Save and Gas Weatherization programs were fully integrated in 2011 and were implemented by each PA's competitively procured lead vendor (see below). Currently, the Company contracts with two Home Performance Contractors (HPCs) to provide "turnkey" audits and weatherization work. Given its size, Unitil does not have any Independent Insulation Contractors (IICs) under contract to implement this program.

Unitil serves as its own Lead Vendor and manages this program throughout its electric and gas service territories. As a lead vendor, the Company is responsible for managing and training market based participants such as participating IICs and HPCs. Additional lead vendor responsibilities include:

- Consistent statewide training
- Data reporting
- Achieving aggressive savings
- Customer satisfaction
- Quality control standards
- Scheduling requirements
- Technical assistance
- Maintain and report health and safety information

Two groups of Mass Save participating contractors, HPCs and IICs, provided services in addition to those services offered by the lead vendor. All participating contractors had to meet program eligibility and requirements. HPCs independently recruited customers, provided Home Energy Assessments ("HEAs"), and implemented weatherization measures. IICs provided installation of weatherization measures for those customers who received an HEA from an HPC or a lead vendor. IICs also had the opportunity to independently recruit customers and refer them to the lead vendor for the HEA.

In order to receive incentives or program rebates, customers were required to have an HEA through either the PA's lead vendor or via a participating HPC to identify and prioritize all cost-effective energy efficiency improvements. Insulation work, whether performed by an HPC or IIC, is subject to quality control inspection(s) performed by the PA-vendor or third-party vendor. This ensured that high quality was maintained, and that installations met Building Performance Institute standards or similar standards set by the PAs.

The gas and electric PAs remained under contract with Competitive Resources, Inc., a third-party Quality Control ("QC") vendor responsible for performing QC inspections of program implementation vendors and participating contractors. The QC vendor provided valuable information and feedback to the Program Administrators on program successes and identified areas of possible improvement.

The Program Administrators are working together toward a "best practices" approach to provide a more coordinated statewide training to reinforce quality installation techniques for the HES program. It is expected that training requirements for contractors to retain their status as a HES participating contractor will increase over time. Additionally, contractors must maintain a high level of customer satisfaction to continue in the program.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009 and the Company's 2012 RCS Budget Petition, filed November 1, 2011. See Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127, and Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 11-RCS-10, respectively. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127 and on December 27, 2011 in and Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 11-RCS-10, respectively.

Table II.A.6 provides information on the performance of the MassSave (RCS) / Weatherization 1-4 Unit Program.

Table II.A.6

Residential MassSAVE (RCS) / Weatherization - 1-4 Units							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 94,401			\$ 119,537		27%
Performance Incentive	\$	\$ 4,888			\$ 1,411		-71%
Participants	Acct	42			35		-17%
Program Cost / Participant	\$	\$ 2,248			\$ 3,415		52%
Savings and Benefits							
Gas							
Lifetime	Th	163,252	498,833	206%	57,711	-88%	-65%
Annualized	Th	7,715	21,662	181%	3,845	-82%	-50%
Average Measure Life	Yrs	21	23	9%	15	-35%	-29%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ 61,604	\$ 66,856	9%	\$ 79	-100%	-100%
Cost-Effectiveness							
TRC Benefits	\$	\$ 200,574			\$ 77,940		-61%
TRC Costs	\$	\$ 115,478			\$ 145,266		26%
Net Benefits	\$	\$ 85,095			\$ (67,326)		-179%
BCR		1.7			0.5		-69%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Total Program Costs:** The variance between actual and planned program costs is attributed to higher than planned expenditures in PP&A, customer incentives, STAT, and M&E. Actual expenditures for customer incentives were 52% higher than planned due to greater per unit incentives provided to customers to weatherize their homes.
- **Performance Incentive:** The majority of the Company's Performance Incentive is earned through the Savings and Values components which are allocated to individual programs based on the percent each program contributes to the Company's total TRC Benefits and Net Benefits, respectively. The C&I sector's actual 2012 results were substantially above target, thus receiving a greater portion of the earned Savings and Value incentives compared to the other two sectors. In addition, the achieved therm savings and associated benefits for the residential sector were below target. As a result, the residential Performance Incentives associated with the residential savings and value components were below expectations.
- **Program Cost/Participant:** The variance is a result of lower planned participation and higher incentives per participant.

- **Gas Savings:** The variance between planned and actual savings is due to the application of evaluation results which introduced deemed savings for some measures and reduced the overall net-to-gross rate for program savings with revised spillover and realization rates.
- **Cost Effectiveness:** The variance in benefits and BCR are attributed to the reduction in savings as a result of evaluation.

EM&V Studies included in this Annual Report that apply to the **Weatherization Program:**

- *HES Realization Rate Results Memo*
This study produced PA-specific realization rates (the ratio of ex ante to ex post savings) used to adjust insulation and air-sealing savings. The study decreased program savings for the Company's 2012 evaluated results. The study is discussed in more detail in Section III, Study 3.
- *2012 Home Energy Services Pre-Weatherization Initiative Evaluation*
This evaluation assessed the impact of additional incentives on a customer's decision to overcome pre-weatherization barriers (overcoming these barriers make them eligible to install certain recommended HES measures). The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 9.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2015. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

d. Residential Multi-Family Retrofit

Purpose/Goal: The purpose of the Residential Multi-Family Retrofit program is to address the energy efficiency retrofit opportunities in facilities with five or more residential dwelling units in the market rate sector.

Targeted Customers: Residential multi-family facilities with five or more dwelling units were targeted by this program.

Definition of Program Participant: A participant is defined as the number of individual units served under this program.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Heating, Ventilation, and Air Conditioning
- Domestic Hot Water
- Building Envelope
- End Use Behavior

Delivery Mechanism: The program was administered cooperatively by the gas and electric Program Administrators. The Multi-Family Market Integrator was responsible for facilitating the delivery of program services as well as acting as the conduit for participant inquiries to ensure that participants were not inconvenienced by having to contact multiple parties directly throughout the project lifecycle.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company’s 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.A.7 provides information on the performance of the Residential Multi-Family program.

Table II.A.7

Residential Multifamily Retrofit - 5+ Units							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 44,605			\$ 41,789		-6%
Performance Incentive	\$	\$ 1,203			\$ 472		-61%
Participants	Unit	132			14		-89%
Program Cost / Participant	\$	\$ 338			\$ 2,985		783%
Savings and Benefits							
Gas							
Lifetime	Th	104,858	47,264	-55%	43,560	-8%	-58%
Annualized	Th	4,194	2,471	-41%	2,210	-11%	-47%
Average Measure Life	Yrs	25	19	-23%	20	3%	-21%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ 12,401	\$ 19,920	61%	\$ 20,195	1%	63%
Cost-Effectiveness							
TRC Benefits	\$	\$ 101,978			\$ 78,494		-23%
TRC Costs	\$	\$ 45,808			\$ 45,476		-1%
Net Benefits	\$	\$ 56,170			\$ 33,018		-41%
BCR		2.2			1.7		-22%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Performance Incentive:** The majority of the Company's Performance Incentive is earned through the Savings and Values components which are allocated to individual programs based on the percent each program contributes to the Company's total TRC Benefits and Net Benefits, respectively. The C&I sector's actual 2012 results were substantially above target, thus receiving a greater portion of the earned Savings and Value incentives compared to the other two sectors. In addition, the achieved therm savings and associated benefits for the residential sector were below target. As a result, the residential Performance Incentives associated with the residential savings and value components were below expectations.
- **Participants:** The Company introduced the multi-family program as a stand-alone component of the residential sector in 2011. The program design and the ramp-up were finalized during the 2011 program year. The 5+ units is a challenging target market in the Company's service territory. A 3rd party vendor (Multifamily Market Indicator "MMI") was brought in to bring multifamily units into the program; however, the Company realized small benefits from MMI.
- **Program Cost/Participant:** Actual program costs per participant (e.g. apartment unit) were higher than planned.
- **Gas Savings:** The variance between planned and actual is due to the unit savings for insulation coming in lower than planned.
- **Non-Gas/Electric Benefits:** The actual non-gas benefits are higher than planned due to an error in the application of NEIs in the program plan. The Company inadvertently applied an electric one-time benefit to the gas program. Replacing the erroneous value with the correct value results in planned non-gas benefits of \$19,107, which is a variance of 6% from actual.
- **TRC Benefits/TRC Costs/Net Benefits/BCR:** Benefits and net benefits are lower than planned as a result of lower actual program savings.

EM&V Studies included in this Annual Report that apply to the **Multifamily Retrofit Program:**

There were no evaluation studies pertaining to this program during the 2012 calendar year.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

3. Residential Pilots

a. Deep Energy Retrofit

Description of Pilot/Specific Activities Intended to Study: The Deep Energy Retrofit (“DER”) pilot was implemented to investigate the potential for energy savings of at least 50 percent of total on-site energy use through deep retrofits of existing residential buildings and to identify incremental savings and how to reduce the costs and challenges associated with deep retrofits.

Why Implemented on Pilot Basis rather than as a Full Program: This initiative was offered as a pilot in order for the Program Administrators to study a new approach to achieving energy savings. The Program Administrators analyze the information gathered from the pilot to determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot, the Program Administrators utilize results to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program.

Targeted Customers: The pilot targeted home owners, property owners, and property managers considering renovations and willing to invest in extensive carbon reductions through energy efficiency measures. In addition, the pilot targeted advanced building remodelers, architects, designers, trade allies, and others involved in renovation or restoration of residential buildings.

Definition of Program Participant: A participant is defined as a unique gas account served under this program.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Heating (deeper energy retrofit measures)
- Hot Water
- Envelope (deeper energy retrofit measures)
- End Use Behavior

Delivery Mechanism: Project design details and assistance were provided to Deep Energy Retrofit contractors performing the work. The projects were handled through technical specialist contractors, program managers and organizations under contract and/or utilizing DOE Building America funds.

Significant Differences in Actual Program Design from Approved Program Design: None.

How Achievement of the Pilot’s Stated Goal was Measured: The overall goal of the Pilot was to attract participants into this “broader and deeper” energy-savings initiative, knowing that costs and project complexities can be barriers to deep energy retrofit participation. Ultimately, achievement of this goal is measured by the pilot’s cost-effectiveness. Based on data collected by National Grid and shared with all Program Administrators, the incremental cost of the Deep

Energy Retrofit measures are cost-effective when performed at the time of roof-replacement, siding-replacement, and basement fit-out.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

The Company did not have any participants in the Deep Energy Retrofit Program in 2012.

b. Community-Based Pilots

Although the Company did not implement a community-based pilot in 2012, Unitil contributed to the *Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report*, discussed below.

EM&V Studies included in this Annual Report that apply to the **Behavior/Feedback Program:**

- *Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report*
This report includes impact findings of behavior/feedback programs and pilots administered by National Grid, NSTAR, Western Massachusetts Electric Company and Cape Light Compact during the 2012 program year. It also includes process findings for CLC's Smart Home Energy Monitoring Pilot (SHEMP) from 2009-2012. The study also established savings estimate ratios to adjust implementer estimates in order to report savings in future years. The study had no impact on savings for Unitil. The full report is included in Section III, Study 22.

B. Low-Income Sector Programs

1. Summary

In 2012, the Company implemented the Low-Income Retrofit program which consisted of two initiatives: the Low-Income Single-Family Retrofit initiative and the Low-Income Multi-Family initiative.⁶ The Company did not offer any pilots in the low-income sector during 2012.

Tables II.B.1 and II.B.3 provide summary information on the performance of the low-income program at the sector and program/initiative levels, respectively. Please note the gas Program Administrators do not track data by end use, and, therefore, are not required to provide the information provided by electric companies in Table II.B.2.

Table II.B.1

Low-Income Sector Summary							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 390,999			\$ 373,279		-5%
Performance Incentive	\$	\$ 20,012			\$ 10,595		-47%
Savings and Benefits							
Gas							
Lifetime	Th	655,881	958,547	46%	731,462	-24%	12%
Annualized	Th	34,940	42,958	23%	37,017	-14%	6%
Electric							
Annualized Energy	kWh	-	-	0%	4,988	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	3.7	0%	0%
Winter	kW	-	-	0%	1.6	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ 546,611	\$ 878,436	61%	\$ 807,262	-8%	48%
Cost-Effectiveness							
TRC Benefits	\$	\$ 1,227,920			\$ 1,819,413		48%
TRC Costs	\$	\$ 411,011			\$ 383,874		-7%
Net Benefits	\$	\$ 816,909			\$ 1,435,539		76%
BCR		3.0			4.7		59%

⁶ In their 2012 Mid-Term Modification filings the Program Administrators proposed a consolidation of the low-income single-family retrofit and low-income multi-family retrofit programs in order to form one low-income retrofit program, noting the expected benefits of increasing flexibility to meet customer needs.

Table II.B.3

Low-Income Program Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Low-Income Retrofit				
TRC Benefits	\$	\$ 1,227,920	\$ 1,819,413	48%
TRC Costs	\$	\$ 404,304	\$ 380,801	-6%
Net Benefits	\$	\$ 823,616	\$ 1,438,613	75%
BCR		3.0	4.8	57%
Hard-To-Measure Initiatives				
TRC Costs	\$	\$ 6,707	\$ 3,073	-54%
Total				
TRC Benefits	\$	\$ 1,227,920	\$ 1,819,413	48%
TRC Costs (incl HTM Initiatives)	\$	\$ 411,011	\$ 383,874	-7%
Net Benefits	\$	\$ 816,909	\$ 1,435,539	76%
BCR		3.0	4.7	59%

Section II.B.2 provides detailed information on the performance of the low-income program.

Low-Income Sector Performance Highlights

In 2012, the Program Administrators continued to leverage funds from the Massachusetts' Department of Energy's Weatherization Assistance Program that is administered by the Department of Health and Human Services' for their low-income energy efficiency programs. This collaborative approach provided simplicity through a seamless, integrated experience for the participants, deeper efficiency penetration consistent with a whole house/building approach, as well as the ability to reach as many low-income residents as practicable with the greatest amount of eligible services.

In addition to public housing authorities and non-profit facilities, "for profit" multi-family facilities were also eligible to participate in the Low-Income Multi-Family Retrofit initiative in 2012, as long as 50 percent of the occupants qualified as low-income, and provided that the PA had budget dollars to serve this new type of customer in its territory.

A more detailed discussion of the above program follows.

2. Low-Income Retrofit Program

Purpose/Goal: Two initiatives, the Low-Income Single Family ("LISF") Retrofit initiative and the Low-Income Multi-Family ("LIMF") Retrofit initiative, were incorporated in the Low-Income Retrofit program.

The purpose of the LISF Retrofit initiative was to increase energy efficiency and reduce the energy cost burden for income-eligible customers through the installation of gas energy efficiency measures to achieve deeper and broader energy savings consistent with a comprehensive, whole house approach.

The purpose of Low-Income Multi-Family Retrofit initiative was to deliver energy efficient products and services directly to income-eligible residential customers living in multi-family facilities with five or more dwelling units.

Targeted Customers: The LISF Retrofit initiative targeted residential gas customers living in one- to four-unit dwellings who were at or below 60 percent of the state median income level and who qualified to receive fuel assistance and/or utility-discounted rates. For two- to four-unit dwellings, 50 percent of the occupants had to qualify as low-income.

The LIMF Retrofit initiative targeted public housing authorities, non-profit housing developers, for-profit housing developers, landlords, property managers, and residential customers at, or below, 60 percent of median income living in multi-family properties consisting of five or more units.

Definition of Program Participant: A participant is defined as a single home or housing unit served under this initiative.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Heating
- Hot water
- Envelope

Delivery Mechanism: PAs used a lead vendor and/or worked closely with their respective Community Action Program (“CAP”) agencies on all aspects of the program design and implementation. All PAs worked in conjunction with the Low-Income Energy Affordability Network (“LEAN”) as well as the Multi-Family Advisory Committee comprised of LEAN, Community Development Corporations, Public Housing Authorities and other nonprofit owners of low-income non-institutional multi-family housing. The Multi-Family Advisory Committee was tasked with prioritizing low-income multi-family projects for each PA, using benchmarking software called WegoWise. The lead vendor/CAP agencies were responsible for providing coordination of energy efficiency services to the customers, working with installation contractors to ensure that the proper initiative guidelines were enforced, ensuring that the customers met the eligibility requirements for program participation, and providing the CAP and/or PA with the required documentation of all work performed.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company’s 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. *See* Fitchburg Gas and Electric Light Company d/b/a Unutil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unutil, D.P.U. 09-127.

Table II.B.4 provides information on the performance of the Low-Income Retrofit program.

Table II.B.4

Low-Income Retrofit							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 384,292			\$ 370,206		-4%
Performance Incentive	\$	\$ 20,012			\$ 10,595		-47%
Participants	Units	171			185		8%
Program Cost / Participant	\$	\$ 2,247			\$ 2,001		-11%
Savings and Benefits							
Gas							
Lifetime	Th	655,881	958,547	46%	731,462	-24%	12%
Annualized	Th	34,940	42,958	23%	37,017	-14%	6%
Average Measure Life	Yrs	19	22	19%	20	-11%	5%
Electric							
Annualized Energy	kWh	-	-	0%	4,988	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	3.7	0%	0%
Winter	kW	-	-	0%	1.6	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ 546,611	\$ 878,436	61%	\$ 807,262	-8%	48%
Cost-Effectiveness							
TRC Benefits	\$	\$ 1,227,920			\$ 1,819,413		48%
TRC Costs	\$	\$ 404,304			\$ 380,801		-6%
Net Benefits	\$	\$ 823,616			\$ 1,438,613		75%
BCR		3.0			4.8		57%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Performance Incentive:** The majority of the dollar value of the Company’s Performance Incentive is associated with the Savings and Values components. The incentives earned by these components are allocated to individual programs based on the percent each program contributes to the Company’s total TRC Benefits and Net Benefits, respectively. Although the Low Income Retrofit program’s 2012 net benefits were higher than planned, the actual 2012 C&I sector results were substantially above target. As a result, the C&I programs received a greater portion of the earned Savings and Value incentives compared to the other sectors. Specifically, the Low Income sector was projected to generate approximately 35% of the Company’s total TRC Benefits/Net Benefits. Despite higher than projected results, the low income sector only generated approximately 12-15% of the total benefits, thus a smaller portion of the PI.
- **Non-Gas/Electric Benefits:** Actual non-gas benefits are higher than planned due in part to the application of additional non-gas benefits in the form of price hedging and economic development which are applied on a per MMBTU basis. Additionally, because non-gas benefits are applied on a per participant basis and vary by measure type (e.g. insulation, air sealing, heating system), the higher actual value is a result of greater actual participation as well as measure mix.
- **TRC Benefits/TRC Costs/Net Benefits/BCR:** TRC Benefits and Net Benefits are higher than planned due to higher actual savings and non-gas benefits. Lower overall actual

TRC Costs and Net Benefits resulted in a higher BCR than planned.

EM&V Studies included in this Annual Report that apply to the **Low-Income Retrofit Program**:

- *Status of Ongoing Low Income Lighting and Heating Metering Study*
This study assesses lighting hours of use and the prevalence of secondary heating in low income households in Massachusetts. The two overarching objectives of the study are to determine a daily low income-specific lighting hours-of-use (HOU) value to replace the current assumption, and to determine the prevalence of low income customers who use a secondary heating source to warm their homes (and how best to incorporate secondary heating usage into future evaluations). This is a preliminary result; the study is ongoing and will be finalized by early September 2013. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study11.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

C. Commercial and Industrial Sector Programs

1. Summary

During 2012, the Company implemented the following Commercial and Industrial (“C&I”) programs:

- C&I New Construction and Major Renovation
- C&I Large Retrofit
- C&I Small Retrofit

The Company did not offer any C&I pilots in 2012.

Tables II.C.1 and II.C.3 provide summary information on the performance of the C&I programs at the sector and program levels, respectively. Please note the gas Program Administrators do not have end-use data available, and, therefore, are not required to provide the information that electric companies provide in Table II.C.2.

Table II.C.1

Commercial & Industrial Sector Summary							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 445,625			\$ 611,883		37%
Performance Incentive	\$	\$ 21,834			\$ 48,648		123%
Savings and Benefits							
Gas							
Lifetime	Th	1,803,524	6,731,825	273%	8,133,143	21%	351%
Annualized	Th	91,801	337,104	267%	405,386	20%	342%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ -	\$ -	0%	\$ 1,750,798	0%	0%
Cost-Effectiveness							
TRC Benefits	\$	\$ 1,485,426			\$ 10,815,073		628%
TRC Costs	\$	\$ 770,767			\$ 1,370,835		78%
Net Benefits	\$	\$ 714,660			\$ 9,444,237		1222%
BCR		1.9			7.9		309%

Table II.C.3

Commercial & Industrial Program Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Commercial & Industrial New Construction & Major Renovation				
TRC Benefits	\$	\$ 310,211	\$ 371,999	20%
TRC Costs	\$	\$ 183,001	\$ 147,110	-20%
Net Benefits	\$	\$ 127,210	\$ 224,889	77%
BCR		1.7	2.5	49%
Commercial & Industrial Large Retrofit				
TRC Benefits	\$	\$ 1,117,149	\$ 10,362,549	828%
TRC Costs	\$	\$ 533,106	\$ 1,190,570	123%
Net Benefits	\$	\$ 584,044	\$ 9,171,978	1470%
BCR		2.1	8.7	315%
Commercial & Industrial Direct Install				
TRC Benefits	\$	\$ 58,066	\$ 80,525	39%
TRC Costs	\$	\$ 32,625	\$ 22,852	-30%
Net Benefits	\$	\$ 25,441	\$ 57,673	127%
BCR		1.8	3.5	98%
Hard-To-Measure Initiatives				
TRC Costs	\$	\$ 22,035	\$ 10,303	-53%
Total				
TRC Benefits	\$	\$ 1,485,426	\$ 10,815,073	628%
TRC Costs (incl HTM Initiatives)	\$	\$ 770,767	\$ 1,370,835	78%
Net Benefits	\$	\$ 714,660	\$ 9,444,237	1222%
BCR		1.9	7.9	309%

Sections II.C.2 provides detailed information on the performance of each C&I program.

C&I Sector Performance Highlights

During 2012, the Program Administrators built upon existing C&I gas energy efficiency programs and significantly expanded initiatives to increase participation in all C&I programs. In order to provide appropriate customer incentives, the gas and electric Program Administrators continued to collaborate on projects in overlapping service territories by sharing both the costs and the results of technical assistance studies. The Program Administrators also held a *Gas Strategy Summit* to identify barriers to customer participation and any other program issues. PA efforts continued in 2012 to transform the workforce, including holding regional and local training events for plumbers, contractors, homeowners and business owners through the Program Administrators' GasNetworks[®]/Mass Save event schedule. The Program Administrators collectively evaluated emerging technologies through a series of shared seminars and discussions. Additional, more formal channels of testing and evaluation are being performed by individual Program Administrators, with resultant information being shared amongst the PAs. GasNetworks/Mass Save and the Massachusetts Technical Assessment Committee collaborated on a more formal process for emerging gas technologies. The following highlights the Program Administrators' efforts in the C&I gas energy efficiency arena during the 2012 program year:

- Annual Training – In September 2012, GasNetworks/Mass Save hosted the Annual Contractor Training at the Lantana in Randolph, MA. Over 400 plumbing and heating contractors were on hand to learn about the latest high efficiency and condensing heating equipment and applications, including opportunities to save

- energy and participate in PA programs. The Program Administrators coordinated a full-day agenda of training sessions and seminars on the latest technologies and installation and maintenance methods.
- Commercial Food Equipment Market – The PAs participated in various food equipment shows throughout the Commonwealth. In 2012, the gas PAs contacted commercial food service equipment dealers, distributors and manufacturers in Massachusetts on over 600 different occasions, including contacts with more than 50 trade partners, to build support and participation in the GasNetworks/Mass Save Program. Approximately 2,580 pieces of program collateral and rebate forms were distributed to partners and end users resulting in 200 rebates being processed through the program. PAs also staffed a number of special events in 2012 to help build awareness and participation in the program. These events included the New England Food Service Expo and the College Sustainability Conference, both in Boston, MA, and the Perkins Trade Show in Foxboro, MA. The PAs also engaged trade partners in promoting the program through their existing marketing vehicles. As a result, the GasNetworks/Mass Save Program was featured in partner newsletters on four different occasions in 2012. Qualified equipment lists were also maintained and updated on a quarterly basis based on changes to the ENERGY STAR® and Food Service Technology Center websites. The PAs continue to research and analyze the market for efficient food service equipment, monitor developments in the industry and emerging technologies, and collect data to help evaluate the program's impact.
 - Statewide Training on Steam Systems – GasNetworks/Mass Save was represented at several contractor training days, refrigerant system training days, and supply house vendor and product shows. Information on contractor and other training, as well as the annual fall event to kick off the heating season, can be found throughout the year on masssave.com and gasnetworks.com.
 - Commercial Custom Steam Program – The PAs completed a survey of each PA's steam trap program. Using these survey results, the PAs aligned the implementation of their programs for consistency throughout Commonwealth. This has increased participation in some service territories.
 - Statewide Forms Review for 2013 – The gas Program Administrators worked collectively to make changes to prescriptive offerings necessitated by market changes and efficiency standards testing issues. GasNetworks/Mass Save offered support to the vendor community with respect to information flow for the Northeast Furnace Standards Rule and the suspension, due to a flaw in the test procedure, of the Air-Conditioning, Heating and Refrigeration Institute and ENERGY STAR listings of modulating condensing boilers.
 - C&I Gas Summit – GasNetworks/Mass Save hosted a C&I Gas Summit on July 26, 2012, which included participation from all Program Administrators and key stakeholders. Improved methods of administering programs and emerging technologies were identified. Specifically, improved collaboration between gas

and electric PAs whose territories overlap was identified as a requirement to more effectively and efficiently deliver savings to customers. A matrix was developed that categorized the results of the Summit into the four guiding principles including: Emerging Technologies, Behavioral Motivators, Forms and Process Improvements, and Collaboration. The results were shared amongst the PAs to help address barriers that were common to all. The issues and barriers identified fell into three categories: Specific Measures, Collaboration and Trade Allies and Forms and Program Issues.

- Market Characterization and Segmentation – The gas Program Administrators analyzed different market segments including those in service territories shared with electric PAs. Technical teams developed lists of specific measures for different customer segments that will offer the best overall comprehensive efficiency opportunities. They also developed specific groups of measures that will be marketable to different customer segments. The PAs have been using technical assistance vendors to help identify savings for these newer measures, which is costly. For that reason, the PAs have been developing savings estimating tools for all of the PAs to share in order to lower the cost of technical assistance. Examples of these tools include the steam trap custom tool, the dual-fuel screening tool, the rooftop controller tool, and the energy recovery ventilation tool. The Program Administrators are collectively seeking and providing training opportunities for the design communities and strategic vendors to familiarize them with these tools and measures.

A more detailed program-level discussion can be found in the following section.

2. C&I New Construction and Major Renovation

Purpose/Goal: The C&I New Construction and Major Renovation program was designed to optimize the efficiency of equipment, building design and systems in new construction and renovation of commercial, industrial, institutional and government facilities. Focusing on offering a comprehensive set of electric and gas efficiency options specific to the needs unique to each customer, the program also targeted the brief window of opportunity to install premium grade replacements when equipment fails or is near the end of its useful life. In doing so, the Program Administrators worked to ensure that the best practices propagated by the program are ultimately built into the evolution of better building requirements.

Targeted Customers: The target market for this program was all time-dependent gas and electric energy efficiency opportunities in the C&I sector including commercial, industrial, institutional, and government customers.

Definition of Program Participant: A program participant is defined as the number of projects completed.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Lighting
- Motors & Drives
- HVAC
- Refrigeration
- Envelope
- Compressed Air
- Hot Water
- Process
- Combined Heat & Power

Delivery Mechanism: The Program Administrators worked together to market and implement the program as a unitary statewide effort to maximize the acquisition of potential energy savings (gas and electric) in the ongoing market for new facilities and replacement equipment in the Commonwealth.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. *See* Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.C.4 provides information on the performance of the C&I New Construction and Major Renovation program.

Table II.C.4

Commercial & Industrial New Construction & Major Renovation							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 119,786			\$ 111,017		-7%
Performance Incentive	\$	\$ 4,652			\$ 1,498		-68%
Participants	Product	89			45		-49%
Program Cost / Participant	\$	\$ 1,346			\$ 2,467		83%
Savings and Benefits							
Gas							
Lifetime	Th	391,492	292,084	-25%	315,057	8%	-20%
Annualized	Th	18,017	14,344	-20%	13,928	-3%	-23%
Average Measure Life	Yrs	22	20	-6%	23	11%	4%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ -	\$ -	0%	\$ -	0%	0%
Cost-Effectiveness							
TRC Benefits	\$	\$ 310,211			\$ 371,999		20%
TRC Costs	\$	\$ 183,001			\$ 147,110		-20%
Net Benefits	\$	\$ 127,210			\$ 224,889		77%
BCR		1.7			2.5		49%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- Performance Incentive: The actual 2012 savings results for this program are below targets. As a result, the program's PI is below expectations.
- Participants: Given the relatively small size of the Company's commercial and industrial base, it is difficult to accurately predict the number of participants in a given year. Although participation was nearly half of planned, it was 50% higher in 2012 than in 2011.
- Gas Savings: Actual savings were lower than planned due primarily to lower actual participation and measure mix.
- TRC Benefits/TRC Costs/Net Benefits/BCR: Actual TRC Benefits are higher than planned as a result of evaluation impacts which decreased freeridership for measures installed through this program (*see* Appendix C, Study 29 submitted with the Company's Annual Energy Efficiency Report for 2011, D.P.U. 12-59) as well as increased savings for some measures as described below in Study 19. Although low participation caused the Company to fall short of planned savings, the impact of higher savings relating to the actual measure mix increased the value of benefits associated with gas savings beyond planned benefits. The TRC Costs are below planned primarily due to lower participant costs contributing to the TRC Costs. The actual BCR is significantly higher than planned due to low TRC Costs and high Net Benefits.

EM&V Studies included in this Annual Report that apply to the C&I New Construction & Major Renovation Program:

- *C&I Customer Profile Project*
This study characterizes the Massachusetts energy efficiency market by analyzing recent customer usage and program participation data. The study relied on comprehensive billing and tracking data for all C&I customers to estimate the extent to which customers of various sizes and types participated in energy efficiency programs in 2011. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 17.
- *Mid-Sized Customer Needs Assessment – Interim Results*
The study is investigating the extent to which current program offerings effectively serve the needs of mid-sized customers by conducting interviews with PAs and implementation contractors and analyzing available customer billing and tracking data to examine differences in participation rates across customer size groups. The interim results of this study do not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 18.
- *Impact Evaluation of 2011 Prescriptive Gas Measures*
This report presents the results of the impact evaluation of C&I prescriptive gas measures installed during program year 2011. The evaluation consists of on-site monitoring and verification of the savings for a sample of participants for four of the top five measures installed (based on total savings). The net effect of the study was to increase savings for the Company. The study is discussed in more detail in Section III, Study 19.
- *Standard Boiler Research Plan and Interview Results Memo*
This document summarizes the plan, execution, and the decision to re-scope a planned boiler baseline assessment. The study intended to identify baseline boiler features and operation for both prescriptive and custom boiler measures, followed by measurement and verification of non-program boilers. However, the team was unsuccessful at locating any customers with a relatively recently installed standard efficiency boiler that was willing to participate in the study. The study had no impact on savings. The study is discussed in more detail in Section III, Study 20.
- *Impact Evaluation of 2011 Custom Gas Installations*
This study produced updated realization rates for custom commercial gas measures for NSTAR and PAs that use the statewide custom gas realization rate. There was no effect on savings for the Company as all installations were prescriptive. The study is discussed in more detail in Section III, Study 21.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those

results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

a. C&I Retrofit

Purpose/Goal: The C&I Retrofit program focused on comprehensive gas and electric energy efficiency opportunities associated with mechanical, electrical, and thermal systems in existing commercial, industrial, governmental and institutional buildings. Through this program, technical assistance and incentives were provided to encourage retrofitting of equipment that continued to function, but was outdated and inefficient, and could be replaced with a premium efficient product. In addition, this program helped participants identify specific peak load management opportunities and assisted occupants in improving their ongoing operation and maintenance practices.

Targeted Customers: The target market for this program was all non-residential customers – commercial, industrial, governmental, and institutional.

Definition of Program Participant: A program participant is defined as the number of projects completed.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Lighting
- Motors and Drives
- HVAC
- Compressed Air and Processes
- Envelope
- Water Heating

Delivery Mechanism: Program Administrator staff, trade allies, and project administrators performed most sales, marketing, program administration, and implementation functions, while outside contractors were retained for technical review of applications, on-site energy analysis, technical and design assistance for comprehensive projects, project commissioning services, and the actual measure installations, including turn-key services.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. *See* Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.C.5 provides information on the performance of the C&I Retrofit program.

Table II.C.5
Commercial & Industrial Large Retrofit

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 279,182			\$ 468,038		68%
Performance Incentive	\$	\$ 15,606			\$ 46,823		200%
Participants	Project	7			8		14%
Program Cost / Participant	\$	\$ 39,883			\$ 58,505		47%
Savings and Benefits							
Gas							
Lifetime	Th	1,339,595	6,409,940	378%	7,784,861	21%	481%
Annualized	Th	67,045	320,773	378%	389,243	21%	481%
Average Measure Life	Yrs	20	20	0%	20	0%	0%
Electric							
Annualized Energy	kWh	-	-	0%	-	0%	0%
Annualized Demand							
Summer	kW	-	-	0%	-	0%	0%
Winter	kW	-	-	0%	-	0%	0%
Non-Gas/Electric Benefits (Life)	\$	\$ -	\$ -	0%	\$ 1,710,294	0%	0%
Cost-Effectiveness							
TRC Benefits	\$	\$ 1,117,149			\$ 10,362,549		828%
TRC Costs	\$	\$ 533,106			\$ 1,190,570		123%
Net Benefits	\$	\$ 584,044			\$ 9,171,978		1470%
BCR		2.1			8.7		315%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Total Program Costs:** The variance between planned and actual costs for this program is attributed to greater than planned spending in PP&A, incentives, STAT, and M&E, with participant expenditures exceeding planned by 90%.
- **Performance Incentive:** The actual 2012 program results were substantially above target. As a result, this program received a greater portion of the earned Savings and Value incentives compared to the other programs, and a corresponding increase in actual PI compared to planned.
- **Program Cost / Participant:** Of the eight projects completed in 2012, one exceptional project was responsible for half of the total incentive expenditures and half of the savings. This outlier significantly increased the average cost per participant.
- **Gas Savings:** The nature of the custom projects completed through this program resulted in actual savings that significantly exceeded planned savings. This was due in large part to the exceptional project referenced above.
- **TRC Benefits/TRC Costs/Net Benefits/BCR:** TRC Benefits and Net Benefits are significantly higher than planned due to higher project savings as well as the application of evaluation results to custom savings (*see* Study 12 filed with the Company's

Massachusetts Joint Statewide Three-Year Electric and Gas Energy Efficiency Plan 2013-2015, Fitchburg Gas and Electric Light Company, D.P.U. 12-104). TRC Costs are higher than planned as described above. High net benefits resulted in a higher than planned BCR.

EM&V Studies included in this Annual Report that apply to the **C&I Retrofit Program**:

- *C&I Customer Profile Project*
This study characterizes the Massachusetts energy efficiency market by analyzing recent customer usage and program participation data. The study relied on comprehensive billing and tracking data for all C&I customers to estimate the extent to which customers of various sizes and types participated in energy efficiency programs in 2011. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 17.
- *Mid-Sized Customer Needs Assessment – Interim Results*
The study is investigating the extent to which current program offerings effectively serve the needs of mid-sized customers by conducting interviews with PAs and implementation contractors and analyzing available customer billing and tracking data to examine differences in participation rates across customer size groups. The interim results of this study do not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 18.
- *Impact Evaluation of 2011 Prescriptive Gas Measures*
This report presents the results of the impact evaluation of C&I prescriptive gas measures installed during program year 2011. The evaluation consists of on-site monitoring and verification of the savings for a sample of participants for four of the top five measures installed (based on total savings). There was no effect on savings for the Company as all projects were custom installations. The study is discussed in more detail in Section III, Study 19.
- *Standard Boiler Research Plan and Interview Results Memo*
This memo summarizes the plan, execution, and decision to re-scope a planned boiler baseline assessment. The study intended to identify baseline boiler features and operation for both prescriptive and custom boiler measures, followed by measurement and verification of non-program boilers. However, the team was unsuccessful at locating any customers with a relatively recently installed standard efficiency boiler that was willing to participate in the study. The study had no impact on savings. The study is discussed in more detail in Section III, Study 20.
- *Impact Evaluation of 2011 Custom Gas Installations*
This study produced updated realization rates for custom commercial gas measures for NSTAR and PAs that use the statewide custom gas realization rate. There was no effect on savings for the Company. The net effect of the study was to slightly decrease savings for the Company. The study is discussed in more detail in Section III, Study 21.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

b. C&I Direct Install

Purpose/Goal: The primary objective of the C&I Direct Install Program was to provide cost-effective, comprehensive electric and gas retrofit services to business customers on a turnkey basis using the same delivery model throughout the Commonwealth.

Targeted Customers: The target market for this program was direct install retrofit business customers with electric consumption below 300kW.

Definition of Program Participant: A program participant is defined as the number of measures installed.

Beginning in 2013, the Program Administrators will use consistent participant definitions, as set forth in Appendix M to the 2013-2015 Three-Year Plan in D.P.U. 12-100 through 12-111.

Targeted End-Uses:

- Lighting
- HVAC
- Hot Water
- Motors & Drives
- Refrigeration
- Envelope

Delivery Mechanism: Vendors selected to implement the program marketed the program, performed facility audits, and offered recommendations to customers while completing audit forms and questionnaires. In addition, the same vendors purchased materials, installed measures, loaded data into a database, and prepared progress reports for the Program Administrators on a regular basis.

Significant Differences in Actual Program Design from Approved Program Design: None.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. *See* Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127. The program was approved by the Department on January 28, 2010 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 09-127.

Table II.C.6 provides information on the performance of the C&I Direct Install program.

Table II.C.6

Commercial & Industrial Direct Install							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	\$	\$ 24,622			\$ 22,525		-9%
Performance Incentive	\$	\$ 1,576			\$ 327		-79%
Participants	Product	50			38		-24%
Program Cost / Participant	\$	\$ 492			\$ 593		20%
Savings and Benefits							
Gas							
Lifetime	Th	72,437	29,801	-59%	33,224.73	11%	-54%
Annualized	Th	6,738	1,987	-71%	2,215	11%	-67%
Average Measure Life	Yrs	11	15	40%	15	0%	40%
Electric							
Annualized Energy	kWh	-	-	-	-	-	-
Annualized Demand							
Summer	kW	-	-	-	-	-	-
Winter	kW	-	-	-	-	-	-
Non-Gas/Electric Benefits (Life)	\$	\$ -	\$ -	0%	\$ 40,504	0%	0%
Cost-Effectiveness							
TRC Benefits	\$	\$ 58,066			\$ 80,525		39%
TRC Costs	\$	\$ 32,625			\$ 22,852		-30%
Net Benefits	\$	\$ 25,441			\$ 57,673		127%
BCR		1.8			3.5		98%

Variance Analysis: The following section discusses the variables associated with significant variances between planned and actual results.

- **Performance Incentive:** The actual 2012 savings results for this program are below targets. As a result, the program's PI is below expectations.
- **Participants:** The Direct Install Program is driven by the electric Small C&I Program, which experienced lower than planned activity due to economic difficulties faced by small businesses during the economic downturn. In some locations, direct install gas measures are already in place at the locations we serve or there are no opportunities to install DI measures.
- **Gas Savings:** As described above, lower than planned participation resulted in actual savings that were significantly below planned. Additionally, the application of evaluation results impacting free-ridership further reduced savings (*see* Appendix C, Study 29 submitted with the Company's Annual Energy Efficiency Report for 2011, D.P.U. 12-59).
- **TRC/Benefits/TRC Costs/Net Benefits/BCR:** TRC Benefits and Net Benefits are higher than planned due to evaluation results which apply non-gas benefits on a per thermostat basis (*see* Study 12 filed with the Company's Three Year Energy Efficiency Plan 2013-2015, D.P.U. 12-104). Actual costs are below planned due to lower participation. Low costs and relatively high benefits resulted in a higher than planned BCR.

EM&V Studies included in this Annual Report that apply to the C&I Direct Install Program:

- *C&I Customer Profile Project*
This study characterizes the Massachusetts energy efficiency market by analyzing recent customer usage and program participation data. The study relied on comprehensive billing and tracking data for all C&I customers to estimate the extent to which customers of various sizes and types participated in energy efficiency programs in 2011. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 17.
- *Mid-Sized Customer Needs Assessment - Interim Results*
The study is investigating the extent to which current program offerings effectively serve the needs of mid-sized customers by conducting interviews with PAs and implementation contractors and analyzing available customer billing and tracking data to examine differences in participation rates across customer size groups. The interim results of this study do not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 18.

Changes Resulting from Current Year Performance: The Company regularly reviews best available information to adjust strategies in order to achieve energy efficiency goals. With respect to 2012 program performance information, the Company incorporated the best available information into its 2013-2015 energy efficiency plan. With respect to the results of EM&V studies that were completed for 2012, the Company will review those results and make any necessary adjustments to ensure it remains on track to achieve its goals for 2013-2105. The Company will continue to monitor program performance to determine if any evaluation is significant enough to trigger a modification under the new MTM guidelines established in D.P.U. 11-120-A (Phase II) (2013).

III. EVALUATION MEASUREMENT AND VERIFICATION ACTIVITIES

A. Summary

The Massachusetts Program Administrators completed 25 evaluation studies for the 2012 Energy Efficiency Annual Report. The studies that had the most significant influence on the final evaluated data for gas Program Administrators were the:

- C&I Customer Profile Project study
- HES Realization Rate Results evaluation
- 2012 Residential Heating, Water Heating and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing study
- Impact Evaluation of 2011 Custom Gas Installations study
- Impact Evaluation of 2011 Prescriptive Gas Measures study

The C&I Customer Profile Project sought to characterize the Massachusetts energy efficiency market by looking at past customer participation, billing data, and customer usage. Overall, the study found the vast majority of savings in 2011 came from custom projects in the custom end-use, which supports a continuation of impact evaluation work to verify these savings. In addition, the study made several other key observations. One, there is an indication of opportunity for more savings in some customer sectors, for example the health care sector where the percent of participating customers is low (1.8 percent of electric and 3 percent of gas) while the savings achieved by participating customers is higher than average. However, while the study identified areas which appear to represent opportunity, it did not seek to answer why participation was low in the sectors. Two, participation rates appeared to increase as account size increased for both gas and electric, reflecting the individualized attention paid to these customers by PA account managers. However, the average savings percent was found to be highest for small gas and electric customers. Finally, the participation rate for gas customers with the same electric PA was found to be 2.6 percent, which was higher than the 1.6 percent participation rate for those with different electric PAs. Additional information on this process evaluation is discussed in more detail in Appendix C, Study 17.

The HES Realization Rate study is a supplemental evaluation following up on the larger 2011 HES Impact Study, which was completed in 2012. This evaluation was needed to provide specific PA realization rates and account for improvements in some vendor software. The HES Realization Rate study targeted two measures: insulation and air sealing. As a background, the savings for these measures are provided by the vendor, who utilizes proprietary software to calculate savings based on the existing conditions compared to the upgraded conditions. The study compared the vendor calculated savings with billing analysis in order to calculate realization rates. The study results showed overall higher savings and higher realization rates when compared with the 2011 impact study. This is due in part to increased adoption of recommended weatherization measures by study participants. This study is discussed in more detail in Appendix C, Study 3.

The 2012 Residential Heating, Water Heating and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing Study sought to determine net-to-gross (“NTG”) ratios and early replacement timing for measures in the Residential Heating and Water Heating and Cool Smart programs. The results indicated that the NTG ratios are slightly higher than previously estimated for many measures. Further, the Net Market Effects (“NME”) analyses and data show evidence that the primary cause of improved NTG ratios is the strong equipment rebate levels that moved the market towards higher tiered efficiency. The study also examined if the program incentives are causing the early replacement of existing equipment prior to failure, thus taking an inefficient equipment offline before the end of its useful life. While the study showed program induced early replacement occurring, the levels of such early replacement were not aligned with the non-energy impacts (“NEIs”) assigned to various measures. Overall, this resulted in a modest increase in savings from early replacement, but a sharp decrease in NEIs associated with several measures. This study is discussed in more detail in Appendix C, Study 2. The NEI application is discussed in more detail in Appendix C, Study 25.

The Impact Evaluation of 2011 Custom Gas Installations and the Impact Evaluation of 2011 Prescriptive Gas Measures sought to test the accuracy of estimated savings of installed C&I custom and prescriptive gas measures. Historically, gas impact work generally found the gas savings estimates to be unpredictable. However, these two new studies showed results appear to be stabilizing. While some measure variation remains, the statewide custom realization rate on annual gas therm savings was found to be 82.1 percent of forecasted savings and the overall statewide prescriptive evaluated savings were found to be 102 percent of forecasted savings. These studies are discussed in more detail in App. C, Study 19 and 21.

Table III.A summarizes the EM&V studies that have not been included in previous Annual Reports. Please note: Studies 4, 5, 6, 8, 10, 13, 14, 15 and 16 apply to electric energy efficiency programs only and are therefore, not included in the table below.

Table III.A			
Evaluation Studies in Annual Report			
Studies	Location of Complete Study in Annual Report	Docket & Exhibit Approving Planned Evaluation Studies	Implemented as Approved? (yes/no)
Residential Program Studies			
MA RNC Program Incremental Cost Report	App. C, Study 1	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	All Studies are implemented as planned
2012 Residential Heating, Water Heating and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing	App. C, Study 2	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
HES Realization Rate Results Memo	App. C, Study 3	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Results of the Massachusetts Onsite Lighting Inventory	App. C, Study 7	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Residential Pilot Studies			
2012 Home Energy Services Pre-Weatherization Initiative Evaluation	App. C, Study 9	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	All Studies are implemented as planned
Low-Income Program Studies			
Status of Ongoing Low Income Lighting and Heating Metering Study	App. C, Study 11	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	All Studies are implemented as planned
Commercial & Industrial Program Studies			
Massachusetts Small Business Direct Install: 2010-2012 Impact Evaluations	App. C, Study 12	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	All Studies are implemented as planned
Customer Profile Project	App. C, Study 17	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Mid-Sized Customer Needs Assessment - Interim Results	App. C, Study 18	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Impact Evaluation of 2011 Prescriptive Gas Measures	App. C, Study 19	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Standard Boiler Research Plan and Interview Results Memo	App. C, Study 20	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Impact Evaluation of 2011 Custom Gas Installations	App. C, Study 21	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Special & Cross Sector Studies			
Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report	App. C, Study 22	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	All Studies are implemented as planned
2012 Massachusetts Statewide Marketing Campaign Evaluation Report	App. C, Study 23	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
2013 Massachusetts Statewide Marketing Campaign: Pre-Campaign Snapshot	App. C, Study 24	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Massachusetts Residential Non-Energy Impacts (NEIs): Deemed NEI Values Addressing Differences in NEIs for Heating and Cooling Equipment that is Early Replacement Compared to Replace on Failure	App. C, Study 25	Study not submitted for approval	

B. Residential Program Studies

1. MA RNC Program Incremental Cost Report

Type of Study: Technology Evaluation
Evaluation Conducted by: NMR Group
Date Evaluation Completed: 6/11/2013

Evaluation Objective and High Level Findings: This report provides estimates of the incremental costs per square foot involved in building high efficiency homes that meet the criteria of the 2013 MA Residential New Construction (RNC) Program. Incremental costs above the costs of typical homes being built outside the program are estimated for single family (SF), low-rise multifamily buildings of three or fewer stories (MF 1-3), and mid- to high-rise multifamily buildings of four stories or more (MF 4+) for each of the incentive options offered by the program.

The evaluation provides the following incremental cost per square foot for homes built through the program.

MA RNC Single Family Incremental costs	Prescriptive		Performance		
	I	II	Tier I	Tier II	Tier III
Single Family Detached	\$ 1.54	\$ 6.39	\$ 1.19	\$ 4.57	\$ 9.33

MA RNC Multi-family 1-3 story Incremental Costs	Prescriptive		Performance	
	I	II	Tier I	Tier II
Single Family Attached	\$ 1.38	\$ 5.61	\$ 1.03	\$ 1.27
Multifamily 1-3 No Master Meter	\$ 0.10	\$ 1.50	\$ 0.65	\$ 1.18
Multifamily 1-3 Master Meter Gas	\$ 0.08	\$ 1.48	\$ 0.79	\$ 1.35
Multifamily 1-3 story Overall	\$ 0.60	\$ 3.10	\$ 0.86	\$ 1.29

MA RNC Multi-family 4+ Story Incremental Costs	Residential In-unit Prescriptive	Whole bldg Simple Prescriptive	Whole bldg Interactive Prescriptive
Multifamily 4+ story	\$ 0.14	\$ 1.21	\$ 1.65

MA RNC Incremental Costs By Sector	Single Family	Multi-Family 1-3 story	Multi-Family 4+ story
Overall Incremental cost/SF	\$ 2.31	\$ 0.95	\$ 1.00

Programs to which the Results of the Study Apply:

- Residential New Construction and Major Renovation (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: No recommendations were offered.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: No recommendations were offered.

Savings Impact: The study had no impact on savings.

Formulas Used in Impact Analysis: Historical RNC program participant data was used to inform differential pricing estimates and weighting.

Application of Results: Retroactively

How the Study Came to the Recommended Conclusions: No recommendations were offered.

A copy of the complete study can be found in Appendix C, Study 1.

2. 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing

Type of Study: Market Assessment, Market Characterization

Evaluation Conducted by: Navigant, ODC, and Cadmus

Date Evaluation Completed: 6/19/2013

Evaluation Objective and High Level Findings: The objectives of this evaluation were to:

1. Determine free-ridership (FR), spillover (SO), and net-to-gross (NTG) values by program measure,
2. Estimate the net market effects (NME) for each measure, and
3. Estimate the timing of equipment replacement (ER) across early replacement, replace on failure (ROF), and “in-between” categories. There is also a fourth category (“new”) which is either a first-time installation of the end-use or new construction.

The high level findings are as follows:

FR, SO, and NTG estimates for Cool Smart and Residential Heating and Water Heating (HEHE) equipment measures are shown in Table 1. The results indicated that the NTG ratios are slightly higher than previously estimated for many measures. Further, the NME analyses and data provide qualitative evidence supporting this finding, and that the primary cause of improved NTG results is a better alignment of equipment efficiency tiers and associated rebate levels – and appropriate changes over time – to move the market.

Table 1: Average FR, SO, and NTG Estimates

Measure	FR	SO	NTG
Boilers, AFUE 90-95.9%	0.32		0.76
Boilers, AFUE \geq 96%	0.31	0.08	0.77
Boilers, Overall	0.31		0.77
Furnaces, AFUE \geq 95%	0.41	0.22	0.81
Central Air Conditioners/Heat Pumps, SEER 14.5-14.9	0.35		0.93
Central Air Conditioners, SEER \geq 16	0.42	0.28	0.86
Central Air Conditioners, Overall	0.40		0.88
Ductless Mini-Splits	0.45	0.07	0.62
Storage Water Heaters, Energy Factor \geq 0.67	0.13	0.13	1.00
Tankless Water Heaters, Energy Factor \leq 0.94	0.37		0.89
Tankless Water Heaters, Energy Factor \geq 0.95	0.28	0.26	0.98
Tankless Water Heaters, Overall	0.32		0.93
Integrated Space Heaters/Water Heaters with a Condensing Boiler	0.34	0.08	0.74

This study also addressed the Quality Installation Verification components of the Cool Smart Program.

Table 2 provides a summary of the QIV FR, SO, and NTG values as follows:

Table 2: Quality Installation Verification NTG

Measure	Average FR	Average SO	NTG
Manual J Central Air Conditioners and Heat Pumps	0.38	0.16	0.78
Manual J Heating	NA	0.15	NA
Airflow Testing/Duct Sealing	0.15	0.07	0.92
Refrigerant Testing	0.22	0.24	1.02
Overall QIV	0.25	0.16	0.91

The measures responsible for the majority of savings due to equipment installations in the HEHE and Cool Smart programs are central HVAC systems: natural gas boilers, natural gas furnaces, central air conditioning, and heat pumps. As shown in

Table 3, participants replacing equipment early (4 or more years of remaining life) represent more than 30% of boiler and 23% of furnace installations, but just 8% of central air conditioner and heat pump installations. Early replacement shares among integrated boiler/hot water units, storage water heaters, and tankless water heaters range from 20 to 33%. There is virtually no early replacement among ductless mini-split installations. More than 95% of these are either first-time cooling installations or are replacing window air conditioners. There are also a significant number of HEHE participants who are neither early nor replace-on-failure (ROF). These in-between installation estimates range from 15 to 25% across all of the program's major equipment measures.

Table 3. Equipment Replacement Timing in HEHE and Cool Smart Programs

Equipment Replacement Timing Shares				
Measure	Early	New	ROF	In-Between
Boiler	30.6%	0.0%	44.9%	24.5%
Furnace	23.1%	0.0%	61.5%	15.4%
Central Air Conditioner / Heat Pump	8.0%	50.4%	29.2%	12.4%
Ductless Mini-Split	2.5%	95.1%	0.0%	2.5%
Integrated Boiler / Water Heater	20.0%	0.0%	55.7%	24.3%
Storage Water Heater	33.3%	0.0%	50.0%	16.7%
Tankless Water Heater	28.0%	0.0%	54.8%	17.2%

Programs to which the Results of the Study Apply:

- Residential Cooling and Heating Equipment (CoolSmart) (Electric)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Company to these recommendations is summarized below.

Recommendation 1: The evaluators want to acknowledge the lack of consensus on NTG algorithms, and recommend that the PAs and EEAC develop clear protocols across all residential and non-residential program categories to look at NTG issues more holistically.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: All recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that require changes to program design and operations. The PAs are considering undergoing an initiative in the Cross Cutting Sector to encourage methodological consensus.

Application of Results: Retroactively

How the Study Came to the Recommended Conclusions: The evaluators estimated measure-specific FR, SO and NTG via what is commonly referred to as the Self-Report Approach (SRA). The SRA method was also used to estimate the NME and ER estimates. The evaluators relied on

surveys with heating, cooling and water heating distributors and contractors, as well as surveys with program participants.

A copy of the complete study can be found in Appendix C, Study 2.

3. Home Energy Services Realization Rate Calibration

Type of Study: Impact Evaluation

Evaluation Conducted by: The Cadmus Group, Inc.

Date Evaluation Completed: 6/28/2013

Evaluation Objective and High Level Findings: The objective of the evaluation was to develop realization rates (the ratio of *ex ante* and *ex post* savings) that each Program Administrator (PA) could use to adjust insulation and air-sealing savings, as estimated by the most recent home auditing software employed by each HES implementer, to more closely reflect evaluated savings.

The evaluation yielded the following realization rates by PA (where appropriate and when sufficient data were available) for each of the four assessed heating fuel types.

Natural Gas

PA	n	Model Precision (at 90% confidence)	<i>Ex Ante</i>	<i>Ex Post</i>	Realization Rate
Berkshire Gas	182	±17%	161	137	0.85
Columbia Gas	294	±10%	209	131	0.63
National Grid	2,889	±4%	188	140	0.74
New England Gas	18	±83%	107	119	1.11
NSTAR	1,344	±5%	165	139	0.84
Unitil	22	±21%	256	175	0.68
Commonwealth-wide	4,749	±3%	183	139	0.76

Electric

PA	n	<i>Ex Ante</i>	<i>Ex Post</i>	Realization Rate
Cape Light Compact	101	2,693	1,360	0.51
National Grid	383	2,423	1,459	0.60
NSTAR	124	2,712	1,468	0.54
Commonwealth-wide	608	2,527	1,445	0.57

Heating Oil

PA	n	<i>Ex Ante</i>	<i>Ex Post</i>	Realization Rate
Cape Light Compact	748	16.4	16.4	1.00
National Grid	5,365	18.9	16.7	0.88
NSTAR	4,192	19.8	16.8	0.85
Unitil	128	38.6	13.9	0.36
WMECo	329	34.7	19.0	0.55
Commonwealth-wide	10,762	19.8	16.8	0.85

Propane

PA	n	<i>Ex Ante</i>	<i>Ex Post</i>	Realization Rate
Cape Light Compact	70	14.3	12.2	0.86
National Grid	216	14.3	12.6	0.88
NSTAR	91	14.2	13.5	0.95
Unitil	5	63.2	12.7	0.20
WMECo	10	33.4	14.6	0.44
Commonwealth-wide	391	15.4	12.8	0.83

Programs to which the Results of the Study Apply:

- Residential Mass Save (Home Energy Services) (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: No recommendations were offered.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: No recommendations were offered.

Savings Impact: The PAs will use the results of this evaluation to retroactively adjust vendor provided *ex ante* savings estimates for insulation and air sealing measures.

Formulas Used in Impact and Process Analysis: The evaluation assessed *ex post* savings for both measures using two approaches: a billing analysis and an engineering analysis. A brief description of each follows:

- **Billing Analysis.** The evaluators developed a fixed-effects conditional savings regression model, using paired pre- and post-participation months to estimate savings for insulation and air sealing installed in homes heated by natural gas. The analysis utilized participation records from the High Efficiency Heating and Water Heating, Cool Smart, and OPower programs to ensure it did not misattribute the efficiency measures installed or behavioral changes resulting from those programs to the two HES measures.
- **Engineering Analysis.** For homes heated by electricity, heating oil, or propane, the evaluators estimated savings using PA- and fuel-specific U.S. Department of Energy (DOE-2) based simulation models, calibrated using each PA's average observed pre-program energy consumption. The simulation models were updated using detailed measure data and home characteristics recorded by HES implementers as well as a variety of weather files selected to best represent each PAs service territory.

Application of Results: Retroactively

How the Study came to the Recommended Conclusions: No recommendations were offered.

A copy of the complete study can be found in Appendix C, Study 3.

7. Lighting Onsite Inventory and Saturation Study

Type of Study: Technology Evaluation

Evaluation Conducted by: NMR Group

Date Evaluation Completed: 6/7/2013

Evaluation Objective and High Level Findings: The objective of this study was to perform lighting inventories and estimate socket saturations in Massachusetts homes. The study also examined lighting purchase behavior and searched for evidence of incandescent bulb stockpiling.

The main conclusions of the study are as follows:

- Most households used at least one CFL in 2013, even if some of them were dissatisfied with the products or not even aware they were using CFLs.

- The percentage of sockets filled with CFLs in 2013 was 28%, which was statistically similar to the 26% observed in 2009. The stagnation in CFL saturation can in part be explained by households replacing burned out CFLs with newly purchased CFLs.
- Saturation of all energy-efficient light bulbs, including CFLs, LEDs, and fluorescent tubes, increased to 39% in 2013.
- LED saturation remained low, at 2% of the total, but doubled from Spring 2012 to Spring 2013. Most LEDs were the under-the-cabinet type, not A-shaped bulbs.
- About 61% of sockets remaining in homes could theoretically be filled with an energy efficient light bulbs; about 57% of the remaining potential rests with standard bulbs, while the other 43% rests with specialty applications (i.e., dimmable or three-way control or does not have the A-shape).
- Households stored about two CFLs on average in 2013.
- The average onsite household bought about three CFLs in 2012—two of them were standard CFLs and one was a specialty CFL.
- The evaluators found evidence of stockpiling of incandescent bulbs; households stored an average of four incandescent bulbs, particularly 60-Watt bulbs. However, none of the onsite participants tied this behavior to EISA but instead explained that they just like to have extra bulbs on hand.

Programs to which the Results of the Study Apply:

- Residential ENERGY STAR Lighting® (Electric)
- Residential New Construction (Both)
- Low Income Residential New Construction (Electric)
- Multi-Family Retrofit (Both)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: Continue tracking the Massachusetts lighting market through regular consumer surveys, onsite saturation studies, shelf stocking surveys, and supplier interviews.

Recommendation 2: The PAs should perform a net-to-gross study as one has not been performed since 2010. This study will help to clarify whether current program-supported sales are helping to prevent backsliding to incandescent or incandescent halogen bulbs or whether they represent a high amount of free ridership.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: All recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that require changes to program design and operations.

The PAs will continue to track the lighting market to evaluate the impact of EISA. The PAs will also continue to work within the EMC to determine the correct timing to conduct a NTG study on the evolving lighting market.

Savings Impact: The report estimated the number of bulbs in indoor fixtures for all bulb types to be 1.49.

Formulas Used in Impact Analysis: There are no savings impacts, but PAs will update the assumed number of bulbs for indoor fixtures to be 1.49.

Application of Results: Retroactively

How the Study Came to the Recommended Conclusions: The study involved performing onsite visits to 150 homes in Massachusetts. Trained technicians took detailed notes about all lighting sockets and light bulbs found in the home, including bulbs found in storage. Households also provided information on when and where they purchased bulbs, why they stored bulbs, and the intended use of bulbs found in storage. The evaluators analyzed the data in Excel spreadsheets and in the Statistical Package for Social Sciences (SPSS) to arrive at the study conclusions.

A copy of the complete study can be found in Appendix C, Study 7.

C. Residential Pilot Studies

9. 2012 Home Energy Services Pre-Weatherization Initiative Evaluation

Type of Study: Process Evaluation

Evaluation Conducted by: The Cadmus Group, Inc.

Date Evaluation Completed: 4/19/2013

Evaluation Objective and High Level Findings: The objective of the evaluation was to assess the impact of initiative additional incentives on customer's decision to overcome pre-weatherization barriers (which then made them eligible to install certain recommended HES measures). The initiative targeted three common, low-cost pre-weatherization barriers: evidence of knob and tube wiring, general combustion safety, and improper dryer venting. The evaluation also assessed the delivery of the initiative itself. Key conclusions included:

Conclusion 1: The initiative data did not show a significant change in the measure adoption rate for National Grid and NSTAR customers who faced the knob and tube wiring barrier. Although these findings suggest that the initiative may not have influenced the measure adoption rate, it is important to remember that the provided data only represent a subset of HES customers, and the evaluators' analysis was limited to two PAs and only one barrier.

Conclusion 2: While the turnkey option offers customers easy access to approved contractors, the PAs and lead vendors that offered the turnkey option were uncertain of the delivery option's long-term viability. These PAs and lead vendors cited difficulties identifying and enrolling contractors given the limited financial opportunities for these contractors. In other words, the level of work for contractors generated by the initiative (to inspect knob and tube wiring and clear other pre-weatherization barriers) was not substantial enough to interest and enlist a sufficient number of approved turnkey contractors. PAs and lead vendors also cited the administrative burden, such as managing and updating the list of qualified contractors willing to participate in the program, as a challenge to turnkey viability. Further, according to Phase 2 participant survey respondents, only a small number of participants used this delivery option.

Conclusion 3: Non-participants indicated confusion about what the initiative actually covered for knob and tube wiring. During the survey, even after being told the incentive was only to check the wiring, non-participants still wanted a higher incentive: they were not able to differentiate between the cost of the inspection and the cost of potentially replacing the knob and tube wiring (if live).

Conclusion 4: PA stakeholders and customers that employed a 30-day deadline for initiative enrollment indicated that additional time would have helped. Specifically, survey respondents that were given the 30-day deadline indicated that the timeframe presented a challenge for addressing the initiative barriers (12%, n=13). However, an analysis of acceptance rates revealed that customers who were given a 30-day deadline had higher acceptance rates than those offered the 90-day deadline.

Conclusion 5: Interviews with PAs and lead vendors indicate that elements of the initiative's design and delivery varied across PAs. Examples of variation included marketing materials, participant forms, incentive amounts, and the timing of when participants received the rebate for clearing a barrier.

Programs to which the Results of the Study Apply:

- Residential Mass Save (Home Energy Services) (Electric & Gas)

Evaluation Recommendations and Program Administrator Response:

The following recommendations were made by the evaluators conducting this study.

Recommendation 1: The evaluators suggest that the PAs should work closely with their lead vendors to determine the long-term viability and effectiveness of the turnkey option.

Recommendation 2: The evaluators suggest that the PAs identify ways to better communicate what the cost of checking knob and tube actually covers and how it differs from the cost to actually replace the knob and tube wiring.

Recommendation 3: The evaluators suggest that the PAs consider a compromise deadline of 45 or 60 days that keeps some of the benefits of the immediacy of the deadline, but makes it more realistic for customers to meet the deadline.

Recommendation 4: While some variation may be necessary, the evaluators suggest that the PAs should discuss these variations, determine best practices, and standardize design and delivery as much as possible across the state.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: In an effort to standardize design and delivery, the PAs have adopted a 60 day deadline for acceptance of the incentive. All other recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any of the other recommendations that require changes to program design and operations.

Savings Impact: There are no savings impacts.

Formulas Used in Impact and Process Analysis: There are no savings impacts.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: The Pre-Weatherization Initiative evaluation included PA program manager interviews, program vendor staff interviews, 118 participant and nonparticipant customer surveys, and a review of pilot and historical program data. Based on information obtained through these data collection methods, the evaluators used their professional judgment and experience evaluating energy efficiency programs to offer recommendations aimed at improving program processes where appropriate.

A copy of the complete study can be found in Appendix C, Study 9.

D. Low-Income Program Studies

11. Low Income Hours of Use and Heating Study

Type of Study: Impact Evaluation

Evaluation Conducted by: The Cadmus Group, Inc.

Date Evaluation Completed: 6/28/2013

Evaluation Objective and High Level Findings: The objective of the study is to assess lighting hours of use (HOU) and the prevalence of secondary heating among low income customers. The study is currently underway and will be completed by September 6, 2013.

While the study is ongoing, the evaluators can offer the following preliminary findings at this time:

- The preliminary low income-specific HOU of 2.66 is slightly less than the current program assumption of 2.8 hours/day.
- Low income seniors use their lights less (2.12 hours per day) than low income non-senior (2.88).
- Homes with secondary heating sources appear to supplement their primary heating when heating their home. As a result, future evaluations should consider the impact of program measures on both primary and secondary heating.

The following caveats are important to consider given the study's status:

- The study is ongoing and all preliminary findings are subject to change. The evaluators do not anticipate significant changes to the key results presented in this memo, but acknowledge these results may shift slightly following a complete review process.
- The preliminary findings may also change based on agency's bulb installation practices. Discussions to date indicate that some agencies may install efficient lighting in any available sockets, while others may target specific high-use room or fixture types. The agency's collective installation practices have ramifications on the appropriateness of the preliminary HOU of 2.66, which represents average usage across all sockets in low income homes.

Programs to which the Results of the Study Apply:

- Low-Income New Construction (Electric)
- Low-Income 1-4 Family Retrofit (Electric & Gas)
- Low-Income Multi-Family Retrofit (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: No recommendations were offered, but the status memo does state that future low income impact evaluations should include secondary heating fuels when estimating total program savings.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: The PAs will include secondary heating fuels where appropriate in future low income impact evaluations.

Savings Impact: No savings impacts are offered at this time.

Formulas Used in Impact and Process Analysis: The preliminary study findings are based on analysis of 261 site visits at randomly sampled low income customer homes across the Commonwealth of Massachusetts.

At each home, trained technicians completed a whole-home lighting inventory and installed up to 10 lighting loggers per home. The technicians also installed a meter that assesses thermostat usage (for both manual and programmable thermostats) and meters that monitored heating equipment. In total, more than 2,000 lighting loggers and 800 meters were installed on heating equipment and collected usage information from November 29, 2012, through May 2, 2013.

The raw data collected through this robust metering process were reviewed, weighted, and annualized to estimate annual usage.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: No formal recommendations were offered.

A copy of the complete study can be found in Appendix C, Study 11.

E. C&I Program Studies

12. Massachusetts Small Business Direct Install: 2010-2012 Impact Evaluations

This study applies to electric energy efficiency programs only and is, therefore, not included in the Gas PAs' Energy Efficiency Annual Reports.

17. C&I Customer Profile Project

Type of Study: Market Characterization

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 6/20/2013

Evaluation Objective and High Level Findings: The primary goals of the C&I Customer Profile project were to:

- Characterize the Massachusetts energy efficiency market by analyzing recent customer usage and program participation data.
- Collect comprehensive billing and tracking data for all C&I customers to develop a single database to provide a consistent source of program tracking and billing data to support ongoing evaluation efforts.
- Estimate the extent to which customers of various sizes and types participated in energy efficiency programs during 2011.
- Document the processes used to consolidate and normalize PA data, and recommend enhancements to tracking systems to improve accuracy of results in future studies.

Highlights of the results of the analyses of participation by sector include:

- Custom vs. Prescriptive: The vast majority of savings in 2011 came from custom projects (64% of electric and 81% of gas). This would support a continuation of impact evaluation work of customer projects to ensure that methods used to calculate savings are effective.
- End Uses: On the electric side, the end use categories with the highest 2011 savings were lighting, combined heat and power (CHP) and heating, ventilation and air-conditioning (HVAC). While impact evaluations are underway for lighting and CHP, it has been several years since the last HVAC study. For gas projects, most 2011 savings came from HVAC.
- Business Type: The reliability of the estimated participation and savings rates by business type is limited by the fact that only 59% of billing accounts could be assigned to a business type. However, it appears that while only 1.8% of electric accounts classified as healthcare participated, their average savings was 23%. Similarly for gas, of the 3% of accounts classified as healthcare and education, the average savings was high. This may indicate the potential for significantly more savings in these sectors.

- **Account Size:** Participation rates increase as account size increases for both gas and electric, reflecting the individualized attention paid to these entities by PA account managers. However, the average savings percent is highest for small gas and electric accounts.
- **Same PAs:** The participation rate for gas customers with the same electric PA is 2.6%, which is higher than the 1.6% participation rate for those with different electric PAs. This may be an indication of the challenges faced in coordinating marketing efforts between PAs.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Electric & Gas)
- C&I Large Retrofit (Electric & Gas)
- C&I Small Retrofit (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: Standardization of tracking database information about end uses and building types would increase the accuracy of any information derived from the records received.

Recommendation 2: In order to evaluate overall customer participation, it is necessary to build the capability to link accounts across fuels.

Recommendation 3: Leverage the baseline information collected here for other market characterization projects and efforts to estimate savings opportunities in each sector.

Recommendation 4: Incorporate checks to ensure that account numbers entered into tracking systems are accurate, and correspond to those in billing systems.

Recommendation 5: If there is a need for more reliable information by business type, explore services and software to use names and addresses to lookup business type rather than relying on PA designations.

Recommendation 6: Build on this one year snapshot with additional data going forward to accumulate program participation history.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: All recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that require changes to program design and operations.

Savings Impact: Not applicable. This is a market characterization study.

Formulas Used in Impact Analysis: Not applicable. This is a market characterization study.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: The project involved the collection, organization and analysis of 2011 energy efficiency project tracking data and billed energy usage for all Massachusetts Commercial and Industrial (C&I) gas and electric customers. The statewide database developed from this project has already provided information upon which other C&I impact and process evaluation work has been based. Once the data were collected and consolidated, it was analyzed to produce summaries that characterize the current energy efficiency market in Massachusetts.

A copy of the complete study can be found in Appendix C, Study 17.

18. Mid-Sized Customer Needs Assessment - Interim Results

Type of Study: Market Characterization

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 6/28/2013

Evaluation Objective and High Level Findings: This study provides results to date for the Massachusetts Mid-Sized Customer Needs Assessment for 2011 C&I customers. The study aims to investigate the extent to which current program offerings effectively serve the needs of mid-sized customers. In addition, if it is found that mid-sized customers or pockets of customers are underserved, the study will explore whether variations to existing program offerings or additional programs would be needed to optimally serve these customers. DNV KEMA completed research activities that addressed the following three objectives:

- Determine how Massachusetts PAs currently address mid-sized customers;
- Identify and describe the population of mid-sized customers across PAs (on-going);
- Estimate program participation rates for the largest, smallest, and mid-sized customers.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Electric & Gas)
- C&I Large Retrofit (Electric & Gas)
- C&I Small Retrofit (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: The following preliminary recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: *Improve processes for linking multiple accounts to customers* – The PA's ability to accurately and consistently classify customers depends upon their ability to track multiple account customers within and across PAs. The PAs employ a range of tools to

help them link customers; however, these tools did not provide sufficient support to enable the research team to link account representatives to the accounts they manage by account number. Moreover, we found large discrepancies between the segments that the PAs felt they were managing and those we were able to match with account representatives.

Recommendation 2: *Standardize classification and marketing approaches to multi-account customers* – The research found that multiple account customers were treated differently across PAs, and also within a PA, across customers. The lack of standardized approaches for treating multiple account customers limits our ability to isolate segments of customers based on size and complicates the PA’s ability to effectively market to those customers.

Recommendation 3: *Link electric and gas customers* – Because much of the identification and marketing to Direct Install customers is handled through the electric PAs, the gas-only PAs lose some autonomy regarding how their customers are marketed. Consequently, some large gas customers are not identified until after they receive Direct Install prescriptive solutions from installation contractors. Improved coordination of tracking systems across PAs would reduce the risk of this occurring. DNV KEMA found that the PA’s ability to link accounts across firms is constrained by legal privacy issues that must be addressed before this will be possible.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: All recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that require changes to program design and operations.

This memorandum provides preliminary results of this mid-sized customer needs assessment. The findings were limited to those relating to the in-depth interviews with PA staff and implementation contractors, and limited analysis of the C&I Customer Profile Project database. Continued research efforts include a detailed data mining exercise to investigate the relationship between in-depth interview responses and the customer billing and program tracking records as well as implementation of a survey of participants and non-participants to test various hypotheses developed based on the PA interviews and data analysis conducted to date. Results of these analyses will be reported in the final report which is expected to be completed in the second half of 2013.

Savings Impact: Not applicable. This is a market characterization study.

Formulas Used in Impact Analysis: Not applicable. This is a market characterization study.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: Interviews with each PA and 5 implementation contractors provided a set of criteria used to segment customers by size. In addition to reviewing the interview findings, DNV KEMA used the available customer billing and tracking data to examine differences in participation rates across the three size groups.

A copy of the complete study can be found in Appendix C, Study 18.

19. Impact Evaluation of 2011 Prescriptive Gas Measures

Type of Study: Technology Evaluation
Evaluation Conducted by: DNV KEMA
Date Evaluation Completed: 6/28/2013

Evaluation Objective and High Level Findings: This report presents the results of the impact evaluation of the Program Year 2011 (PY2011) Massachusetts Prescriptive Gas Measures Program. The evaluation consists of on-site monitoring and verification of the savings for a sample of participants for four of the top five measures installed, in terms of savings.

The overall relative performance for the four measures was about 102% and the relative precision was about $\pm 15.6\%$. The condensing furnace and condensing boiler measures both had relative performance greater than 100%, at about 160% and 107 % respectively. Since they represent about 85% of total program savings their performance offset the lower relative performance observed for the other two measures. Indirect water heater and infrared heating measures had lower relative performance of 79% and 20% respectively.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Gas)
- C&I Large Retrofit (Gas)
- C&I Small Retrofit (Gas)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: Condensing Boiler Savings Recommendations:

Size	Efficiency Requirement	Report 2010 Savings (MMBtu)	Report 2011 Savings (MMBtu)	Report 2012 Savings (MMBtu)
<= 300 MBH	>= 90% AFUE	22.1	29.8	30.6
301-499 MBH	>=90% Thermal Efficiency	42.3	56.9	58.4
500-999 MBH	>=90% Thermal Efficiency	77.1	104.6	107.3
1000-1700 MBH	>=90% Thermal Efficiency	142.6	192.1	197.2
1701+ MBH	>=90% Thermal Efficiency	249.0	336.2	345.1

Recommendation 2: Recommended Condensing Furnace Savings

Furnace Efficiency	Report 2010 Savings (MMBtu)	Report 2011 Savings (MMBtu)	Report 2012 Savings (MMBtu)
Furnace AFUE =>92%	21.1	5.9	7.5
Furnace AFUE =>92% w/ECM	19.6	5.5	6.9
Furnace AFUE =>94% w/ECM	23.6	6.2	8.5
Furnace AFUE =>95% w/ECM	NA	NA	9.0
Furnace AFUE =>96% w/ECM	NA	NA	9.5
Furnace AFUE =>97% w/ECM	NA	NA	9.9

Recommendation 3: Recommended Infrared Heater Savings

Measure Type	Report 2010 Savings (MMBtu)	Report 2011 Savings (MMBtu)	Report 2012 Savings (MMBtu)
Infrared Heater	74.4	22.3	12.0

Recommendation 4: Recommended Indirect Water Heater Savings

Measure Type	Report 2010 Savings (MMBtu)	Report 2011 Savings (MMBtu)	Report 2012 Savings (MMBtu)
Indirect Water Heater	30.4	20.7	19.0

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: PAs plan to incorporate recommendations

Savings Impact: The overall relative performance for the four measures was about 102% and the relative precision was about ±15.6%. The condensing furnace and condensing boiler measures both had relative performance greater than 100%, at about 160% and 107 % respectively. Since they represent about 85% of total program savings their performance offset the lower relative performance observed for the other two measures. Indirect water heater and infrared heating measures had lower relative performance of 79% and 20% respectively.

Formulas Used in Impact Analysis:

$$\Delta MMBtu = \Delta MMBtu$$

Application of Results: Retrospectively

How the Study Came to the Recommended Conclusions: The evaluation consists of on-site monitoring and verification of the savings for a sample of participants for four of the top five measures installed, in terms of savings. The sample sites were monitored for about eight weeks in an attempt to capture seasonally sensitive variations in energy consumption between the winter and swing seasons. The first monitoring equipment was installed in the first week of December 2012 and recovery was completed during the second week of March 2013. The on-site sample design was designed to achieve a relative precision of ± 20% at the 80% confidence interval using a two-tail test for the overall program savings.

A copy of the complete study can be found in Appendix C, Study 19.

20. Standard Boiler Research Plan and Interview Results Memo

Type of Study: Technology Evaluation
Evaluation Conducted by: DNV KEMA
Date Evaluation Completed: 5/28/2013

Evaluation Objective and High Level Findings: This document summarizes the plan, execution, and the decision to re-scope the Boiler Baseline Assessment for the Massachusetts

Energy Efficiency Programs' Large Commercial & Industrial Evaluation. This study was commissioned to identify the base line boiler features and operation for both prescriptive and custom boiler measures. The research was intended to encompass two elements: first boiler distributors were to be interviewed to determine the characteristic features of new code-compliant boilers and also to provide leads for standard code-compliant boilers. Secondly, a sample of standard code compliant boilers would be metered to determine characteristic performance, with a particular interest in cycling boilers (vs. modulating firing rate). The second stage of research was expected to be M&V of non-program boilers. However, the team was unsuccessful at locating any customer both with a relatively recently installed standard efficiency boiler and willing to participate in the study through distributors, contractors, and other efficiency partners contacted.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Gas)
- C&I Large Retrofit (Gas)
- C&I Small Retrofit (Gas)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: It is important to note that the initial scoping does not provide conclusive evidence on the absence of standard efficiency boilers in the Massachusetts market, and further research on existing installed stock and recent sales data is warranted.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: PAs plan to incorporate recommendations. The Evaluation Working Group agreed to re-direct some of the funds not spent on metering to a boiler market investigation which would encompass a more rigorous interview sample, seek manufacturer sales data, and utilize other techniques to provide a more reliable view of the market. The results of this investigation will be presented and/or filed at a later date.

Savings Impact: Not applicable. This is a market characterization study.

Formulas Used in Impact Analysis: Not applicable. This is a market characterization study.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: The evaluators were unable to find base case boilers to monitor, therefore the focus turned to characterize the Massachusetts boiler market.

A copy of the complete study can be found in Appendix C, Study 20.

21. Impact Evaluation of 2011 Custom Gas Installations

Type of Study: Impact Evaluation

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 6/17/2013

Evaluation Objective and High Level Findings: This study aims to quantify the actual energy savings due to the installation of Custom Gas measures installed through the Massachusetts Energy Efficiency Program Administrators' (PAs) Commercial and Industrial (C&I) Lost Opportunity and Large Retrofit programs in 2011.

The realization rates will be used for planning and program reporting, including program year 2012 annual reporting and any 2013-2015 program planning and subsequent year reporting, unless replaced by results from a subsequent study.

The scope of work for this impact evaluation included NSTAR's 2011 Custom Gas measures. NSTAR's 2011 results were combined with those from the other gas PAs, which were based on the 2010 program year.

Key findings include the following:

- Statewide realization rate on annual gas therms savings was 82.1% with a relative precision of +9.4% at 80% confidence.
- NSTAR realization rate on annual gas therms savings was 84.4% with a relative precision of +/-6.9% at 80% confidence.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Gas)
- C&I Large Retrofit (Gas)

Evaluation Recommendations and Program Administrator Response: The following recommendations were made by the evaluators conducting this study. The initial response from the Program Administrator to these recommendations is summarized below.

Recommendation 1: Project documentation should include savings estimates in the native file form and support the claimed baseline.

Recommendation 2: Controls measures, particularly EMS based strategies, must be verified for proper operation, setpoints, and applicability. Savings estimates for these types of measures should include all necessary assumptions and operating characteristics well outlined. Post verification metering should be considered where savings justify the added expense or be included as a requirement of the project.

Recommendation 3: Estimated savings for measures such as combustion controls, which are based on a savings a fixed percentage of total gas used should include not only the percentage savings, but the baseline and projected as-built efficiencies and the billed gas usage. The

baseline, if currently installed, should be demonstrated using combustion gas efficiency tests or other measure of the baseline. The resulting parameters can be easily checked against acceptable ranges to validate the measure.

Recommendation 4: The evaluators recommend that PA implementers consider using the results of the savings fraction analysis performed as part of the desk review process as a sanity check of individual application savings estimates and as indicator where a deeper review of an application may be required.

Recommendation 5: Consider some summer metering for measures which involve summer gas use such as industrial processes or re-heat operations.

Recommendation 6: In considering evaluation activities for the PY2012 program, the Evaluation Group may want to consider an additional round of on-site M&V impact evaluations for all the PAs except NSTAR. It is reasonable to conclude that the realization rates may not have stabilized statewide due to the rapid and continued expansion of the programs and the intent of the PAs to improve savings estimate processes.

Recommendation 7: However, before proceeding with the on-site M&Vs, the evaluators recommend repeating the desk-review task to further test the validity of the desk review method for triggering more expensive impact evaluations.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: All recommendations are being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that require changes to program design and operations.

Savings Impact: This impact evaluation produced an 84% realization rate for NSTAR, which is an improvement on the previous impact evaluation result of 47%, found one year earlier. As a result, the statewide realization rate also improved to 82%.

Formulas Used in Impact Analysis: Evaluated savings were determined through custom engineering analysis similar to how tracking savings were developed.

Application of Results: Retrospectively

How the Study Came to the Recommended Conclusions: Data collection included pre and post installation billing data, power metering, temperature metering, and in some cases, trend data collected from customer energy management systems. The sample was designed to achieve 80/10% precision at the statewide level, and 80/20% at the larger PA level (Columbia gas, National Grid, NSTAR). This sample design included 50 sites statewide. Following a desk review process, which helped determine that NSTAR would be the only PA to proceed with full M&V activities, the NSTAR sample was increased from the proposed 13 sites to 16 sites to ensure that the goal of 80/20% precision was met.

A copy of the complete study can be found in Appendix C, Study 21.

F. Special & Cross Sector Studies

22. Massachusetts Cross-Cutting Behavioral Program Evaluation Integrated Report

Type of Study: Impact and Process Evaluation

Evaluation Conducted by: Opinion Dynamics with Navigant Consulting and Evergreen Economics

Date Evaluation Completed: 6/20/2013

Evaluation Objective and High Level Findings: This report includes impact findings of behavior/feedback programs and pilots administered by National Grid, NSTAR, Western Massachusetts Electric Company (WMECo) and Cape Light Compact (CLC) during the 2012 program year. It also includes process findings for CLC's Smart Home Energy Monitoring Pilot (SHEMP) from 2009 - 2012.

The evaluation includes the following findings:

- The 2012 impacts for the National Grid and NSTAR behavior/feedback programs range from 41 kWh to 258 kWh per household for the electric cohorts and from 0.28 MMBtus to 1.90 MMBtus for the gas cohorts.
- OPower electric programs have demonstrated an average adjusted net savings gain of 27% from program year (PY) 1 to PY2, and 16% from PY2 to PY3. Gas programs have demonstrated an average adjusted net savings gain of 20% from PY1 to PY2, and 23% from PY2 to PY3.
- Since 2009, the National Grid and NSTAR behavior/feedback programs using OPower have channeled 24,122 additional participants into other residential programs and resulted in a savings of 5,298 MWh and 28,581 MMBtus. The additional savings are a result of the OPower program driving increased participation in other residential programs.
- For National Grid and NSTAR behavior/feedback programs, the report provided savings estimate ratios to adjust implementer estimate of savings based on comparison of treatment and control group usage for each month of participation. The savings estimates range between 90% - 111%.
- The WMECo program achieved a total overall savings of 2,263 MWh in 2012 attributable to "passive" participants that receive energy saving reports (mailers), and "activated" participants that interact with an online web platform.
- The WMECo program has had a substantial positive impact on participation in other energy efficiency programs. For instance, online activation of the web portal has increased participation in the Mass Save program by 431 customers in 2012.
- CLC's SHEMP Pilot using the Tendril in-home displays had significant savings differences between the older Legacy cohort and the more recent Energize cohort. Legacy customers' savings range from 7.8%-8.8% average savings per household.

Comparatively, Energize savings estimates are significantly lower, ranging from 1.49%-1.99% average savings per household.

- CLC’s SHEMP Pilot had differences between Legacy and Energize cohorts’ cross-program participation levels. Legacy customers demonstrated a sharp increase in cross-program participation during the Legacy participation period. Energize customers’ monthly cross-program participation dropped during the treatment period.

Programs to which the Results of the Study Apply:

- Behavior/Feedback (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: There were no recommendations as part of this report.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: Not applicable

Savings Impact: For the National Grid and NSTAR behavior/feedback programs, the net savings increase or decrease slightly compared to the 2012 TRM for various cohorts. Please see Table 2 on page 10 in the report for additional information.

Similarly for WMECo, net savings increase or decrease compared to planned values, with passive participants exhibiting increased savings while activated participants exhibiting decreased savings. Please see Table 14 in the report for additional information

CLC’s SHEMP pilot results do not impact savings.

Formulas Used in Impact Analysis:

Impact analysis for Behavior/Feedback programs using OPower HER, and for passive participants in the WMECo program:

$$ADC_{it} = \alpha_i + \beta_1 Post_t + \beta_2 Treatment_i \cdot Post_t + \epsilon_{it} \quad (\text{Equation 1})$$

where:

ADC_{it} = Average daily consumption (kWh) for household i at time t

α_i = Household-specific intercept

β_1 = Coefficient for the change in consumption between pre- and post-periods

β_2 = Coefficient for the change in consumption for the treatment group in the post-period compared to the pre-period, and to the comparison group. This is the basis for the net savings estimate.

Please refer to section 3.1.2 of the report for additional information.

Developing Savings Estimate Ratio for Behavior/Feedback programs using OPower HER:

$$\text{Savings Estimate Ratio}_{u,c,f} = \frac{(\text{Estimated Modeled Savings}) = \sum_{i=0}^p n * kWh Savings_{u,c,t,f}}{(\text{OPOWER Reported Savings}) = \sum_{i=0}^p n * kWh Savings_{u,c,t,f}}$$

(Equation 3)

where:

- n is the average number of participants in a given cohort
- u is a given utility
- c is a given cohort
- i is a given time period
- f is a given fuel type

Please refer to section 3.1.2 of the report for additional information.

Impact Analysis for WMECo’s Activated Participants:

The matching method was employed to calculate savings for WMECo’s activated participants. The matching method follows the approach summarized in Imbens and Wooldige (2009) and applied in Abadie and Imbens (2011). In this model, the effect of the activation in month *t* is the difference between the energy use of participant *k* and its estimated counterfactual (baseline) consumption.

Impact Analysis for CLC’s SHEMP Pilot -- Model 1:

$$kWh_{kt} = \alpha_{0t} + \alpha_1 Treatment_{kt} + \alpha_2 PREkWh_{kt} + \sum_{j=1}^J \beta^j EE_{kt}^j + \varepsilon_{kt}$$

where:

kWh_{kt} is the average daily electricity use by household k during month t;

all Greek characters denote coefficients to be estimated, and in particular α_{0t} is a monthly fixed effect.

$Treatment_{kt}$ is an indicator variable taking a value of 1 if customer k is a SHEMP participant, and 0 otherwise;

$PREkWh_{kt}$ is the average daily electricity use by household k during the most recent month before household k enrolled in SHEMP that is also the same calendar month as month t. For instance, if household k enrolled in August 2011, the value of $PREkWh_{kt}$ for June 2012 is June 2011.

EE_{kt}^j is an indicator variable for energy efficiency program j, taking a value of 1 if customer k is in the program in period t and 0 otherwise. In the analysis we consider four EE programs (that is, J=4), denoted by the following variables in regression results reported in Appendix C (of the Evaluation Report):

- LISF= Low Income Single Family program;
- MFR= Multi-Family Retrofit program;
- RHE= Residential Home Energy program;

RP= Residential Products program.

ε_{kt} is the error term

In this model α_1 indicates average daily savings generated by the program for participants over the course of the initiative.

Please refer to section 3.3.4 of the report for additional information.

Impact Analysis for CLC's SHEMP Pilot -- Model 2:

$$\text{Savings}_{kt} = kWh_{kt} - \overline{kWh}_{kt}^C$$
$$\overline{kWh}_{kt}^C = kWh_{kt}^M + \hat{\beta}(\mathbf{X}_{kt} - \mathbf{X}_{kt}^M)$$

where:

kWh_{kt} = the average daily electricity use by household k during month t ;

\overline{kWh}_{kt}^C = the estimated counterfactual energy use by household k during month t ;

kWh_{kt}^M = the energy use by household k 's match during month t ;

\mathbf{X}_{kt} = the values for household k in month t of the independent variables \mathbf{X} affecting energy use;

\mathbf{X}_{kt}^M = the values of \mathbf{X} in month t for household k 's match.

$\hat{\beta}$ = the factors used to adjust household k 's energy use to reflect differences between household k and its match in the value of \mathbf{X} .

Please refer to section 3.3.4 of the report for additional information.

Application of Results:

- The National Grid and NSTAR Behavior/Feedback results will be applied in the 2012 Annual Report.
- The National Grid and NSTAR Behavior/Feedback savings estimate ratio will be applied in 2013 and going forward.
- The WMECo Behavior/Feedback results will be applied in the 2012 Annual Report.
- CLC SHEMP is a pilot program that will not directly affect savings for any program during this annual report year.

How the Study Came to the Conclusions: For the National Grid and NSTAR Behavior/Feedback programs and WMECo passive participants, the evaluation developed its savings estimate based on a billing analysis of the entire program population and its randomly assigned control groups using a linear fixed effects regression. A channeling analysis was then performed to determine what portion of HER savings, as measured through the billing analysis, were captured in other programs. For more information, please see section 3.1 of the study.

For the WMECo Western Mass Saves (WMS) activated participants, the matching method was employed to calculate savings. More details can be found in Section 3.2.2 of the study.

For CLC's SHEMP pilot process evaluation, the evaluation findings are based on a literature review, survey research from pre and post treatments surveys and an additional survey to a comparison group. For CLC's impact analysis, the evaluation uses a billing analysis of the opt-in treatment group to a matched comparison group. For more information, please see section 3.3 of the study.

A copy of the complete study can be found in Appendix C, Study 22.

23. 2012 Massachusetts Statewide Marketing Campaign Evaluation Report

Type of Study: Market Assessment

Evaluation Conducted by: Opinion Dynamics Corporation

Date Evaluation Completed: 1/11/2013

Evaluation Objective and High Level Findings: This report presents results from the post 2012 statewide umbrella marketing survey effort conducted by Opinion Dynamics. The primary goal of this research is to enable the PAs to track changes in Mass Save awareness over time as well as to measure the effectiveness of the campaign. As such, this report presents the results from residential and C&I quantitative surveys conducted immediately following the 2012 campaign, which ran from April 2 to August 19, 2012. A comparison of results from the pre- and post-campaign surveys indicates that there have been some changes in Mass Save awareness or familiarity as a result of 2012 campaign activities. However, there are differing results within the residential and commercial populations.

Overall, the team found divergent results within the residential and C&I populations, with C&I customers showing greater changes in awareness and other metrics over time. For example, there has been a significant increase in Mass Save awareness among C&I customers compared to awareness prior to the 2012 campaign launch. The August 2012 survey shows that awareness among C&I customers has risen from 33% pre-campaign to 40% post-campaign. However, awareness of and familiarity with Mass Save has not changed significantly among residential PA customers since the pre-campaign survey. In addition, there has been little change in residential familiarity compared to the 2010 baseline study conducted by the campaign implementer.

Programs to which the Results of the Study Apply:

- Residential New Construction and Major Renovation (Electric & Gas)
- Residential Cooling and Heating Equipment (Electric & Gas)
- Residential Multi-Family Retrofit (Electric & Gas)
- Residential Mass Save (Home Energy Services) (Electric & Gas)
- Residential ENERGY STAR® Lighting (Electric)

- Residential ENERGY STAR® Appliances (Electric)
- C&I New Construction and Major Renovation (Electric & Gas)
- C&I Large Retrofit (Electric & Gas)
- C&I Small Retrofit (Electric & Gas)
- Behavior/Feedback Program (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: There were no recommendations from this report as it was designed to track changes in awareness from the campaign and to measure the campaigns effectiveness.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: Not applicable.

Savings Impact: No savings impact.

Formulas Used in Impact Analysis: Not applicable.

Application of Results: Prospectively.

How the Study Came to the Recommended Conclusions: A telephone survey was conducted with a random sample of 402 residential customers between August 20 and September 9, 2012, immediately following the conclusion of the 2012 marketing campaign. The sample of customers was based on files that the PAs provided to the evaluators, which merged PA Customer Information System (CIS) data with program tracking databases to develop a master file of all PA residential customers. The evaluators used the merged customer database to create a sample frame containing all unique residential accounts with valid contact information. From this frame, a random sample was created and survey quotas set for each PA combination, in proportion to their representation in the overall population to ensure that the sample was representative of the overall customer base.

Weights were developed and applied to the residential telephone survey data to match the composition of customers within the Massachusetts population based on home ownership.

The evaluators also conducted a telephone survey among PA business customers to assess changes in awareness, familiarity, and associations with Mass Save. The team surveyed a simple random sample of 295 C&I customers in August and September 2012. The fielding of the survey was timed to take place immediately following the 2012 marketing campaign. The team based the sample of C&I customers on customer files provided by the PAs. Given the lack of readily available population-level data on Massachusetts businesses, the evaluators conducted an unweighted analysis of the commercial survey data.

A copy of the complete study can be found in Appendix C, Study 23.

24. 2013 Massachusetts Statewide Marketing Campaign Pre-Campaign Results

Type of Study: Market Assessment

Evaluation Conducted by: Opinion Dynamics Corporation

Date Evaluation Completed: 6/5/2013

Evaluation Objective and High Level Findings: This report presents results from the pre-2013 statewide umbrella marketing survey effort conducted by Opinion Dynamics. The goal of the research is to document current levels of awareness of Mass Save against which to measure changes over time.

The pre-campaign survey indicates that unaided awareness of Mass Save among residential customers remains moderate (36%) and has not changed since the post 2012 campaign survey. Further, consistent with prior surveys, the percentage of residential customers who consider themselves somewhat or very familiar with Mass Save, remains relatively low (19%). Just under half of residential (46%) customers aware of Mass Save identify utilities or energy efficiency service providers as sponsors.

Among C&I customers, unaided awareness of Mass Save is moderate with 47% reporting that they have seen or heard the term before. This represents an increase since the last statewide marketing survey when awareness was 40%. Additionally, just over half of commercial customers (55%) aware of Mass Save identify utilities or energy efficiency service providers as sponsors.

Programs to which the Results of the Study Apply:

- Residential New Construction and Major Renovation (Electric & Gas)
- Residential Cooling and Heating Equipment (Electric & Gas)
- Residential Multi-Family Retrofit (Electric & Gas)
- Residential Mass Save (Home Energy Services) (Electric & Gas)
- Residential ENERGY STAR® Lighting (Electric)
- Residential ENERGY STAR® Appliances (Electric)
- C&I New Construction and Major Renovation (Electric & Gas)
- C&I Large Retrofit (Electric & Gas)
- C&I Small Retrofit (Electric & Gas)
- Behavior/Feedback Program (Electric & Gas)

Evaluation Recommendations and Program Administrator Response: There were no recommendations from this report as it was designed to establish baseline campaign awareness.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: Not applicable.

Savings Impact: No savings impact.

Formulas Used in Impact Analysis: Not applicable.

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: Evaluators conducted a telephone survey with a random sample of 504 residential PA customers. The team drew the sample from multiple data files provided by the PAs. The team integrated customer data to create a sample frame containing all unique residential accounts with valid contact information. From this frame, the team drew a random sample and set survey quotas for each PA combination in proportion to their representation in the overall population to ensure that the sample was representative of the overall customer base.

Similar to the 2012 surveys, the team developed and applied weights to the residential telephone survey data to match the composition of customers within the Massachusetts population based on homeownership.

The team also surveyed a random sample of 456 PA C&I customers in March of 2013. The team drew the sample of C&I customers from customer data provided by the PAs.

Given the lack of readily available population-level data on Massachusetts businesses, the evaluators did not weight the results of the commercial survey. However, the team also considered whether weighting the survey results to those from the first survey with this group was necessary. The team determined that it was appropriate to leave the data unweighted due to the fact that the team spoke with similar firms across each of the survey waves, and the fact that there is no consistent or significant relationship between any of the firmographics and Mass Save awareness across the waves.

A copy of the complete study can be found in Appendix C, Study 24.

25. Massachusetts Residential Non-Energy Impacts (NEIs): Deemed NEI Values Addressing Differences in NEIs for Heating, Cooling, and Water Heating Equipment that is Early Replacement Compared to Replace on Failure

Type of Study: Impact Evaluation

Evaluation Conducted by: NMR Group

Date Evaluation Completed: July 15, 2013

Evaluation Objective and High Level Findings: Non-Energy Impacts (NEIs) associated with heating, cooling, and water heating equipment may differ according to whether the program-sponsored equipment is an early replacement measure, a measure that is replacing failed equipment, or equipment that was scheduled to be replaced.

This memorandum provides adjusted deemed NEI values that address the differences in NEIs for residential heating, cooling, and water heating equipment that is early replacement compared to replace on failure. These deemed NEIs update the NEIs provided in the residential NEI report submitted to the PAs on August 15, 2011⁷.

Programs to which the Results of the Study Apply:

- Residential Cooling & Heating Equipment (Electric)
- Residential Heating and Water Heating (Gas)

Evaluation Recommendations and Program Administrator Response: The study did not offer any recommendations.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: The study did not offer any recommendations.

⁷ NMR Group, Inc. (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts. (http://www.ma-eeac.org/Docs/8.1_EMV%20Page/2011/2011%20Residential%20Studies/Mass%20Cross-cutting%20NEIs%20Final%20Report%20081511.pdf)

Savings Impact:

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Percent ROF	Overall NEI Value (\$/Year)
Cooling System	Central Air Conditioner/ Heat Pump	Noise Reduction	Annual	\$2.83	67%	\$1.90	35.4%	\$2.50
		Home Durability	Annual	\$1.54	33%	\$0.51		\$1.17
		Property Value Increase	One Time	\$62.65	50%	\$31.33		\$51.56
Heating and Cooling System	Ductless Mini-Split	Noise Reduction	Annual	\$1.42	67%	\$0.95	1.3%	\$1.41
		Home Durability	Annual	\$1.98	33%	\$0.65		\$1.96
		Property Value Increase	One Time	\$80.69	50%	\$40.35		\$80.19
Heating System	Boilers between 90 and 96% AFUE	Home Durability	Annual	\$17.42	33%	\$5.75	86.5%	\$7.33
		Property Value Increase	One Time	\$678.52	50%	\$339.26		\$385.23
	Boilers greater than or equal to 96% AFUE	Home Durability	Annual	\$17.42	33%	\$5.75	86.8%	\$7.30
		Property Value Increase	One Time	\$678.52	50%	\$339.26		\$384.21
	Furnaces greater than or equal to 95% AFUE	Home Durability	Annual	\$17.42	33%	\$5.75	88.4%	\$7.10
		Property Value Increase	One Time	\$678.52	50%	\$339.26		\$378.61
Heating and Hot Water System	Integrated Boiler / Water Heater	Home Durability	Annual	\$0.72	33%	\$0.24	67.9%	\$0.39
		Property Value	One Time	\$29.17	50%	\$14.59		\$19.27

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Percent ROF	Overall NEI Value (\$/Year)
		Increase						
Hot Water System	Storage Water Heater	Home Durability	Annual	\$2.13	33%	\$0.70	58.4%	\$1.30
		Property Value Increase	One Time	\$82.56	50%	\$41.28		\$58.47
	Tankless Water Heater	Home Durability	Annual	\$2.13	33%	\$0.70	63.4%	\$1.23
		Property Value Increase	One Time	\$82.56	50%	\$41.28		\$56.39

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Final Adjustment	Adjusted NEI Value (\$/Year)
Cooling System	Central Air Conditioner / Heat Pump	Thermal Comfort	Annual	\$3.92	100%	\$3.92	÷ 2	\$1.96
		Health Benefits		\$0.13		\$0.13		\$0.07
Heating and Cooling System	Ductless Mini-Split	Thermal Comfort	Annual	\$5.05	100%	\$5.05	÷ 2	\$2.53
		Health Benefits		\$0.16		\$0.16		\$0.08
Heating System	Boilers between 90 and 96% AFUE	Thermal Comfort	Annual	\$48.63	100%	\$48.63	÷ 2	\$24.32
		Health Benefits		\$1.56		\$1.56		\$0.78
	Boilers greater than or equal to 96% AFUE	Thermal Comfort	Annual	\$48.63	100%	\$48.63	÷ 2	\$24.32
		Health Benefits		\$1.56		\$1.56		\$0.78

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Final Adjustment	Adjusted NEI Value (\$/Year)
	Furnaces greater than or equal to 95% AFUE	Thermal Comfort	Annual	\$48.63	100%	\$48.63	= 2	\$24.32
		Health Benefits		\$1.56		\$1.56		\$0.78
Heating and Hot Water System	Integrated Boiler / Water Heater	Thermal Comfort	Annual	\$1.83	100%	\$1.83	= 2	\$0.92
		Health Benefits		\$0.06		\$0.06		\$0.03

Formulas Used in Impact Analysis:

Overall NEI Value =

$$[(EE \text{ Portion of NEI} * Full \text{ NEI Value}) * ROF\%] + [Full \text{ NEI Value} * (1 - ROF\%)]$$

Application of Results: Retroactively

How the Study Came to the Recommended Conclusions: First, NMR developed a method based on industry knowledge and published literature in order to attribute a portion of the NEIs associated with heating, cooling, and water heating systems to the measure’s “newness” and a portion to the measure for being energy efficient.

Second, using the attribution factors, NMR estimated the value of the portion of NEIs for heating, cooling, and water heating measures associated with the energy efficiency of the measure for systems that are replaced on failure. Then, using data from the current Residential Heating and Water Heating and Cool Smart programs evaluation,⁸ the percentage of program participants that replaced failed systems was determined and the adjusted NEI values was attributed to these participants.

A copy of the complete study can be found in Appendix C, Study 25.

⁸ Cadmus. 2013. 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing (Draft Final Report). June 2013. Prepared for The Electric and Gas Program Administrators of Massachusetts.

G. Future Studies

Table III.B summarizes the studies expected to be included in next year’s Annual Report. There are a number of other studies which have been identified and are in the process of being scoped, however it is not known at this time whether they will be completed in time for the next Annual Report.

Table III.B: Evaluation Studies in Next Annual Report		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
Residential Studies		
Residential New Construction Net Savings	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Multifamily Process Evaluation	Study is planned but not yet submitted for approval.	Yes
Home Energy Services Home Performance Contractor and Lead Vendor Analysis	Study is planned but not yet submitted for approval.	Yes
Regional Hours of Use Lighting Logger Study	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
LED Market Effects Baseline Study (Residential and C&I)	Study is planned but not yet submitted for approval.	Yes
Understand Current Stagnation of Lighting Saturation	Study is planned but not yet submitted for approval.	Yes
Lighting Market Assessment	Study is planned but not yet submitted for approval.	Yes
Incremental Cost Assessment for Lighting and Products	Study is planned but not yet submitted for approval.	Yes
Top 10 Products Impact Assessment	Study is planned but not yet submitted for approval.	Yes
Residential Pilot Studies		
Low-Income Studies		
Low Income Hours of Use	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Low Income Multi-family Impact Scoping Study	Study is planned but not yet submitted for approval.	Yes
Commercial & Industrial Studies		
Mid-Sized Customer Needs Assessment - Final Report	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
CHP Impact Evaluation	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Existing Buildings Market Characterization	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Whole System Approach Study	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Codes & Standards Research using Existing New Construction Data	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Lighting Controls Scoping Study	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
LED Market Effects Baseline Study (Residential and C&I)	Study is planned but not yet submitted for approval.	Yes
Market Assessment of Roof Top Units	Study is planned but not yet submitted for approval.	Yes
Learning from Successful Projects	Study is planned but not yet submitted for approval.	Yes
Documentation of Program Administrator Differences	Study is planned but not yet submitted for approval.	Yes
C&I Customer Profile - 2012 Data	Study is planned but not yet submitted for approval.	Yes
Characterization of Supply Side Population	Study is planned but not yet submitted for approval.	Yes
Commercial Real Estate Market Characterization	Study is planned but not yet submitted for approval.	Yes
Process Evaluation of Direct Install Delivery Method	Study is planned but not yet submitted for approval.	Yes
Impact Evaluation of Custom HVAC Installations	Study is planned but not yet submitted for approval.	Yes
Impact Evaluation of Prescriptive Non-Lighting Installations	Study is planned but not yet submitted for approval.	Yes
Special & Cross-Cutting Studies		
2013 Massachusetts Statewide Marketing Campaign Post-Campaign Results	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Efficient Neighborhoods Plus	Study is planned but not yet submitted for approval.	Yes
Serrafix CMI (Northampton/Pittsfield)	Study was approved in January 2013 with the 2013-2015 Three Year Plan. D.P.U. 12-100 through D.P.U. 12-111	Yes
Brand Assessment Analysis of Gas Networks and CoolSmart	Study is planned but not yet submitted for approval.	Yes
New Construction Non Energy Impact Study	Study is planned but not yet submitted for approval.	Yes
Analysis of Non Energy Impacts for C&I Marketing	Study is planned but not yet submitted for approval.	Yes
Top Down Net to Gross Scoping Study	Study is planned but not yet submitted for approval.	Yes
Codes and Standards Scoping Study	Study is planned but not yet submitted for approval.	Yes

IV. STATUTORY BUDGET REQUIREMENTS

A. Introduction

The Green Communities Act requires that energy efficiency programs minimize administrative costs, utilize competitive procurement processes, and spend a certain amount on low-income programs. G.L. c. 25 §§ 19(a) - (c).

For each sector, Tables IV.A through IV.C summarize and compare planned and actual program planning and administration (“PP&A”) costs, outsourced activities, and budget allocation, respectively.

B. Minimization of Administrative Costs

General Laws c. 25, § 19(a) requires the Department, when authorizing energy efficiency programs, to ensure that such programs minimize administrative costs to the fullest extent practicable. Administrative costs, also commonly referred to as Program Planning & Administration (“PP&A”) costs, have traditionally been defined as all in-house and outsourced costs associated with planning activities and program administration. These include costs associated with developing program plans, and day-to-day program administration, including labor, overhead costs, and any regulatory costs associated with energy efficiency activities.

The most significant factor in the PA approach to minimizing administrative costs is the statewide collaborative process, which is used by the Program Administrators to coordinate planning, the adoption of consistent programs and processes, program design, EM&V studies, statewide marketing, regulatory proceedings, and the development and sharing of all best practices. Sharing of these costs, which would otherwise be borne by each Program Administrator individually, results in economies of scale that reduce the cost for each Program Administrator. For example, joint releases of Requests for Proposals (“RFPs”) lead to minimization of administrative costs in that the cost for preparation and release of the RFP are shared by the PAs. The Program Administrators also minimize administrative costs by coordinating energy efficiency program delivery, where appropriate, with other customer service activities such as customer acquisition, key account management and trade ally relationships.

Notwithstanding any appropriate coordination with other customer service departments, it is necessary and appropriate for all Program Administrators to maintain a skilled and dedicated administrative staff in order to ensure successful delivery of programs, compliance with the Green Communities Act, timely responses to the directives of the Council, Department, and DOER; and documentation and achievement of substantial savings. The Program Administrators seek to balance the need to minimize administrative costs to the extent prudent with the need to maximize program quality and oversight. Councilors have emphasized the need to devote sufficient administrative resources to successfully implement the aggressive programs called for in the three-year plans.

While the economies of scale and other steps taken by the PAs to minimize costs are effective, and administrative costs incurred by the PAs are transparent and are presented in each Program Administrator’s narrative and supporting tables, exact quantification of the minimization of administrative costs is not possible in a meaningful way. This is because the continuous scaling up and evolution of the Plans make it impossible to establish a solid baseline for a comparison.

When the variables are constantly (and necessarily) shifting, there is no opportunity to make a meaningful quantitative comparison or to estimate a counterfactual. Further, a direct quantitative comparison would not be useful because it would only provide a comparison of two points in time; the mandate of the Green Communities Act, however, is to seek administrative efficiencies, which is a continuous process that evolves along with energy efficiency planning and programming, whereas costs and administrative efficiency opportunities are always changing. The Program Administrators seek to minimize costs at all available opportunities, and not just from one point in time to another.

Please refer to Table IV.A. As shown, the Company did not experience any variances greater than ten percent between planned and actual PP&A spending at the sector level.

Table IV.A

Program Planning and Administration Costs						
Customer Sector / Program	Planned		Actual		% Change from Planned to Actual	
	Value (\$)	% of Total Program Costs	Value (\$)	% of Total Program Costs	Value	% of Total Program Costs
Residential						
Residential New Construction & Major Renovati	\$ 2,789	8.0%	\$ 4,155	11.5%	\$ 1,366	3.5%
Residential Heating and Water Heating	\$ 12,463	7.4%	\$ 12,787	6.7%	\$ 324	-0.7%
MassSAVE	\$ 3,969	52.9%	\$ 283	13.1%	\$ (3,685)	-39.8%
Weatherization Program	\$ 6,718	7.7%	\$ 7,573	6.5%	\$ 856	-1.3%
Multifamily Retrofit	\$ 3,554	8.0%	\$ 3,551	8.5%	\$ (3)	0.5%
Behavior/Feedback Program	\$ -	-	\$ -	-	\$ -	-
Deep Energy Retrofit	\$ 531	7.8%	\$ -	0	\$ (531)	-7.8%
Residential Building Practices and Demonstratio	\$ -	-	\$ -	-	\$ -	-
Energy Analysis: Internet Audit Program	\$ -	-	\$ -	-	\$ -	-
Community Based Pilots	\$ -	-	\$ -	-	\$ -	-
Workforce Development	\$ -	-	\$ -	-	\$ -	-
Statewide Marketing & Education	\$ -	0.0%	\$ 449	14.1%	\$ 449	14.1%
EEAC Consultants	\$ 3,800	100.0%	\$ 2,009	100.0%	\$ (1,791)	0.0%
DOER Assessment	\$ 3,800	100.0%	\$ 3,462	100.0%	\$ (338)	0.0%
Sponsorships & Subscriptions	\$ -	-	\$ -	-	\$ -	-
Residential Total	\$ 37,623	10.3%	\$ 34,270	8.6%	\$ (3,353)	-1.7%
Low-Income						
Low-Income Retrofit	\$ 29,455	7.7%	\$ 28,793	7.8%	\$ (662)	0.1%
Statewide Marketing & Education	\$ -	0.0%	\$ 112	17.1%	\$ 112	17.1%
Low-Income Energy Affordability Network Fundi	\$ 3,932	100.0%	\$ 1,298	100.0%	\$ (2,634)	0.0%
DOER Assessment	\$ 275	100.0%	\$ 1,120	100.0%	\$ 845	0.0%
Low-Income Total	\$ 33,662	8.6%	\$ 31,323	8.4%	\$ (2,339)	-0.2%
Commercial & Industrial						
C&I New Construction & Major Renovation	\$ 9,648	8.1%	\$ 11,250	10.1%	\$ 1,602	2.1%
C&I Retrofit	\$ 22,967	8.2%	\$ 30,605	6.5%	\$ 7,638	-1.7%
C&I Direct Install	\$ 1,958	8.0%	\$ 3,101	13.8%	\$ 1,143	5.8%
Workforce Development	\$ 2,534	26.3%	\$ -	0.0%	\$ (2,534)	-26.3%
Business Energy Analyzer	\$ -	-	\$ -	-	\$ -	-
Deep Energy Retrofit	\$ -	-	\$ -	-	\$ -	-
Statewide Marketing & Education	\$ -	0.0%	\$ 471	12.3%	\$ 471	12.3%
EEAC Consultants	\$ 1,600	100.0%	\$ 861	100.0%	\$ (739)	0.0%
DOER Assessment	\$ 1,600	100.0%	\$ 5,600	100.0%	\$ 4,000	0.0%
Sponsorships & Subscriptions	\$ -	-	\$ -	-	\$ -	-
Commercial & Industrial Total	\$ 40,308	9.0%	\$ 51,888	8.5%	\$ 11,580	-0.6%
Grand Total	\$ 111,593	9.3%	\$ 117,480	8.5%	\$ 5,887	-0.8%

C. Competitive Procurement

Table IV.B
Outsourced and Competitively Procured Services

Customer Sector	In-House Activities		Outsourced Activities						Total Activities (\$)
	(\$)	% of Total Activities	Competitively Procured		Non-Competitively Procured		Total Outsourced Activities		
			(\$)	% of Total Outsourced	(\$)	% of Total Outsourced	(\$)	% of Total Outsourced	(\$)
Residential									
Planned	\$ 69,151	32%	\$ 149,006	100%	\$ -	0.0%	\$ 149,006	68.3%	\$ 218,158
Actual	\$ 81,058	58%	\$ 58,714	100%	\$ -	0.0%	\$ 58,714	42.0%	\$ 139,772
% Difference from Planned to Actual		26%		0%		0.0%		-26.3%	
Low-Income									
Planned	\$ 78,151	49%	\$ -	0%	\$ 81,173	100.0%	\$ 81,173	50.9%	\$ 159,324
Actual	\$ 80,599	61%	\$ -	0%	\$ 51,897	100.0%	\$ 51,897	39.2%	\$ 132,496
% Difference from Planned to Actual		12%		0%		0%		-11.8%	
Commercial & Industrial									
Planned	\$ 59,431	34%	\$ 113,949	100%	\$ -	0.0%	\$ 113,949	65.7%	\$ 173,380
Actual	\$ 144,651	73%	\$ 53,063	100%	\$ -	0.0%	\$ 53,063	26.8%	\$ 197,714
% Difference from Planned to Actual		39%		0%		0%		-38.9%	
Total									
Planned	\$ 206,734	38%	\$ 262,955	76%	\$ 81,173	23.6%	\$ 344,128	62.5%	\$ 550,862
Actual	\$ 306,308	65%	\$ 111,776	68%	\$ 51,897	31.7%	\$ 163,674	34.8%	\$ 469,982
% Difference from Planned to Actual		28%		-8%		8%		-27.6%	

The Company did not experience any significant variances between planned and reported outsourced activities and competitively procured activities.

D. Low-Income Spending

Table IV.C
Customer Sector Budget Allocation

Customer Sector	Planned		Actual		% Change from Planned to Actual	
	Total Program Costs	% of Total Program Costs	Total Program Costs	% of Total Program Costs	Total Program Costs	% of Total Program Costs
Residential	\$ 365,669	30.4%	\$ 397,658	28.8%	\$ 31,990	-1.7%
Low-Income	\$ 390,999	32.5%	\$ 373,279	27.0%	\$ (17,721)	-5.5%
Commercial & Industrial	\$ 445,625	37.1%	\$ 611,883	44.2%	\$ 166,258	7.2%
Total	\$ 1,202,293	100.0%	\$ 1,382,820	100.0%	\$ 180,527	0.0%

As shown in Table IV.C, the Company met the minimum statutory requirement by spending 27 percent of energy efficiency funds in the low-income customer sector.

V. PERFORMANCE INCENTIVES

The performance incentive mechanism includes three components: the Savings Mechanism, the Value Mechanism, and other Performance Metrics. The Savings Mechanism provides an incentive for achieving dollar benefits from energy efficiency program efforts at or above threshold levels. The Value Mechanism provides an incentive for achieving net benefits equal to or in excess of the threshold level of performance. Performance metrics establish a focus on specified program outcomes or plan development, with each metric stating the specific requirements for reaching each level of the metric. Table V summarizes the performance incentives earned by the Company by component for its successful delivery of energy efficiency programs in 2012.

Table V.

Performance Incentives Summary				
Incentive Components	Threshold	Design	Exemplary	Actual Incentive
Savings Mechanism	\$ 21,460	\$ 28,614	\$ 35,767	\$ 35,767
Value Mechanism	\$ 13,438	\$ 17,917	\$ 22,396	\$ 22,396
Performance Metrics	\$ 6,549	\$ 8,733	\$ 10,916	\$ 7,395
Total Incentive (before-tax)	\$ 41,447	\$ 55,263	\$ 69,079	\$ 65,558
Total Incentive (after-tax)	\$ 25,179	\$ 33,572	\$ 41,965	\$ 39,826

Tax Rate:	39.25%
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The planned values referenced in the Performance Incentives Summary Table above were originally filed in the performance incentives model set forth at Exhibit D, Attachment 2 to the Company's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 11-111 ("2012 MTM"). The Company earned \$65,558 in actual before-tax incentives, which is 119 percent of design level. The tax rate used to calculate the after-tax total incentive is 0.3925.

All supporting documentation for each performance incentive component, including detailed information on the Company's clear and distinct role in achieving the performance metrics, can be found in Appendix D.

For the Savings and Value components of the performance incentive, the Company calculated its earned performance incentive in accordance with the incentive mechanism included in the 2012 MTM, using the post-evaluation benefits. The Company achieved 125 percent of its planned benefits and 125 percent of its planned net benefits at the portfolio level, surpassing the 75 percent threshold required in order to earn both the savings and value mechanisms of the performance incentive. Using evaluated results, the Company calculated the lifetime benefits and net benefits that each program achieved. The benefits were multiplied by the savings payout rate of \$0.0079385907 and the net benefits were multiplied by the value payout rate of \$0.0093710302 per the 2012 MTM. Although performance under both the Savings and Value Mechanisms is assessed at the portfolio level, this calculation was done at the sector level, as shown in Appendix D, to facilitate the allocation of earned performance incentives in the cost-effectiveness calculations. The incentive dollars earned from performance metrics were allocated to sectors consistent with the allocation presented in the 2012 MTM. A model

illustrating the calculation of the performance incentives in accordance with this methodology is included in Appendix D, Section 1.

A summary of the Company's performance for each Performance Metric is set forth below. Achievement of performance metrics relate to the metrics filed in Exhibit D, Attachment 1 to the 2012 MTM. Additional supporting documentation related to performance metrics is included in Appendix D, Section 2.

**FITCHBURG GAS AND ELECTRIC LIGHT COMPANY
 2012 SUMMARY OF PERFORMANCE METRIC ACHIEVEMENT**

RESIDENTIAL METRIC NUMBER AND NAME	ACHIEVEMENT LEVEL
Res #1: Mass Save/Weatherization: Deeper Savings {Electric & Gas} – Statewide	Design
Res #2: Mass Save/Weatherization: Lost Opportunity/ Market Opportunity {Electric & Gas} – Statewide	Exemplary
LOW-INCOME METRIC NUMBER AND NAME	ACHIEVEMENT LEVEL
LI #1: Best Practices Program Strategies Research & Technical Review of Potential New Measures {Electric & Gas} – Statewide	Exemplary
LI #2: Multi-family Building Inventory {Electric & Gas} – Statewide	Exemplary
COMMERCIAL & INDUSTRIAL METRIC NUMBER AND NAME	ACHIEVEMENT LEVEL
C&I #1: Retrofit – Depth of Savings	Below Threshold
C&I #2: New Construction – Comprehensiveness and Depth of Savings	Below Threshold
C&I #3: Direct Install Electric and Gas Integration	Below Threshold
C&I #4: Combined Heat & Power	N/A - Unutil did not participate in this metric
OTHER FUNDING METRIC NUMBER AND NAME	ACHIEVEMENT LEVEL
1. “Other Financing Capital” Metric	Exemplary
2. Cost Efficiency of Program Expenditures	Exemplary

VI. AUDITS

Please refer to the Company's 2011 Energy Efficiency Annual Report for information on audits related to the Company's energy efficiency activities during the last five years (2008-2012).

VII. APPENDICES

- A. Glossary of Defined Terms – includes Types of Costs in each Budget Category and a Glossary of Terms and Abbreviations.
- B. Cost-Effectiveness Supporting Tables and Documentation – includes the D.P.U. 08-50 Tables, the Screening Tool, and Technical Reference Manual.
- C. Program and Pilot Program EM&V Studies – includes evaluation studies for the residential, low-income, and C&I sector programs and pilot programs.
- D. Performance Incentives Supporting Documentation – includes documentation that supports the Company's determination of actual performance incentives earned through the performance metrics.
- E. Other Supporting Documentation – includes additional supporting documentation with regard to competitive procurement activities in 2012.
- F. Lost Base Revenue Information – includes a reference to the information on savings on which LBR is based.