



Melissa G. Liazos
Senior Counsel

August 1, 2013

VIA HAND DELIVERY AND E-FILING

Mark D. Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
Boston, MA 02110

**Re: D.P.U. 13-xx – 2012 Energy Efficiency Annual Report
Massachusetts Electric Company and Nantucket Electric Company each d/b/a
National Grid**

Dear Secretary Marini:

On behalf of Massachusetts Electric Company and Nantucket Electric Company each d/b/a National Grid (the “Company”), enclosed please find the Company’s 2012 Energy Efficiency Annual Report in this proceeding, along with the Affidavits of Lynn Westerland and Brian Pelletier, my Appearance of Counsel, and a Certificate of Service.

Thank you for your time and attention to this matter.

Very truly yours,

Melissa G. Liazos

Enclosures

cc: Jeffrey Leupold, Hearing Officer
Matthew Saunders, Assistant Attorney General
Steven Venezia, Department of Energy Resources

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

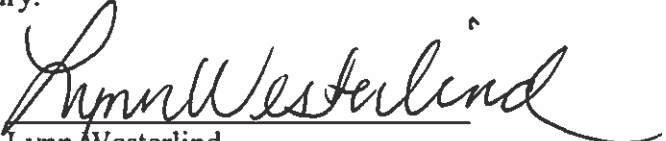
D.P.U. 13-__

Affidavit of Lynn Westerlind

I, Lynn Westerlind, do attest and swear to the following:

1. I am employed by National Grid as Manager, Policy and Evaluation Program Strategy – Massachusetts. In my current position, I am responsible for energy efficiency evaluation and for energy efficiency related regulatory efforts in support of energy efficiency for Massachusetts Electric Company and Nantucket Electric Company.
2. I am familiar with National Grid's 2012 Energy Efficiency Annual Report Filing.
3. I have reviewed the filing, and the representations made therein are true and correct to the best of my knowledge.

Signed under the pains and penalties of perjury.


Lynn Westerlind

Dated: August 1, 2013

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

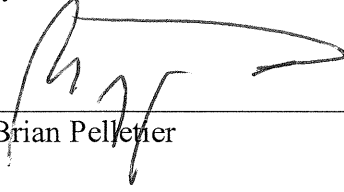
D.P.U. 13-__

Affidavit of Brian Pelletier

I, Brian Pelletier, do attest and swear to the following:

1. I am employed by National Grid as Manager, Energy Efficiency Reporting. In my current position, I am responsible for reporting of energy efficiency spending and savings in support of energy efficiency for Massachusetts Electric Company and Nantucket Electric Company.
2. I am familiar with National Grid's 2012 Energy Efficiency Annual Report Filing where it pertains to spending and savings.
3. I have reviewed the spending and savings portions of the filing, and the representations made therein are true and correct to the best of my knowledge.

Signed under the pains and penalties of perjury.



Brian Pelletier

Dated: August 1, 2013

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

_____)
Massachusetts Electric Company and Nantucket)
Electric Company each d/b/a National Grid)
2012 Energy Efficiency Annual Report)
_____)

D.P.U. 13-xx

NOTICE OF APPEARANCE

In the above-entitled proceeding, I hereby appear for and on behalf of Massachusetts Electric Company and Nantucket Electric Company each d/b/a National Grid.



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Date: August 1, 2013

THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

_____)
Massachusetts Electric Company and Nantucket)
Electric Company each d/b/a National Grid)
2012 Energy Efficiency Annual Report)
_____)

D.P.U. 13-xx

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing in the above referenced docket upon the service list compiled in this proceeding by hand delivery and E-Filing.

MASSACHUSETTS ELECCTRIC COMPANY and
NANTUCKET ELECTRIC COMPANY
each d/b/a NATIONAL GRID



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Date: August 1, 2013

**Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid
2012 Electric 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 expended efforts in 2012 to review and expand 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.

The PAs also continued their efforts in integrating gas and electric energy efficiency services and expanding 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

Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid (“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.

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

C. Summary of Program Portfolio

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

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	\$	217,514,830			163,083,485		-25%
Performance Incentive	\$	10,841,373			9,848,087		-9%
Savings & Benefits							
Energy							
Lifetime	MWh	5,099,506	4,513,838	-11%	4,273,290	-5%	-16%
Annualized	MWh	518,875	451,907	-13%	424,051	-6%	-18%
Demand							
Lifetime	kW	866,743	677,533	-22%	604,206	-11%	-30%
Annualized							
Summer	kW	77,899	62,429	-20%	54,498	-13%	-30%
Winter	kW	90,469	82,902	-8%	79,460	-4%	-12%
NEB (Lifetime) (change to)	\$	158,548,381	219,600,838	39%	218,379,812	-1%	38%
Cost-Effectiveness							
TRC Benefits	\$	869,279,795			772,849,229		-11%
TRC Costs	\$	305,053,047			226,630,854		-26%
Net Benefits	\$	564,226,748			546,218,375		-3%
BCR	n/a	2.85			3.41		20%

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 and revised on February 15, 2013 in Massachusetts Electric Company and Nantucket Electric Company d/b/a NationalGrid, D.P.U. 11-108.

As shown in Table I.A above, at the portfolio level there were significant variances between planned and preliminary savings and benefits. Specifically, preliminary Summer kW and Lifetime kW values were 20% and 22% lower than planned values, respectively. Preliminary Lifetime Non Electric Benefits (“NEBs”) were 39% higher than planned values. There were no significant variances at the portfolio level between preliminary and evaluated savings and benefits. Significant portfolio level variances between planned and actual expenses and cost-effectiveness occurred with Total Program Costs where actual expenses were 25% lower than planned values, TRC Costs where actual costs were 26% lower than planned, and the BCR which was 20% higher than planned.

For a more detailed discussion of the cause of variances in each sector please reference section II.A.1 for residential results, section II.B.1 for low-income results; and section II.C.1 for C&I results.

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.

Table I.B: Customer Sector Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential				
TRC Benefits	\$	260,478,681	289,450,393	11%
TRC Costs	\$	84,140,001	91,485,700	9%
Net Benefits	\$	176,338,680	197,964,693	12%
BCR	n/a	3.10	3.16	2%
Low-Income				
TRC Benefits	\$	42,830,448	60,012,656	40%
TRC Costs	\$	25,711,059	20,061,154	-22%
Net Benefits	\$	17,119,389	39,951,502	133%
BCR	n/a	1.67	2.99	80%
C&I				
TRC Benefits	\$	565,970,666	423,386,179	-25%
TRC Costs	\$	195,201,987	115,083,999	-41%
Net Benefits	\$	370,768,679	308,302,180	-17%
BCR	n/a	2.90	3.68	27%
TOTAL				
TRC Benefits	\$	869,279,795	772,849,229	-11%
TRC Costs	\$	305,053,047	226,630,854	-26%
Net Benefits	\$	564,226,748	546,218,375	-3%
BCR	n/a	2.85	3.41	20%

As shown in Table I.B above, there were no significant variances between planned and actual values for the Residential sector. There were, however, significant variances between planned and actual values for the Low-Income sector, the C&I sector, and the values for the total of the three customer sectors. Specifically, for the Low-Income sector actual TRC Benefits, Net Benefits and the BCR were 40%, 133% and 80% higher than planned estimates, respectively, and TRC Costs were 22% lower than planned values. Within the Low Income sector, both programs had lower than planned TRC Costs, contributing to the variance between planned and actual values. The Low Income Retrofit Program had higher than planned TRC Benefits, which contributed to the higher than planned Low-Income sector Net Benefits and BCR. Please reference section II.B.2 for a more detailed discussion of the variances by program within this sector.

In the C&I sector actual TRC Benefits and TRC costs were 25% and 41% lower than planned estimates, respectively, and the BCR was 27% higher than planned values. The C&I New Construction and Major Renovation and C&I Retrofit Programs had lower than planned TRC Benefits, while all of the programs had lower than planned TRC Costs, which contributed to the higher than planned BCR. Please reference section II.C.2 for a more detailed discussion of the variances by program within this sector.

For the total of all customer sectors, actual TRC costs were 26% lower than planned estimates and the BCR was 20% higher than planned values. On the portfolio level, the lower than planned TRC Cost was primarily driven by the lower than planned TRC Costs within the C&I Sector, which led to a higher than planned portfolio BCR.

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 Cooling and Heating Equipment
- Multi-Family Retrofit
- Mass Save[®]
- Behavior/Feedback Program
- ENERGY STAR[®] Lighting
- ENERGY STAR[®] Appliances

Residential Pilots

- Deep Energy Retrofit
- Residential New Construction and Major Renovation – Major Renovation Statewide Pilot
- Residential New Construction - Multi-Family (4-8 story) Statewide Pilot
- Residential New Construction – Lighting Design Statewide Pilot
- R&D and Demonstration
- Community Based Pilot

Tables II.A.1 through II.A.3 provide summary information on the performance of the residential programs at the sector, end use, and program levels, respectively.

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	\$	71,250,873			65,331,072		-8%
Performance Incentive	\$	3,386,984			3,771,572		11%
Savings & Benefits							
Energy							
Lifetime	MWh	904,338	1,160,617	28%	1,098,124	-5%	21%
Annual	MWh	177,980	189,102	6%	178,354	-6%	0%
Demand							
Lifetime	kW	102,566	145,729	42%	96,524	-34%	-6%
Annualized							
Summer	kW	16,349	19,869	22%	14,793	-26%	-10%
Winter	kW	40,047	45,160	13%	42,761	-5%	7%
NEB (Lifetime)	\$	153,509,118	196,927,743	28%	165,345,863	-16%	8%
Cost-Effectiveness							
TRC Benefits	\$	260,478,681			289,450,393		11%
TRC Costs	\$	84,140,001			91,485,700		9%
Net Benefits	\$	176,338,680			197,964,693		12%
BCR	n/a	3.10			3.16		2%

Table II.A.2: Residential Sector Summary of End Uses				
End Uses	Units (Lifetime)	Preliminary Year-End Results	Evaluated Results	% Change from Preliminary to Evaluated
Lighting				
Energy	MWh	878,316	866,088	-1%
Demand	kW	86,986	71,603	-18%
NEB	\$	6,485,728	6,283,263	-3%
HVAC				
Energy	MWh	122,127	83,654	-32%
Demand	kW	40,758	11,984	-71%
NEB	\$	107,975,211	88,912,792	-18%
Refrigeration				
Energy	MWh	46,334	46,018	-1%
Demand	kW	5,535	5,140	-7%
NEB	\$	876,043	876,043	0%
Hot Water				
Energy	MWh	2,266	3,625	60%
Demand	kW	169	362	114%
NEB	\$	8,549,747	7,183,522	-16%
Process				
Energy	MWh	18,303	18,310	0%
Demand	kW	1,472	2,810	91%
NEB	\$	0	-	0%
Behavior				
Energy	MWh	64,592	61,177	-5%
Demand	kW	3,996	3,836	-4%
NEB	\$	0	-	0%
Envelope				
Energy	MWh	28,679	19,253	-33%
Demand	kW	6,813	790	-88%
NEB	\$	73,041,015	62,090,243	-15%
Total				
Energy	MWh	1,160,617	1,098,124	-5%
Demand	kW	145,729	96,524	-34%
NEB	\$	196,927,743	165,345,863	-16%

Table II.A.3: Residential Program Summary				
Program / Performance Category	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential New Construction & Major Renovation				
TRC Benefits	\$	9,346,545	9,286,394	-1%
TRC Costs	\$	3,595,015	5,501,140	53%
Net Benefits	\$	5,751,530	3,785,254	-34%
BCR	n/a	2.60	1.69	-35%
Residential Cooling & Heating Equipment				
TRC Benefits	\$	3,265,085	5,163,903	58%
TRC Costs	\$	3,047,264	4,668,994	53%
Net Benefits	\$	217,821	494,909	127%
BCR	n/a	1.07	1.11	3%
Multi-Family Retrofit				
TRC Benefits	\$	21,273,547	21,973,273	3%
TRC Costs	\$	11,332,914	7,474,369	-34%
Net Benefits	\$	9,940,632	14,498,904	46%
BCR	n/a	1.88	2.94	57%
MassSAVE				
TRC Benefits	\$	146,817,083	156,226,833	6%
TRC Costs	\$	28,644,662	33,853,078	18%
Net Benefits	\$	118,172,421	122,373,755	4%
BCR	n/a	5.13	4.61	-10%
Behavior/Feedback Pilot				
TRC Benefits	\$	7,054,072	5,937,385	-16%
TRC Costs	\$	3,445,292	3,550,344	3%
Net Benefits	\$	3,608,780	2,387,040	-34%
BCR	n/a	2.05	1.67	-18%
ENERGY STAR Lighting				
TRC Benefits	\$	66,467,472	82,156,508	24%
TRC Costs	\$	17,093,022	23,598,548	38%
Net Benefits	\$	49,374,450	58,557,960	19%
BCR	n/a	3.89	3.48	-10%
ENERGY STAR Appliances				
TRC Benefits	\$	6,254,877	8,706,098	39%
TRC Costs	\$	3,298,940	3,567,980	8%
Net Benefits	\$	2,955,938	5,138,118	74%
BCR	n/a	1.90	2.44	29%
Deep Energy Retrofit				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	278,603	318,363	14%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Residential New Construction & Major Renovation - Major Renovation Statewide Pilot				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	270,017	144,853	-46%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Residential New Construction Multi Family (4-8 story) Statewide Pilot				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	308,585	468,422	52%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Residential New Construction Lighting Design Statewide Pilot				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	73,106	24,162	-67%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
R&D and Demonstration				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	1,498,834	-	-100%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Community Based Pilot				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	140,001	69,514	-50%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
TOTAL				
TRC Benefits	\$	260,478,681	289,450,393	11%
TRC Costs	\$	84,140,001	91,485,700	9%
Net Benefits	\$	176,338,680	197,964,693	12%
BCR	n/a	3.10	3.16	2%

As shown in Table II.A.1 above, preliminary Lifetime MWh, Lifetime kW, Summer kW and Winter kW are significantly higher than planned. This variance is primarily due to the performance of the Residential New Construction & Major Renovation and the Residential Cooling & Heating Equipment programs, which both had significantly higher preliminary energy

and capacity savings than planned. Preliminary Lifetime NEBs are also significantly higher than planned; however, this variance is due to the actual measure mix of the Mass Save program.

Evaluated Lifetime and Summer kW are significantly lower than the preliminary values, which is primarily caused by evaluation results relating to the Residential Cooling & Heating Equipment program, Mass Save, and Multi-Family Retrofit programs. 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 in all residential programs. Selected highlights are presented below:

- Residential New Construction & Major Renovation⁴ - In 2012, with 121 communities adopting the Stretch Energy Code, 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 code requirements. To address these barriers, the Program Administrators offered technical assistance as well as incentives to exceed the 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. The PAs continued to participate in three pilots (multi-family new construction, major renovations, and lighting design) to aid in identifying the next generation of energy savings opportunities. It is expected that builders will continue to look to the Program Administrators to provide training, technical assistance and incentives to meet the new energy code. 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*. The 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 Cooling & Heating Equipment – In 2012, the Program Administrators exceeded their annual statewide goals for cooling equipment, duct sealing and the early replacement of old, inefficient equipment in the Residential Cooling and Heating Equipment program, also known as the COOL SmartSM program. PAs held quality installation training sessions, including trainings on system design, duct diagnostics, brushless fan motors and ENERGY STAR Heating, Ventilation

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

and Air Conditioning (“HVAC”) quality installation. A customer incentive for specified eligible energy efficient Heat Pump Water Heaters (“HPWH”) installed to replace an existing electric water heater, or for new construction was introduced in 2012. Over 2,100 HPWHs were installed in 2012, with retail stores stocking and heavily promoting this energy-saving measure. In October, the Program Administrators held their annual COOL Talk meeting. This event is a forum for the PAs to share the program offerings, as well as a chance for contractors to articulate their own experiences with the program. The PAs also continued to offer technical support to contractors engaged in quality efforts, and continued to participate in joint electric and gas integration at events such as the Plumbing Heating Cooling Contractors Annual Trade Show and the annual GasNetworks® fall conference.

- 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, whole facility, energy efficiency services.

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.

- Mass Save– Program Year 2012 was the first full year of the 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 vendor.

The Contractors 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. The 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.

- **ENERGY STAR[®] Lighting** - In 2012, the ENERGY STAR[®] Lighting program produced strong results, with all the PAs meeting or exceeding savings goals. The ENERGY STAR[®] qualification of new light-emitting diode (“LED”) products sparked new manufacturer interest in the Program Administrators’ residential programs. Manufacturing partners were eager to create and enhance LED Negotiated Cooperative Promotions with new and existing retail partners. As a result of increased LED product availability, the Massachusetts Program Administrators were able to surpass their statewide LED bulb goal by 362 percent and their LED fixture goal by 98 percent.
- **ENERGY STAR[®] Appliances** – The ENERGY STAR[®] Appliances program results varied by Program Administrator and measure. ENERGY STAR[®] qualified refrigerators and freezers, as well as the second refrigerator and freezer recycling program, were once again strong performers for this program. Pool pumps, computers, and ENERGY STAR[®] televisions also performed well. Other measures, like advanced power strips, LCD monitors, and room air cleaners, lagged behind expectations. The PAs introduced a short-term mark down of ENERGY STAR[®] room air conditioners with an Energy Efficiency Rating of 10.8 or higher through independent retailers.

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

2. Residential Programs

a. Residential New Construction & Major Renovation

Purpose/Goal: The purpose of the Residential New Construction & 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.

Targeted Customers: The target market for this program included homebuilders, contractors, architects/designers, trade allies, Home Energy Rating System 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 unique electric account served under this program. For residential new construction the account represents a newly constructed dwelling unit.

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
- Envelope
- Refrigeration

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.4⁵ provides information on the performance of the Residential New Construction & 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	\$	1,425,122			1,687,032		18%
Performance Incentive	\$	99,893			87,139		-13%
Participants	Accounts	900			1,221		36%
Program Cost/ Participant	\$	1,583			1,382		-13%
Savings & Benefits							
Energy							
Lifetime	MWh	21,248	28,447	34%	25,985	-9%	22%
Annualized	MWh	1,777	2,509	41%	2,104	-16%	18%
Average Measure Life	yrs	12	11	-5%	12	9%	3%
Demand							
Lifetime	kW	1,006	7,307	626%	7,057	-3%	602%
Annualized							
Summer	kW	141	439	212%	396	-10%	181%
Winter	kW	278	506	82%	433	-14%	56%
Average Measure Life	yrs	7	17		18		
NEB (Lifetime)	\$	7,188,762	5,190,998	-28%	5,144,095	-1%	-28%
Cost-Effectiveness							
TRC Benefits	\$	9,346,545			9,286,394		-1%
TRC Costs	\$	3,595,015			5,501,140		53%
Net Benefits	\$	5,751,530			3,785,254		-34%
BCR	n/a	2.60			1.69		-35%

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.

Preliminary Lifetime and Annual MWh savings were 34% and 41% higher than planned values, respectively. The majority of the energy savings in the Residential New Construction & Major Renovation program were due to energy efficient lighting measures. The Company installed more compact fluorescent light bulbs (“CFLs”), fixtures, and LED fixtures than planned. LED fixtures contributed to the higher than planned Lifetime MWh savings because of their high measure life. Moreover, more homes were incentivized at higher tier levels than planned, because they yielded higher savings than expected.

Preliminary Lifetime, Summer, and Winter kW savings were 626%, 212%, and 82% higher than planned because of the increase in installed energy efficient lighting measures.

There are a few factors to recognize for the 36% variance in actual participation versus planned. First, a rebound in the new construction market over the last few years has resulted in many more participants than originally planned. In addition, Stretch Code adoption in many municipalities across the Commonwealth (over 100 by December 31, 2012), has resulted in the uptake in program participation. A majority of the early adopters of Stretch Code were located in National Grid’s territory and builders were informed the program could assist with training and incentives, thus driving up participation rates. Lastly, the uptick in Stretch Code adoption caused the market to respond by increasing the number of HERS raters in 2010-2012. The increase in the rater market promoting the Program and providing technical assistance to builders also can be attributed to increased participation.

Preliminary NEBs decreased 28% from planned values, which was primarily driven by preliminary non-resource benefits because they were significantly less than planned. The Company installed less heating measures than planned. Since heating measures are the largest contributor to non-resource benefits in this program, the preliminary NEBs are significantly less than planned.

There were no significant variances between preliminary and evaluated values.

EM&V studies included in the Annual Report that apply to this 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 all energy-efficient light bulbs, including CFLs, LEDs, and fluorescent tubes, was 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.

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).

b. Residential Cooling & Heating Equipment

Purpose/Goal: The purpose of the Residential Cooling & Heating Equipment (“COOL Smart”) program was to raise residential consumer awareness and market share of properly installed high-efficiency cooling equipment and systems, and increase market share of ENERGY STAR[®] furnaces equipped with an electronically commuted motor.

Targeted Customers: The program targeted residential customers in the market to purchase new or replacement HVAC equipment, including: new systems in existing and new homes (new systems); replacement systems in existing homes (new equipment/old systems), including the early retirement of existing equipment; and improvements in operational systems in existing homes (new equipment/old systems). The program also targeted: HVAC contractors and technicians; suppliers, manufacturers, and distributors of HVAC equipment; new-home builders; and remodeling contractors.

Definition of Program Participant: A participant is defined as a unique electric 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: HVAC

Delivery Mechanism: The program was administered by each Program Administrator in its service territory. Delivery was through a common vendor selected through a common RFP. Whenever possible, there was coordination with the related gas Program Administrator’s initiatives. To this end, the COOL Smart and Gas Networks’ High Efficiency Heating and Hot Water programs worked to procure a single, joint circuit rider to support both programs in the field. Program initiatives were also piggybacked onto the Residential New Construction and Mass Save/Home Energy Services (“HES”) programs:

- Participating residential new construction program builders and their HVAC contractors were referred to the COOL Smart program for training and Quality Installation Verification (“QIV”). Whenever appropriate, these training were jointly provided with GasNetworks.

- HES participants were referred to COOL Smart for HVAC measures using COOL Smart literature, which is part of the standard HES information package.

Quality control follow-up inspections were performed by independent inspectors on up to 10 percent of installations to verify equipment installation and performance.

The program continued to use equipment distributors to assist customers with filling out their rebate forms, sell high-efficiency and QIV-related technology, and to provide indoor training labs for HVAC contractors.

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.5 provides information on the performance of the Residential Cooling & Heating Equipment program.

Table II.A.5: Residential Cooling & Heating Equipment							
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	\$	2,866,005			3,977,844		39%
Performance Incentive	\$	22,322			37,165		66%
Participants	Accounts	6,559			6,051		-8%
Program Cost/ Participant	\$	437			657		50%
Savings & Benefits							
Energy							
Lifetime	MWh	16,973	39,896	135%	38,873	-3%	129%
Annualized	MWh	1,035	3,257	215%	3,213	-1%	210%
Average Measure Life	yrs	16	12	-25%	12	-1%	-26%
Demand							
Lifetime	kW	4,910	34,708	607%	6,101	-82%	24%
Annualized							
Summer	kW	342	3,318	871%	468	-86%	37%
Winter	kW	227	4,297	1793%	623	-86%	174%
Average Measure Life	yrs	14	10		13		
NEB (Lifetime)	\$	368,151	334,894	-9%	(65,365)	-120%	-118%
Cost-Effectiveness							
TRC Benefits	\$	3,265,085			5,163,903		58%
TRC Costs	\$	3,047,264			4,668,994		53%
Net Benefits	\$	217,821			494,909		127%
BCR	n/a	1.07			1.11		3%

Preliminary Annual and Lifetime MWh savings were 135% and 215% higher than planned values. Moreover, preliminary Lifetime, Summer and Winter kW savings were significantly higher than planned values. These variances were due to measure mix, where the Company rebated different quantities of measures than initially planned. Specifically, the Company rebated a large volume of heat pump water heaters, a new measure introduced in 2012, which

was not originally planned for. These measures yielded high energy and demand savings. Furthermore, the Total Program Cost was 39% higher than planned and Program Cost/Participant was 50% higher than planned because heat pump water heaters had the highest rebate amount (\$1,000/unit) in the Program.

Evaluated Lifetime, Summer, Winter kW savings decreased by 82%, 86%, and 86%, respectively, from preliminary values. These variances are due to the results of the *Heat Pump Water Heaters Evaluation of Field Installed Performance*, which was previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57. This evaluation decreased demand savings for heat pump water heaters.

Evaluated NEBs decreased 120% from preliminary values. These variances were due to the combined effects of the *2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing* and the *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* described below. The studies showed that the full NEI values cannot be applied to all program rebated equipment, which was the planning assumption used in the preliminary values. The discounted NEI values have been applied to the evaluated results.

EM&V studies included in the Annual Report that apply to this program:

- *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.

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. Multi-Family Retrofit

Purpose/Goal: The purpose of the Multi-Family Retrofit program was 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 total number of dwelling units within a participating facility.

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
- Motors and Drives
- Refrigeration
- 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 during 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 was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.6 provides information on the performance of the Multi-Family Retrofit program.

Table II.A.6: Multi-Family 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	\$	8,821,444			6,975,715		-21%
Performance Incentive	\$	207,029			245,197		18%
Participants	Units	12,260			9,676		-21%
Program Cost/ Participant	\$	720			721		0%
Savings & Benefits							
Energy							
Lifetime	MWh	85,974	126,102	47%	104,440	-17%	21%
Annualized	MWh	10,546	11,896	13%	9,947	-16%	-6%
Average Measure Life	yrs	8	11	30%	10	-1%	29%
Demand							
Lifetime	kW	7,723	10,279	33%	5,193	-49%	-33%
Annualized							
Summer	kW	1,005	1,050	4%	498	-53%	-50%
Winter	kW	2,701	2,983	10%	3,037	2%	12%
Average Measure Life	yrs	8	10		10		
NEB (Lifetime)	\$	11,521,327	13,271,267	15%	11,074,352	-17%	-4%
Cost-Effectiveness							
TRC Benefits	\$	21,273,547			21,973,273		3%
TRC Costs	\$	11,332,914			7,474,369		-34%
Net Benefits	\$	9,940,632			14,498,904		46%
BCR	n/a	1.88			2.94		57%

Preliminary Lifetime MWh and kW savings were 47% and 33% higher than planned, respectively. These variances were due to measure mix, where the Company installed a different quantity of measures than initially planned. Specifically, the Company installed LEDs and LED fixtures, which were not included in planned values. LEDs and LED fixtures have a higher measure life, which yields higher lifetime savings.

Program participation was 21% less than planned, which resulted in a 21% decrease in program costs when compared to planned costs. Participation has been lower in the last couple of years due to market saturation in the Company’s service territory. The Program made the transition to the next generation of lighting measures early in the second half of the 2012, and participation levels rebounded significantly, but not enough to overcome the first and second quarter shortfall in participation. However, with the transition to applicable LED technology, the Program ended 2012 with a strong backlog of projects under contract but not completed. While this limited 2012 participation, the transition to the LED lighting products has placed the program in a much stronger position for success in 2013 and beyond.

Evaluated Lifetime and SummerkW savings decreased 49% and 53% from preliminary values, respectively, due to the combined effects of the *Massachusetts Multifamily Program Impact*

Analysis and the *Demand Impact Model User Manual*, which were both previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57.

There are no EM&V studies pertaining to this program being filed in the 2012 Annual Report.

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. Mass Save

Purpose/Goal: The purpose of the Mass Save/HES program was to provide residential customers with energy efficiency recommendations that enable them to identify and initiate the process of installing cost-effective energy efficiency improvements.

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.

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.

Definition of Program Participant: A participant is defined as a unique electric account served under this program. For this program a unique electric account is equal to a residential audit.

Targeted End-Uses:

- Lighting
- HVAC
- Hot Water
- Envelope
- Refrigeration

Delivery Mechanism: Mass Save/HES was implemented by each PA's competitively procured lead vendor.

The program was delivered by lead vendors selected through a competitive bidding process.

Lead vendors were responsible for managing and training market-based participants such as participating IICs and HPCs. Additional lead vendor responsibilities included:

- Consistent statewide training
- Data reporting
- Achieving aggressive savings
- Customer satisfaction
- Quality control standards
- Scheduling requirements
- Technical assistance
- Maintaining and reporting 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 the 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 was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a

National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.7 provides information on the performance of the Mass Save program.

Table II.A.7: MassSAVE							
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	\$	24,662,070			25,401,189		3%
Performance Incentive	\$	2,158,640			2,306,367		7%
Participants	Audits	20,500			18,790		-8%
Program Cost/ Participant	\$	1,203			1,352		12%
Savings & Benefits							
Energy							
Lifetime	MWh	132,217	205,807	56%	126,055	-39%	-5%
Annualized	MWh	17,118	23,733	39%	15,565	-34%	-9%
Average Measure Life	yrs	8	9	12%	8	-7%	5%
Demand							
Lifetime	kW	22,370	21,785	-3%	4,532	-79%	-80%
Annualized							
Summer	kW	2,245	2,511	12%	659	-74%	-71%
Winter	kW	3,000	4,958	65%	4,490	-9%	50%
Average Measure Life	yrs	10	9		7		
NEB (Lifetime)	\$	129,147,502	172,390,177	33%	143,452,374	-17%	11%
Cost-Effectiveness							
TRC Benefits	\$	146,817,083			156,226,833		6%
TRC Costs	\$	28,644,662			33,853,078		18%
Net Benefits	\$	118,172,421			122,373,755		4%
BCR	n/a	5.13			4.61		-10%

Preliminary Lifetime and Annual MWh savings were 56% and 39% higher than planned, respectively. Moreover, preliminary Winter kW was 65% higher than the planned value. These variances were due to the installation of more CFLs than planned, which have high energy and winter demand savings and a relatively low cost. The Company installed an average of 22 bulbs per home, resulting in higher savings without affecting program costs.

Preliminary NEBs were 33% higher than planned. This variance is due to the installation of more oil thermostats and completion of more weatherization than planned and the installation of early boiler replacements, which the Company did not plan for.

Evaluated Lifetime and Annual energy savings were 39% and 34% lower than preliminary and lifetime and summer demand savings were 79% and 74% lower than preliminary, respectively. These decreases were due to the combined effects of *HES Realization Rate Results Memo* described below and the *Home Energy Services Net-to-Gross Evaluation* and the *Demand Impact Model User Manual*, which were both filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57. The *HES Realization Rate Results Memo* produced realization rates for air sealing and insulation that were less than 100% while the *Home Energy Services Net-to-Gross Evaluation* provided lower net-to-gross ratios than what was assumed for preliminary savings. Additionally, the application of the *Demand Impact Model* to kWh savings in this Program resulted in lower demand savings.

EM&V studies included in the Annual Report that apply to this 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.

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).

e. Behavior/Feedback Program

Purpose/Goal: The purpose of the Behavior/Feedback Program was to lower residential customer energy consumption by educating and motivating customers to take energy saving actions and modify their behaviors.

Targeted Customers: The program targeted residential customers with high energy use.

Definition of Program Participant: A participant is defined as one residential household.

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 program targeted all residential end-uses.

Delivery Mechanism: Participants received information on their household energy consumption compared to similar households through monthly home energy reports and the Energy Insider website. The program was administered by National Grid. The vendor was OPOWER.

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.8 provides information on the performance of the Behavior/Feedback Program.

Table II.A.8: Behavior/Feedback Program							
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	\$	3,374,377			3,494,842		4%
Performance Incentive	\$	70,916			55,502		-22%
Participants	Accounts	369,000			333,254		-10%
Program Cost/ Participant	\$	9			10		15%
Savings & Benefits							
Energy							
Lifetime	MWh	72,683	64,592	-11%	61,177	-5%	-16%
Annualized	MWh	72,683	64,592	-11%	61,177	-5%	-16%
Average Measure Life	yrs	1	1	0%	1	0%	0%
Demand							
Lifetime	kW	4,557	3,996	-12%	3,836	-4%	-16%
Annualized							
Summer	kW	4,557	3,996	-12%	3,836	-4%	-16%
Winter	kW	18,171	15,932	-12%	15,296	-4%	-16%
Average Measure Life	yrs	1	1		1		
NEB (Lifetime)	\$	-	-	0%	-	0%	0%
Cost-Effectiveness							
TRC Benefits	\$	7,054,072			5,937,385		-16%
TRC Costs	\$	3,445,292			3,550,344		3%
Net Benefits	\$	3,608,780			2,387,040		-34%
BCR	n/a	2.05			1.67		-18%

There were no significant variances from planned to preliminary or preliminary to evaluated values in this program.

EM&V studies included in the Annual Report that apply to this 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 net effect of the study was to decrease savings for the Company. The full report is included in Section III, Study 22.

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).

f. ENERGY STAR[®] Lighting

Purpose/Goal: The purpose of the ENERGY STAR[®] Lighting program was to increase consumer awareness of the importance and benefits of purchasing ENERGY STAR[®]-qualified lighting products and expand the availability, consumer acceptance, and use of high-quality energy-efficient lighting technologies and controls.

Targeted Customers: All residential electric customers were targeted by this program.

Definition of Program Participant: A participant is defined as a unique electric account served under this program. In the case of upstream lighting, participants are determined by dividing units by an agreed upon factor per measure, as set forth below.

Residential Lighting Assumptions

2012 Lighting program	Widget per Participant
Screw-in Bulbs	8
Screw-in Bulbs - Hard to reach	4
Screw-in Bulbs (Specialty bulbs)	8
LED's	1
Indoor Fixture (incl. Torchieres)	2
Outdoor Fixture	2
LED Fixtures	1
Screw-in Bulbs - School Fundraiser	4

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: Residential lighting

Delivery Mechanism: This program utilizes upstream incentives and an online catalog channel, which dramatically increased sales and lowered costs of product for the customer.

A manufacturer/retailer outreach contractor recruited and trained retailers to participate in the program, placed point-of-purchase materials and rebate coupons in participating retail stores, oversaw the Negotiated Cooperative Promotions (“NCP”) process, and acted as a liaison for Program Administrators, manufacturers, and retailers.

A rebate fulfillment contractor collected data and payment requests from manufacturers,

retailers, and consumers, processed rebate coupons and NCPs, and provided documentation to the Program Administrators for program tracking and evaluation purposes.

An Internet/mail-order sales channel contractor purchased and stocked products offered through the catalog and the Mass Save website, staffed a toll-free line for customers, and processed catalog and website purchases.

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.9 provides information on the performance of the ENERGY STAR® Lighting program.

Table II.A.9: ENERGY STAR® Lighting							
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	\$	13,920,021			11,584,451		-17%
Performance Incentive	\$	767,200			947,313		23%
Participants	Hholds	471,500			596,050		26%
Program Cost/ Participant	\$	30			19		-34%
Savings & Benefits							
Energy							
Lifetime	MWh	529,595	632,704	19%	678,549	7%	28%
Annualized	MWh	68,965	75,063	9%	78,297	4%	14%
Average Measure Life	yrs	8	8	10%	9	3%	13%
Demand							
Lifetime	kW	56,952	60,810	7%	61,741	2%	8%
Annualized							
Summer	kW	7,415	7,711	4%	7,870	2%	6%
Winter	kW	14,830	15,421	4%	17,715	15%	19%
Average Measure Life	yrs	8	8		8		
NEB (Lifetime)	\$	4,464,343	4,864,363	9%	4,864,363	0%	9%
Cost-Effectiveness							
TRC Benefits	\$	66,467,472			82,156,508		24%
TRC Costs	\$	17,093,022			23,598,548		38%
Net Benefits	\$	49,374,450			58,557,960		19%
BCR	r/a	3.89			3.48		-10%

Program participation was 26% higher than planned, which was driven by a higher number of rebates for LEDs and CFLs than planned. Because program participation was higher than planned and there was not a significant variance between the planned and actual Total Program Cost, Program Cost/Participant was 34% lower than planned.

There were no significant variances between preliminary and evaluated Annual and Lifetime MWh savings, Annual and Lifetime kW savings or Lifetime NEBs for this program.

EM&V studies included in the Annual Report that apply to this program:

- *Massachusetts Consumer Survey Results Winter-2012*
This consumer survey was performed in December 2012 and January 2013 with the objective of tracking key lighting market indicators and understanding likely and actual consumer responses to the increased lighting efficiency standards mandated by the Energy Independence and Security Act of 2007 (EISA). The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 4.
- *Residential Lighting Shelf Survey and Pricing Analysis*
This evaluation included a light bulb shelf-stocking survey and a hedonic pricing regression analysis. The results of the shelf-stocking survey demonstrated that participating stores carry a greater proportion of energy-efficient CFLs and LEDs than incandescent or halogen bulbs. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 5.
- *Lighting Retailer, Supplier Perspectives on the Massachusetts ENERGY STAR Lighting Program*
The study performed in-depth interviews with lighting manufacturers and high-level buyers and conducted surveys with store managers in order to understand their perceptions of the current impacts of EISA on the lighting market as well as to explore the perspectives on the growing LED market and program impacts on the lighting market. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 6.
- *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 all energy-efficient light bulbs, including CFLs, LEDs, and fluorescent tubes, was 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.
- *Massachusetts ENERGY STAR® Lighting Program: Early Impacts of EISA*
The objective of this study was to interpret the results and effects of the first full-year of implementation of the increased lighting efficiency standards mandated by the Energy Independence and Security Act (EISA) on the Massachusetts residential lighting market. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 8.

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).

g. ENERGY STAR[®] Appliances

Purpose/Goal: The purpose of the ENERGY STAR[®] Appliances program was to increase consumer awareness of the importance and benefits of purchasing ENERGY STAR[®]-qualified appliances and electronic products, and expand the availability, consumer acceptance, and use of high-quality energy-efficient technologies.

Targeted Customers: All residential electric customers were targeted by this program.

Definition of Program Participant: A participant is defined as the total number of rebates issued 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:

- Refrigeration
- Process

Delivery Mechanism: The program utilizes upstream incentives and mail-in rebates, which dramatically increased sales and lowered costs of product for customers.

A manufacturer/retailer outreach contractor recruited and trained retailers to participate in the program, placed point-of-purchase materials and rebate forms in participating retail stores, oversaw the NCP process for televisions, and acted as a liaison for Program Administrators, manufacturers, and retailers.

A rebate fulfillment contractor collected data and payment requests from manufacturers, retailers and consumers, processed rebate applications and NCPs, and provided documentation to the Program Administrators for program tracking and evaluation purposes.

For recycling, the customer contacted a vendor either via internet or telephone to schedule a pick-up. The vendor then issued an incentive payment to the customer and properly disposed of the appliance.

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on

January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.10 provides information on the performance of the ENERGY STAR® Appliances program.

Table II.A.10: ENERGY STAR® Appliances							
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	\$	2,701,505			3,319,071		23%
Performance Incentive	\$	60,984			92,889		52%
Participants	Rebates	27,635			44,411		61%
Program Cost/ Participant	\$	98			75		-24%
Savings & Benefits							
Energy							
Lifetime	MWh	45,648	63,069	38%	63,045	0%	38%
Annualized	MWh	5,857	8,052	37%	8,049	0%	37%
Average Measure Life	yrs	8	8	0%	8	0%	0%
Demand							
Lifetime	kW	5,048	6,844	36%	8,065	18%	60%
Annualized							
Summer	kW	644	845	31%	1,067	26%	66%
Winter	kW	840	1,063	27%	1,167	10%	39%
Average Measure Life	yrs	8	8		8		
NEB (Lifetime)	\$	819,033	876,043	7%	876,043	0%	7%
Cost-Effectiveness							
TRC Benefits	\$	6,254,877			8,706,098		39%
TRC Costs	\$	3,298,940			3,567,980		8%
Net Benefits	\$	2,955,938			5,138,118		74%
BCR	n/a	1.90			2.44		29%

Preliminary Lifetime and Annual Energy Savings were 38% and 37% higher than planned values, respectively. Moreover, Lifetime, Summer, and Winter kW savings were significantly higher than planned values. These variances were due to issuing approximately double the planned rebates for refrigerators, freezers, and televisions less than 60 inches. The Company also issued significantly more refrigerator and freezer recycling rebates than planned due to the carryover from 2011.

The increase in rebates issued translated into a 61% higher than planned program participation and 23% higher than planned Total Program Costs. Since participation was 61% higher than planned and costs were only 23% higher than planned, Program Cost/Participant was less than planned.

Evaluated Lifetime Demand savings were 18% higher than preliminary and evaluated Annualized Summer Demand savings were 26% higher than preliminary. This was due to increases in the modeled demand savings for most program measures from the updated *Demand Impact Model*, which was previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57.

There are no EM&V studies pertaining to this program being filed in the 2012 Annual Report.

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).

3. Residential Pilots

a. Deep Energy Retrofit

Description of Pilot/Specific Activities Intended to Study: The Deep Energy Retrofit 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 will 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 will utilize these pilot results to determine the future of the pilot and whether it will be adopted either as a standalone 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. 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 electric 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:

- Lighting
- HVAC
- Hot Water
- Envelope
- End Use Behavior

Delivery Mechanism: Project design details and assistance to the Deep Energy Retrofit

contractors performing the work the work was handled through technical specialist contractor, program manager and organizations under contract and/or utilizing Department of Energy 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-fitout. The pilot served a wide array of customers in a variety of home types. Over half the participating dwelling units in some PAs' territory were owner-occupied two-family and three-family homes. An average single family project was 2,645 SF (includes conditioned basement). For example, the average size of all National Grid DER projects dwelling units was 1,476 SF (includes conditioned basement).

Docket/Exhibit where the Program is Discussed and Approved:The pilot was discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.11 provides information on the performance of the Deep Energy Retrofit pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.11: Deep Energy 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	\$	1,316,834			899,161		-32%
Participants	Account	20			17		-15%
Program Cost / Participant	\$	65,842			52,892		-20%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	278,603			318,363		14%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

Total Program Costs were lower than planned because the program had fewer participants than anticipated. Based on the average "time to completion" in 2011, the Company stopped accepting new projects in March 2012, so the projects would be able to be completed by the end of the pilot in December 2012. More than two thirds of the 2012 projects completed in December 2012.

There are no EM&V studies included in the Annual Report that apply to this pilot.

b. Residential New Construction and Major Renovation – Major Renovation Statewide Pilot

Description of Pilot/Specific Activities Intended to Study: The pilot was implemented to capture lost opportunities and encourage energy efficient additions and renovations to existing homes.

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 analyzed 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 reviewed the results and determined to transition the pilot as part of the HES program.

Targeted Customers: This pilot targeted customers who were undergoing extensive renovations to their home and/or building an addition onto their existing home.

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

Targeted End-Uses:

- Lighting
- HVAC
- Hot Water
- Envelope

Delivery Mechanism: The Program Administrators, along with the JMC, originally included this pilot as an offering under the Massachusetts New Homes with ENERGY STAR[®] program, but subsequently determined it was more appropriate to offer the program as part of the HES program. This pilot combines elements of the Residential New Construction program (for the addition) and the HES program (for the existing portion) to provide a comprehensive whole-house approach. Each home in the pilot had an analysis performed in order to better understand the existing structure. Recommendations were provided to the homeowner for the existing portion of the home (under a Mass Save model) and also to increase the energy efficiency of the new addition by the market-based rater in the program.

Significant Differences in Actual Program Design from Approved Program Design: During the course of 2012, the pilot focused more extensively on contractors and expanded eligibility to include additional types of additions and rehabs.

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. Ultimately, achievement of this goal is measured by the pilot’s cost-effectiveness.

Docket/Exhibit where the Program is Discussed and Approved:The pilot was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.12 provides information on the performance of the Residential New Construction and Major Renovation – Major Renovation Statewide Pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.12: New Construction & Major Renovation - Major Renovation Statewide Pilot							
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	\$	267,203			144,853		-46%
Participants	Account	50			7		-86%
Program Cost / Participant	\$	5,344			20,693		287%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	270,017			144,853		-46%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

Seven projects completed in the Company’s territory in 2012. The Major Renovations Statewide pilot was redesigned mid course to be more contractor oriented, to capture any size addition or partial gut renovation, and to use certified building analysts and building envelope professionals, as well as home energy raters as verifiers of savings. The administration of this pilot proved to be more labor intensive, with greater need for additional quality control and lead vendor assistance than originally expected.

The Company discontinued the Major Renovations effort as a pilot in the 2013-2015 Three-Year Plan period. Instead, the Company is completing the projects that were in process in 2012 by integrating a model that is cost-effective within the HES initiative. PAs anticipate being able to offer deeper energy savings measures in major renovation projects through the HES initiative, based upon lessons learned from the *Major Renovations Pilot Evaluation* previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57, and the results of the three year pilot. However, significant research is still necessary to develop the trainings needed to build the contractor infrastructure to implement this initiative successfully.

There are no EM&V studies included in the Annual Report that apply to this pilot.

c. Residential New Construction Multi-Family (4-8 story) Statewide Pilot

Description of Pilot/Specific Activities Intended to Study: The pilot was implemented to broaden participation and achieve deeper savings in the multi-family new construction 4-8 story category through an incentive design that encourages such action.

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 analyzed the information gathered from the pilot to

determine market viability, cost-effectiveness, and, if applicable, adoption rates. The Program Administrators utilized these pilot results and adopted this pilot into the Residential New Construction Program.

Targeted Customers: This pilot targeted 4-8 story multi-family new construction projects.

Definition of Program Participant: Participants are defined as the number of dwelling units served under this program.

Targeted End-Uses:

- Lighting
- Hot Water
- HVAC
- Motors and Drives
- Envelope

Delivery Mechanism: This pilot was delivered by the Program Administrators and the statewide new construction program lead vendor.

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. Ultimately, achievement of this goal is measured by the pilot's cost-effectiveness.

Docket/Exhibit where the Program is Discussed and Approved: The pilot was discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.13 provides information on the performance of the Residential New Construction Multi-Family (4-8 story) Statewide pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.13: Residential New Construction Multi Family (4-8 Story) Statewide Pilot							
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	\$	294,585			468,422		59%
Participants	Units	209			542		159%
Program Cost / Participant	\$	1,409			864		-39%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	308,585			468,422		52%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

The Multi-Family 4-8 Story pilot was introduced in January of 2010. A goal of this pilot was to provide a single point-of-contact for the participants and offerings for all fuel sources and meter configurations. A suite of offerings to maximize energy savings included a comprehensive list of measures, such as wall insulation, heating systems, instant savings domestic hot water measures, appliances, lighting, and controls. The year end results of the pilot were positive in 2011 and the Company continued to offer the pilot in 2012. The Multi-Family New Construction 4-8 story pilot successfully exceeded all of its goals in the 2012 calendar year. The pilot results showed opportunity for cost effective savings in new construction multi-family buildings.

The lessons learned from this pilot and the continued need to serve customers in this market segment warranted the PAs to discontinue it as a pilot effort and transition to a full offering within the Residential New Construction Initiative for the 2013 – 2015 program years. All participating projects that did not complete in 2012 are being integrated into the 2013-2015 initiative.

There are no EM&V studies included in the Annual Report that apply to this pilot.

d. Residential New Construction Lighting Design – Statewide Pilot

Description of Pilot/Specific Activities Intended to Study: The Program Administrators worked with build/design teams and homeowners to identify innovative solutions to approach energy savings through proper lighting design on a portfolio level.

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 analyzed the information gathered from the pilot to

determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot in 2012, the Program Administrators incorporated this pilot into the Residential New Construction Program for 2013-2015.

Targeted Customers: The target audience for this pilot included homebuilders, contractors, architects/designers, trade allies, HERS raters, homebuyers, realtors, developers, low-income and affordable housing developers, and consumers in the market for new homes and or major renovations.

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

Targeted End-Uses: High efficiency lighting and controls.

Delivery Mechanism: The Program Administrators, along with the JMC, included this pilot as an offering under the Massachusetts New Homes with ENERGY STAR program.

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. Ultimately, achievement of this goal is measured by the pilot's cost-effectiveness.

Docket/Exhibit where the Program is Discussed and Approved: The pilot was discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.A.14 provides information on the performance of the Residential New Construction Lighting Design Statewide Pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A14: Residential New Construction Lighting Design Statewide Pilot							
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	\$	69,356			24,162		-65%
Participants	Account	6			8		33%
Program Cost / Participant	\$	11,559			3,020		-74%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	73,106			24,162		-67%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

This initiative was offered as a pilot in 2012 for the PAs to study a new approach to achieving energy savings. In the Company’s territory, there were 8 participants in this pilot, exceeding the goal of 6 participants. All projects successfully utilized the use of working with a lighting designer and incorporated high efficacy lamps and lighting controls where applicable, i.e. dimmers, occupancy sensors, vacancy sensors, timers, etc. Although the sample size is very small, results from pilot participants showed an increase in savings over the baseline home, and the Company has seen electric controls become a larger portion of the home’s total estimated lighting savings.

The Company has decided to discontinue this Pilot moving forward. However, the Company intends to continue offering lighting controls in homes where cost effective savings can be found. Additionally, as shown in the approved Three Year Plan, the Company has included qualified, cost effective light-emitting diodes (“LEDs”) and LED fixtures into its standard offering for the Residential New Construction Initiative in the 2013-2015 Three-Year Plan.

There are no EM&V studies included in the Annual Report that apply to this pilot.

e. R&D and Demonstration

Description of Pilot/Specific Activities Intended to Study: Participate in funding electric demonstration projects that apply to emerging technologies. Specific technologies that were reviewed include the following: Programmable Controllable Thermostats (“PCT”), Electronically Commutated Hot Water Circulating Pumps (“ECM”), Multi Family Occupancy/Temperature Control (“MFTC”), Oil Boiler Load Controls (“OBLC”), Heat Pump Water Heater (“HPWH”), Energy Monitoring Thermostats (“EMT”) and Variable Refrigerant Flow (“VRF”) heat pump system.

Why Implemented on Pilot Basis rather than as a Full Program: This pilot is used to test new measures and technologies prior to implementation.

Targeted Customers: Residential customers who can benefit from improved technologies that use electricity as the main power source for the technology.

- For the PCT demonstration we selected towns for customer participation that had both gas and electric. Customers were required to have central air conditioning.
- The ECM demonstration participants were selected from towns that had National Grid electric service. Participants were required to be replacing a boiler and installing new hot water circulating pumps.
- The MFTC demonstration was one site with multiple families. The site required the use of electric for heating and air conditioning, and the ability to use occupancy sensors for the controls.
- The OBLC demonstration was open to oil customers in National Grid electric service territory. Customers were required to have an oil hot water boiler.
- The HPWH demonstration was open to electric customers and was a continuation of a pilot installed in 2010. Customers were required to be replacing an electric resistance hot water heater.
- The EMT demonstration participants are being targeted for the segment of the customer base who received an energy audit during the past 5 years through the Mass Save audit program. Customers are required to have central air conditioning.
- The VRF demonstration participants are residents of a multi family dwelling. One group of customers has window air conditioning units and electric heat. The comparison group has a VRF system installed in their residence.

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

Targeted End-Uses: Residential electric controlled equipment.

Delivery Mechanism:

- PCT demonstration units were installed by a third party HVAC contractor. The systems were required to have central air conditioning. The program administrator handled the rebate processing and processed the contractor payments. A third party evaluation contractor evaluated the product.
- ECM demonstration units were installed as part of a new boiler installation by a plumbing contractor. The contractor would install (1) new ECM pump replacing single and multiple pump systems. The program administrator processed the customer rebates which were paid to the contractor. A third party evaluation contractor evaluated the results.
- The MFTC demonstration was installed by a third party control contractor. The contractor worked with the owner to develop a scope with the approval of National Grid. The program administrator worked with the customer and vendor

on the project. A third party evaluation contractor evaluated the system performance and customer benefits.

- The OBLC demonstration was installed by a plumbing contractor in existing oil boiler installations. The program administrator paid the rebate to the oil contractor for the installation services for installing the controls. A third party evaluation contractor evaluated the results achieved and customer satisfaction.
- The HPWH demonstration was installed by a plumbing contractor in 2010. The units were monitored and preliminary evaluation results were received during 2011. Final evaluation results were received during 2012 by an external third party contractor.
- The EMT demonstration units will be installed by a heating and cooling contractor. Customers will be recruited from a list provided by our Mass Save audit contractor. The contractor will install up to two thermostats per home. A third party contractor will evaluate the results achieved during the demonstration.
- The VRF demonstration unit was installed by an independent contractor. The customer provided the funding for the installation of the equipment and installation. National Grid is using a third party contractor to evaluate the project to determine the customer benefit of the installation.

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

How Achievement of the Pilot's Stated Goal was Measured:

- PCT demonstration is determining whether customers will interact with controllable thermostats and use the enhanced options that will result in increased electric savings. Determine if a greater percentage of customers utilize the programmable option. Evaluation was completed in 2012.
- ECM demonstration is assessing whether single and multiple pump system can be replace with a single high efficiency variable speed motor. Installing a single motor significant savings can be achieved because of the pumping reduction capacity. Evaluation was completed in 2012.
- MFTC demonstration is determining what level of savings can be achieved by automating the temperature control system as well as automating the lighting and outlet control based on unit occupancy. Occupancy feedback is also a key component to this type of technology. Evaluation was completed during 2012.
- OBLC demonstration is attempting to achieve oil savings based on an advanced control technology that uses the boilers thermal demand to provide cycling of the boiler resulting in reduced fuel consumption. Evaluation was completed in 2012
- HPWH demonstration is developing a new technology that would replace existing electric resistance water heaters that can use up to 70% less energy. Customer satisfaction with the technology is also an important goal for this technology. An evaluation was provided in 2012
- EMT demonstration is determining whether customers will use less whole house energy when presented their usage in real time with messaging of their behavioral based on a comparison population. The final metric is to determine whether customers act to make energy efficiency upgrades based on the information they

receive in their reports. An evaluation will be performed to determine if we can achieve our stated goals.

- VRF demonstrates how much savings the installation of a central refrigerant based heat pump system can provide compared to an electric resistance heating system with window air conditioning units. We will monitor the peak load and overall heating and cooling savings being achieved. An ongoing external evaluation will determine if we can achieve our stated goals.

Docket/Exhibit where the Program is Discussed and Approved: The pilot was discussed in detail in the Company’s 2012 Mid-Term Modification, originally filed on October 8, 2011 and revised on February 15, See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 11-108.

Table II.A.15 provides information on the performance of the R&D and Demonstration Pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.15: R&D and Demonstration							
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	\$	278,603			318,363		14%
Participants	TBD	4			11		175%
Program Cost / Participant	\$	69,651			28,942		-58%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	1,498,834			-		-100%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

The year end results for the PCT demonstration confirmed the preliminary savings results that the Company achieved mid year during the pilot, which demonstrates the measure is cost effective. The cooling savings exceeded the projected savings.

The ECM demonstration participants achieved savings that exceeded the Company’s minimum expectations. More specifically sites with larger pumps exceeded expectations, while installations with fractional horsepower pumps were in line with expected savings. The ECM demonstration confirmed that this measure can be cost effective. The Company will explore the possibility of adding to its gas programs, which would use pumps for boiler installations.

The MFTC demonstration exceeded expectations, which indicated that the site had a lot of energy that was being wasted. It was concluded that the site maintained better temperature control in the space within a defined temperature limit, which was most likely being exceeded before the demonstration. The Company will look to install the technology at a few sites in 2013 and evaluate the technology after a one year period to determine if the savings are consistent with the demonstration. The program would be implemented in the Multi-Family program.

The OBLC demonstration achieved savings levels that were less than expected. Savings impacts may have been linked to the style of boilers; however, on average, savings were below expectations. The OBLC demonstration will continue to be monitored to determine if outdoor temperatures are relevant to achieving greater savings. The preliminary results show cost effective savings. The OBLC demonstration will consider the amount of savings that might be achieved by installing outdoor sensors. The results will compare units with outdoor sensors compared to units without outdoor sensors under comparable degree days. The evaluation will be performed by a third party evaluator.

The HPWH demonstration met expectations and closely matched savings estimates provided by NEEP and estimates provided by manufacturers. The *Heat Pump Water Heaters Evaluation of Field Installed Performance*, which was previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57, proved that the measure is cost effective and was offered as a measure in 2012 by the Company in the Residential Cooling & Heating program.

The EMT demonstration is in the early part of implementation. The Company does not have an estimate of savings achieved at this time. Moreover, the VRF demonstration is currently under evaluation. The EMT demonstration will be implemented in 2013 and we expect to monitor the whole house electric savings achieved as well as any gas savings. The Company will explore what impact the real time electric usage display had on their consumption habits. Also, it will determine if presenting an estimated bill and comparative usage had any behavioral impact on customer behavior. These results will be evaluated by a third party contractor.

There are no EM&V studies included in the Annual Report that apply to this pilot.

f. Community Based Pilot

Description of Pilot/Specific Activities Intended to Study: The term “Community-Based Pilot” encompassed a number of unique partnerships in 2012 between the Program Administrators and local communities designed to harness the power of community-based outreach to achieve broader participation in the Commonwealth’s energy efficiency programs. National Grid participated in a number of community initiatives in its service territory in 2012 including those in Nantucket, Boston, Wellesley, Metropolitan Springfield (Palmer, Monson, East Longmeadow, Belchertown, Hampden, Longmeadow, Wilbraham), and Western Massachusetts (Great Barrington, Lenox, North Adams, Williamstown, Stockbridge, Amherst). The Company also issued an RFP in Q3 of 2012 to municipalities in its dual fuel territory and selected Medford Swampscott to launch initiatives in late 2012. These initiatives are scheduled to run through 2013.

Why Implemented on Pilot Basis rather than as a Full Program: The community-based

initiatives were offered as pilots to assess the effectiveness of each partnership and determine their potential for replication.

Targeted Customers: The Program Administrators and interested stakeholders selected communities with the greatest opportunities for success, based on an assessment of the proposal submitted. Targeted customers varied by pilot, but in general included residential customers with incomes between 61 and 120 percent of median household income in their community.

Definition of Program Participant: Participants in this pilot are counted as participants in other programs such as Mass Save.

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 the community based pilots included the same end-uses addressed under the Company's existing audit and weatherization programs.

Delivery Mechanism: Program outreach was conducted by local community groups. Measures were installed through the Company's existing lead vendors.

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

How Achievement of the Pilot's Stated Goal was Measured: A multi-year evaluation of community based pilots was conducted by Opinion Dynamics Corporation to assess the effectiveness of these pilots and determine their potential for replication. This process evaluation was submitted with the Program Administrators' 2011 Energy Efficiency Annual Reports.

Docket/Exhibit where the Program is Discussed and Approved: The pilot was discussed in detail in the Company's 2012 Mid-Term Modification, originally filed on October 8, 2011 and revised on February 15, See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 11-108.

Table II.A.15 provides information on the performance of the residential CommunityBased Pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.16: Community Based Pilot							
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	\$	140,001			69,514		-50%
Participants	TBD	2			0		-100%
Program Cost / Participant	\$	70,001			0		-100%
Savings & Benefits							
Energy							
Lifetime	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	MWh	n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Demand							
Lifetime	kW	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	kW	n/a	n/a	n/a	n/a	n/a	n/a
Summer		n/a	n/a	n/a	n/a	n/a	n/a
Winter		n/a	n/a	n/a	n/a	n/a	n/a
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
NEB (Lifetime)	\$	n/a	n/a	n/a	n/a	n/a	n/a
Cost-Effectiveness							
TRC Benefits	\$	n/a			n/a		n/a
TRC Costs	\$	140,001			69,514		-50%
Net Benefits	\$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

The Company has reported zero participants for the Community Based Pilot program because the pilot was used as a vehicle to increase customer participation in other programs such as Mass Save. Therefore, participants are being counted in the Mass Save program.

The Home MPG pilot in metropolitan Springfield is ongoing. Uptake in the initiative in 2012 was slower than anticipated and National Grid is collaborating with the Massachusetts Department of Energy Resources to increase participation through the remainder of the 2013. The pilot will be officially evaluated by an independent third party before scaling.

Collaboration in Nantucket has proven successful will continue into 2013 due to the unique nature of serving the island community.

Outreach in Western Massachusetts was successful, but any renewal of the efforts will need to be reviewed through the new Request for Proposal (“RFP”) process the Company has developed for enhanced standardization.

All best practices from community outreach will be catalogued and replicated in future initiatives.

There are no EM&V studies included in the Annual Report that apply to this pilot.

B. Low-Income Sector Programs

1. Summary

During 2012 the Company implemented the following low-income programs and associated initiatives:⁶

- Low-Income Residential New Construction
- Low-Income Retrofit⁷
 - Low-Income Single-Family
 - Low-Income Multi-Family

Tables II.B.1 through II.B.3 provide summary information on the performance of the low-income programs at the sector, end use, and program/initiative levels, respectively.

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	\$	24,804,450			18,927,211		-24%
Performance Incentive	\$	787,609			1,133,943		44%
Savings & Benefits							
Energy							
Lifetime	MWh	156,189	133,578	-14%	124,189	-7%	-20%
Annualized	MWh	15,404	10,784	-30%	9,955	-8%	-35%
Demand							
Lifetime	kW	15,960	14,228	-11%	17,088	20%	7%
Annualized							
Summer	kW	1,534	1,135	-26%	1,078	-5%	-30%
Winter	kW	3,565	2,284	-36%	2,318	1%	-35%
NEB (Lifetime)	\$	24,769,987	32,167,189	30%	44,362,522	38%	79%
Cost-Effectiveness							
TRC Benefits	\$	42,830,448			60,012,656		40%
TRC Costs	\$	25,711,059			20,061,154		-22%
Net Benefits	\$	17,119,389			39,951,502		133%
BCR	n/a	1.67			2.99		80%

⁶ The Company did not offer any pilot programs in the low-income sector during 2012. However, low-income new construction customers were eligible for the residential Multi-Family 4-8 story pilot. Please see the residential pilot descriptions.

⁷ 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.2: Low-Income Sector Summary of End Uses				
End Uses	Units (Lifetime)	Preliminary Year-End Results	Evaluated Results	% Change from Preliminary to Evaluated
Lighting				
Energy	MWh	44,125	45,122	2%
Demand	kW	4,202	2,158	-49%
NEB	\$	984,132	952,289	-3%
HVAC				
Energy	MWh	10,790	9,730	-10%
Demand	kW	192	197	3%
NEB	\$	18,239,492	21,396,839	17%
Refrigeration				
Energy	MWh	69,573	54,114	-22%
Demand	kW	9,130	6,690	-27%
NEB	\$	1,019,605	1,311,761	29%
Hot Water				
Energy	MWh	1,524	1,441	-5%
Demand	kW	147	185	25%
NEB	\$	1,069,098	1,043,105	-2%
Process				
Energy	MWh	743	743	0%
Demand	kW	200	118	-41%
NEB	\$	11,769	18,493	57%
End Use Behavior				
Energy	MWh	2,929	407	-86%
Demand	kW	340	142	-58%
NEB	\$	3,033,720	3,340,987	10%
Envelope				
Energy	MWh	3,893	12,633	225%
Demand	kW	15	7,598	50410%
NEB	\$	7,809,373	16,299,049	109%
Total				
Energy	MWh	133,578	124,189	-7%
Demand	kW	14,228	17,088	20%
NEB	\$	32,167,189	44,362,522	38%

Table II.B.3: Low-Income Program Summary				
Program / Performance Category	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Low-Income Residential New Construction				
TRC Benefits	\$	1,733,223	1,604,593	-7%
TRC Costs	\$	490,430	306,842	-37%
Net Benefits	\$	1,242,793	1,297,751	4%
BCR	n/a	3.53	5.23	48%
Low Income Retrofit				
TRC Benefits	\$	41,097,225	58,408,063	42%
TRC Costs	\$	24,472,247	19,436,423	-21%
Net Benefits	\$	16,624,978	38,971,640	134%
BCR	n/a	1.68	3.01	79%
TOTAL				
TRC Benefits	\$	42,830,448	60,012,656	40%
TRC Costs	\$	25,711,059	20,061,154	-22%
Net Benefits	\$	17,119,389	39,951,502	133%
BCR	n/a	1.67	2.99	80%

According to Table II.B.1, on a the Low-Income sector level, preliminary annual MWh, Summer kW, and Winter kW are significantly below planned and Preliminary NEBs are significantly higher than the planned value. Low-Income Retrofit is the driver of these variances. Both Low-Income programs had lower than planned TRC Costs, contributing to the variance between planned and actual values. The Low-Income Retrofit Program had higher than planned TRC Benefits, which contributed to the higher than planned Low-Income sector Net Benefits and BCR.

Evaluated Lifetime kW and NEBs are significantly higher than preliminary, which is the result of EM&V studies that apply to Low-Income Retrofit program.

Please reference section II.B.2 for a more detailed discussion of the variances by program within this sector.

Low-Income Sector Performance Highlights

Low-Income Residential New Construction

The Low-Income Residential New Construction Program provided incentives to low-income low-rise and high-rise projects. Incentives were based on final achieved and verified performance of the participating project. The program also provided additional incentives for high efficiency gas and cooling equipment, along with compact fluorescent lamps and appliance rebates.

Low-Income Retrofit

In 2012, the Program Administrators continued to leverage funds from the 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 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 market in its territory.

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

2. Low-Income Programs

a. Low-Income Residential New Construction

Purpose/Goal: The purpose of the Low-Income Residential New Construction program was to encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards near-zero energy.

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 and/or major renovations.

Definition of Program Participant: A participant is defined as a unique electric account served under this program. For the low-income new construction program, the account represents a newly constructed dwelling unit.

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
- Refrigeration
- Hot Water
- Envelope

Delivery Mechanism: The program is administered by each Program Administrator in its service territory and coordinated regionally through the JMC.

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 Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.B.4 provides information on the performance of the Low-Income Residential New Construction program.

Table II.B.4: Low Income Residential New Construction							
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	\$	346,793			284,837		-18%
Performance Incentive	\$	24,637			22,005		-11%
Participants	Accounts	170			197		16%
Program Cost / Participant	\$	2,040			1,446		-29%
Savings & Benefits							
Energy							
Lifetime	MWh	2,632	2,431	-8%	2,188	-10%	-17%
Annualized	MWh	356	185	-48%	150	-19%	-58%
Average Measure Life	yrs	7	13	78%	15	11%	97%
Demand							
Lifetime	kW	259	316	22%	287	-9%	11%
Annualized							
Summer	kW	36	22	-37%	18	-18%	-48%
Winter	kW	69	38	-45%	33	-14%	-52%
Average Measure Life	yrs	7	14		16		
NEB (Lifetime)	\$	1,429,640	1,348,134	-6%	1,333,003	-1%	-7%
Cost-Effectiveness							
TRC Benefits	\$	1,733,223			1,604,593		-7%
TRC Costs	\$	490,430			306,842		-37%
Net Benefits	\$	1,242,793			1,297,751		4%
BCR	n/a	3.53			5.23		48%

Preliminary Annual MWh savings were 48% below planned values, while preliminary Lifetime MWh savings did not have a significance variance from planned. Preliminary Summer and Winter kW savings were 37% and 45% lower than planned, respectively while Lifetime kW was 22% above planned. These variances are due to differences in planned versus actual measure mix. Specifically, the Program installed fewer CFLs, fixtures, and domestic hot water measures than planned while greater number of refrigerators and dishwashers were installed than planned. Refrigerators and dishwashers have a higher measure life than CFLs, causing the disproportionate increase in lifetime savings compared to annual savings.

EM&V studies included in the Annual Report that apply to this program:

- 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 all energy-efficient light bulbs, including CFLs, LEDs, and fluorescent tubes, was 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.
- 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. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study11.

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).

b. Low-Income Retrofit Program

Purpose/Goal: Two initiatives, the Low-Income Single Family Retrofit initiative and the Low-Income Multi-Family (“LIMF”) Retrofit initiative, were incorporated in the Low-Income Retrofit program in 2012.

The purpose of the Low-Income Single Family Retrofit initiative was to increase energy efficiency and reduce the energy cost burden for income-eligible customers through the installation of electric, oil, and propane 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 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 Low-Income Single Family Retrofit initiative targeted residential 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 discount rate(s). 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: For the Low-Income Single Family program, a participant is defined as a unique electric account served under this initiative. The unique account is tied to the low-income audit. For the Low-Income Multi-Family program, participants are defined as the total number of dwelling units in a participating facility.

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
- Heating and Ventilation
- Refrigeration
- 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”). 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 was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.B.5 provides information on the performance of the Low-Income Retrofit program.

Table II.B.5: 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	\$	23,709,275			18,324,485		-23%
Performance Incentive	\$	762,972			1,111,938		46%
Participants	Account/Unit	11,100			10,574		-5%
Program Cost / Participant	\$	2,136			1,733		-19%
Savings & Benefits							
Energy							
Lifetime	MWh	153,557	131,147	-15%	122,001	-7%	-21%
Annualized	MWh	15,048	10,600	-30%	9,804	-8%	-35%
Average Measure Life	yrs	10	12	21%	12	1%	22%
Demand							
Lifetime	kW	15,701	13,912	-11%	16,801	21%	7%
Annualized							
Summer	kW	1,499	1,113	-26%	1,060	-5%	-29%
Winter	kW	3,496	2,246	-36%	2,285	2%	-35%
Average Measure Life	yrs	10	13		16		
NEB (Lifetime)	\$	23,340,347	30,819,055	32%	43,029,519	40%	84%
Cost-Effectiveness							
TRC Benefits	\$	41,097,225			58,408,063		42%
TRC Costs	\$	24,472,247			19,436,423		-21%
Net Benefits	\$	16,624,978			38,971,640		134%
BCR	n/a	1.68			3.01		79%

In 2012, the Low Income Retrofit program included both Low-Income Single Family Retrofit and Low Income Multi-Family Retrofit initiatives. Preliminary Annual MWh savings were 30% below planned values. Preliminary Summer and Winter kW savings were 26% and 36% lower than planned, respectively. The reason for these program results is that both retrofit programs are well-developed with a great deal of market saturation. Additionally, due to Hurricane Sandy, the warehouse in New Jersey where many of the Program's refrigerators and freezers for the Low Income Multi-Family Retrofit initiative were stored was shut down for a length of time, effectively decreasing the number of refrigerators available for installation and decreasing available savings opportunities. Both the Low-Income Single Family Retrofit and Low Income Multi-Family Retrofit initiatives installed fewer CFLs than planned, which contributed to the shortfall of savings.

Despite the shortfall in annual savings, preliminary NEBs were 32% higher than planned values. For the Low-Income Multi-Family Retrofit initiative, the planned NEBs assumed that the non-resource benefits would only accrue to participants receiving weatherization measures. For actual results, the Company applied the non-resource benefits due to installation of weatherization measures to these weatherization participants only, while applying other non-resource benefits not related to weatherization to all participants. Because the number of participants in the program was much greater than the number of participants who received weatherization measures, the non-resource benefit value for the Low-Income Multi-Family Retrofit initiative was higher than planned. This was the primary driver for the higher than planned NEBs.

Total Program Costs were 23% lower than planned. Costs were lower than anticipated because the Company had the opportunity to work with LEAN to leverage Department of Energy (DOE)

funds in order to better serve the low income community. As a result, the Company was able to achieve savings for a lower cost than planned. In addition, due to Hurricane Sandy related issues, the program was not able to obtain and install many of the planned refrigerators and freezers, as the appliances were warehoused in New Jersey.

Evaluated Lifetime kW savings were 21% higher than preliminary. This increase was due to the combined effects of the *Low Income Single Family Program Impact Evaluation* and the *Demand Impact Model User Manual* which were both previously filed in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 12-57. Lifetime demand savings were calculated by multiplying summer demand savings by the measure lifetime. The application of the *Demand Impact Model* for most program measures tended to reduce summer kW savings. An exception to this was the Oil Weatherization measure in the Low Income Single Family initiative. The impact evaluation estimated kWh savings due to cooling associated with this measure, which had previously not been estimated. The addition of cooling kWh savings also led to summer demand savings which were calculated using the *Demand Impact Model*. Since the Oil Weatherization measure had a 20 year lifetime the program level, lifetime kW increased while the summer kW decreased slightly.

Evaluated NEBs are 40% higher than preliminary. This increase was due to the results of the *Additional Non-Energy Impacts for Low Income Programs*, which was previously filed in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2011 Energy Efficiency Annual Report, D.P.U. 12-57. This report provided new NEIs that were applied to evaluated results.

EM&V studies included in the Annual Report that apply to this 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. The results of this study did not impact the 2012 evaluated results. The study is discussed in more detail in Section III, Study 11.

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. 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 through II.C.3 provide summary information on the performance of the C&I programs at the sector, end use, and program levels, respectively.

Table II.C.1: C&I 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	\$	121,459,507			78,825,202		-35%
Performance Incentive	\$	6,666,779			4,942,571		-26%
Savings & Benefits							
Energy							
Lifetime	MWh	4,038,979	3,219,643	-20%	3,050,976	-5%	-24%
Annualized	MWh	325,491	252,021	-23%	235,742	-6%	-28%
Demand							
Lifetime	kW	748,217	517,576	-31%	490,593	-5%	-34%
Annualized							
Summer	kW	60,015	41,425	-31%	38,627	-7%	-36%
Winter	kW	46,857	35,458	-24%	34,381	-3%	-27%
NEB (Lifetime)	\$	-19,730,724	(9,494,094)	-52%	8,671,427	-191%	-144%
Cost-Effectiveness							
TRC Benefits	\$	565,970,666			423,386,179		-25%
TRC Costs	\$	195,201,987			115,083,999		-41%
Net Benefits	\$	370,768,679			308,302,180		-17%
BCR	n/a	2.90			3.68		27%

Table II.C.2: C&I Sector Summary of End Uses				
End Uses	Units (Lifetime)	Preliminary Year-End Results	Evaluated Results	% Change from Preliminary to Evaluated
Lighting				
Energy	MWh	1,816,139	1,684,479	-7%
Demand	kW	359,726	328,731	-9%
NEB	\$	(3,796,645)	7,629,198	-301%
HVAC				
Energy	MWh	403,793	391,182	-3%
Demand	kW	58,858	58,886	0%
NEB	\$	(9,394,134)	(4,807,857)	-49%
Motors and Drives				
Energy	MWh	432,019	408,999	-5%
Demand	kW	36,981	36,141	-2%
NEB	\$	201,780	737,033	265%
Refrigeration				
Energy	MWh	78,942	99,543	26%
Demand	kW	9,022	12,079	34%
NEB	\$	1,518,997	3,128,635	106%
Process				
Energy	MWh	452,465	430,488	-5%
Demand	kW	47,113	48,878	4%
NEB	\$	1,975,909	1,984,417	0%
Compressed Air				
Energy	MWh	36,285	36,285	0%
Demand	kW	5,316	5,316	0%
NEB	\$	-	-	0%
Total				
Energy	MWh	3,219,643	3,050,976	-5%
Demand	kW	517,015	490,032	-5%
NEB	\$	(9,494,094)	8,671,427	-191%

Table II.C.3 C&I Program Summary				
Program / Performance Category	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
C&I New Construction & Major Renovation				
TRC Benefits	\$	171,064,232	146,822,737	-14%
TRC Costs	\$	42,143,967	27,577,184	-35%
Net Benefits	\$	128,920,266	119,245,553	-8%
BCR	n/a	4.06	5.32	31%
C&I Large Retrofit				
TRC Benefits	\$	310,869,324	188,137,692	-39%
TRC Costs	\$	114,350,250	58,699,204	-49%
Net Benefits	\$	196,519,073	129,438,488	-34%
BCR	n/a	2.72	3.21	18%
C&I Small Retrofit				
TRC Benefits	\$	84,037,110	88,425,750	5%
TRC Costs	\$	37,475,486	27,580,235	-26%
Net Benefits	\$	46,561,624	60,845,515	31%
BCR	n/a	2.24	3.21	43%
Community Based Pilot				
TRC Benefits	\$	n/a	n/a	n/a
TRC Costs	\$	96,550	-	-100%
Net Benefits	\$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
TOTAL				
TRC Benefits	\$	565,970,666	423,386,179	-25%
TRC Costs	\$	195,201,987	115,083,999	-41%
Net Benefits	\$	370,768,679	308,302,180	-17%
BCR	n/a	2.90	3.68	27%

As illustrated in Table II.C.1., preliminary Lifetime and Annual MWh and Lifetime, Summer Winter kW, are significantly lower than planned. C&I Large Retrofit is the primary driver for these variances. Preliminary Lifetime NEBs are significantly higher than planned, which is also the result of the C&I Large Retrofit program.

Within the C&I sector, the C&I New Construction and Major Renovation and C&I Retrofit Programs had lower than planned TRC Benefits, while all of the programs had lower than planned TRC Costs, which contributed to the higher than planned BCR.

Evaluated Lifetime NEBs are significantly higher than preliminary values, which is due to the application of EM&V studies being applied to the C&I Small Retrofit program.

Section 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 programs and significantly expanded initiatives to increase participation across all C&I programs. Selected highlights are presented below:

- **Proactive Research of Emerging Technologies** – In 2012, the Massachusetts Technical Advisory Committee (“MTAC”), the entity designed to field inquiries on the appropriateness of new technologies to be offered under the Massachusetts programs, achieved several key milestones. First, discussions were initiated in 2012 regarding the merger of the separate residential and C&I committees in order to evaluate promising new technologies in a consistent statewide manner. These committees merged in 2013. Second, in 2012, the MTAC reviewed 18 commercial natural gas and electric technologies and approved three as eligible for energy efficiency incentives under the Mass Save program.⁸ Third, the energy use of major medical equipment in the healthcare sector, such as Magnetic Resonance Imaging (MRI) machines and other energy intensive medical equipment was evaluated. The MTAC provided the vehicle for investigating opportunities for this sector and contracted with the Fraunhofer Center for Sustainable Energy Systems for this analysis in 2012.⁹

Another important technology evaluated by the MTAC was rooftop unit controls for existing packaged cooling and heating equipment. C&I buildings typically have multiple packaged units with no control communication between these units. The potential for both natural gas and electric savings appears very promising, and initial inquiries indicate that there are thousands of applicable units in the Commonwealth that could benefit from this technology. Cape Light Compact provided an initial test site in 2012 and the MTAC has hired an independent consulting engineer to perform before and after monitoring of this site. (A report was issued in the first quarter of 2013 and this technology went on to be approved for implementation later in 2013.)

- **Refinements to Upstream Lighting Initiative** – 2012 was the first full year of operation for the Upstream Lighting Initiative, known to customers as “Bright Opportunities.” After a dramatic customer response upon roll out in late 2011, the initiative continued to garner high volume throughout 2012, yielding over 21,000 participants and more than \$18 million in buy downs paid statewide for high efficiency linear fluorescents and LED lamps. During 2012, a number of new LED lamp types were added to the initiative, substantially expanding the variety of possible applications for participating customers to use this technology. By the second quarter, the LED product selection had been expanded to include A-lamps, PAR Lamps in three sizes, MR16s, and decorative fixture lamps for chandeliers.

⁸ Of the other 15 technologies considered by MTAC in 2012, three were denied approval; the remaining 12 were continued into 2013 for additional evaluation – either in field monitoring studies or because the MTAC was awaiting additional documentation from applicants.

⁹ The final Fraunhofer report, presented in early 2013, demonstrated savings opportunities exist primarily in powering down machinery between uses rather than making changes to equipment specifications for lower energy use during operation. Such changes to hospital operating protocols would require recertification of equipment operators and procedures, thus limiting the accessibility of such savings.

As part of the initiative's early success, program LED lamp prices dropped sufficiently that the PAs lowered incentives for certain lamps and enacted a minimum threshold customer contribution to ensure that the discounted product held value for participants, as manufacturers and distributors were able to lower their margins with increased volumes. Additionally, the PAs proactively addressed the rare earth shortage and the subsequent material price increases that impacted the lighting industry in late 2011 and 2012. By monitoring market pricing changes, the PAs increased incentives for eligible linear fluorescent lamps to reduce the incremental cost between standard and high-efficiency lamps.

The high participation levels experienced in 2012 were the result of a number of promotional efforts undertaken by the PAs. A special college LED promotion led to 75,000 LED lamps being installed in college dorm rooms across Massachusetts. Another effort targeted state and municipal facilities and yielded more than 120,000 reduced wattage T8 lamps. *Preferred Distributor* recognition, along with higher incentives, was also developed to stimulate demand for the program's linear fluorescent products, resulting in an increase of 1 million units in Q3/Q4 of 2012.

Quality control and quality assurance ("QA/QC") was another key component of this initiative in 2012. The PAs issued an RFP for a QA/QC vendor in early 2012 and awarded contract to CRI. Starting in the third quarter of 2012, CRI began inspecting five percent of participant sites on a monthly basis to verify the installation of lamps purchased through the program, as well as to gather field data on wattage of lamps replaced and customer satisfaction with the upstream products, particularly with regard to LEDs installed in dimming applications.

- **Development of Upstream HVAC** – In 2012, the PAs began development work to expand the upstream program to also include HVAC measures in 2013. The development team researched existing programs around the country, including having in depth discussions with administrators in California who have a long standing successful upstream HVAC program. The team then decided to proceed with a concept that would take Mass Save's existing Cool Choice program completely upstream, so that C&I customers seeking packaged HVAC or heat pump units could find higher efficiency units available at their distributor without having to pay a premium for that efficiency. A full scale C&I program RFP was issued in November 2012 (with the option to add a residential program at a later date), and bid proposals were received from three prospective suppliers. (Contract award and program launch occurred in the first half of 2013.)
- **Market Characterization and Segmentation** – NU and National Grid led an effort to characterize the market for energy efficiency for the term of the 2013-2015 Plan, through a study performed by the consulting firm Point 380 in 2012. The Point 380 study results are, and will continue to be, used to inform the PAs "go-to-market" strategies by identifying the industries, building types and end uses representing greater efficiency opportunities and thus warranting relatively greater attention and allocation of resources. The results also greatly support

sales force planning, while enabling more relevant and effective value propositions to better meet specific customers' needs. The Point 380 materials were shared with all Program Administrators, who have each benefited from this effort. NU and National Grid made a joint presentation to the Council summarizing the Point 380 study, which is available at <http://www.ma-eeac.org>.

In order to achieve greater participation and savings, the Program Administrators have increasingly used market segmentation to inform go-to-market strategies. Based on the specific characteristics of defined segments, marketing approaches, delivery systems, value propositions and offerings can be customized to better meet the needs and interests of individual companies in those segments. For example, the PAs began developing specific offerings and marketing collateral to better serve the needs of grocers.

- **Appreciative Inquiry Summit**– 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 in attendance. Many C&I customers, contractors and experts participated in this event and provided insight into their view of the programs and recommendations to improve the delivery of energy efficiency in Massachusetts.
- **Development of the 2013-2015 Three-Year Energy Efficiency Plan** - Throughout much of 2012, the PAs were actively involved in developing the 2013-2015 three-year plan. Two primary focal points of the 2013-2015 three-year plan were reviewed during this process in 2012, including: new strategies to increase breadth of participation, as well as the comprehensiveness of efficiency projects.

The strategies explored included: expanded service offerings targeted at smaller customers to enable self-service participation options; community-based engagement built upon the Main Streets model; expanding the upstream delivery model to non-lighting technologies; greater use of segmentation approaches to develop customized offerings to encourage greater comprehensiveness among specific subsets of customers such as hospitals and municipalities; an accelerated rebate pilot for the top five electric and gas customers; and exploration of options for inclusion of utility-owned LED street lighting in programs.

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

2. C&I Programs

a. 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 a unique billing account that has received a financial incentive for the completed implementation of one or more electric energy efficiency measures. Customers who have participated in both the traditional C&I New Construction and Major Renovation program and upstream lighting component of the program will be counted as twice.

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

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 was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

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

Table II.C.4: C&I New Construction and 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	\$	31,298,856			22,671,194		-28%
Performance Incentive	\$	2,102,376			1,795,843		-15%
Participants	Accounts	1,185			5,066		328%
Program Cost / Participant	\$	26,413			4,475		-83%
Savings & Benefits							
Energy							
Lifetime	MWh	1,138,940	1,243,751	9%	1,157,378	-7%	2%
Annualized	MWh	91,804	94,272	3%	86,344	-8%	-6%
Average Measure Life	yrs	12	13	6%	13	2%	8%
Demand							
Lifetime	kW	276,546	226,845	-18%	215,822	-5%	-22%
Annualized							
Summer		22,180	18,044	-19%	16,770	-7%	-24%
Winter		15,915	13,890	-13%	12,760	-8%	-20%
Average Measure Life	yrs	12	13		13		
NEB (Lifetime)	\$	-7,099,553	-12,081,928	70%	(15,490,068)	28%	118%
Cost-Effectiveness							
TRC Benefits	\$	171,064,232			146,822,737		-14%
TRC Costs	\$	42,143,967			27,577,184		-35%
Net Benefits	\$	128,920,266			119,245,553		-8%
BCR	n/a	4.06			5.32		31%

Total Program Cost for the C&I New Construction program was 28% below planned, which was due to under spending in non-participant incentive spending buckets. Participants were 328% higher than planned values, which was because upstream lighting participants were not accounted for during the planning process and therefore not included in the planned value. The increase in actual participation and decrease in actual Total Program Costs from planned values resulted in a lower than planned program cost per participant.

Preliminary NEBs are 70% lower than planned values. This variance is primarily attributable to a large combined heat and power (“CHP”) project the Company completed. The CHP project had large negative annual non-resource costs due to increased maintenance cost in addition to higher negative gas benefits.

Evaluated NEBs were 28% lower than preliminary, which was due to the *Impact Evaluation of 2010 Prescriptive Lighting Installations*. More specifically, the negative heating benefit values

from the report were lower than previous values for upstream lighting measures causing the NEBs to decrease significantly.

EM&V studies included in the Annual Report that apply to this program:

- *Impact Evaluation of 2011-2012 Prescriptive VSDs*
This study produced realization rates for annual kWh for prescriptive VSDs. The study decreased program savings for the Company's 2012 evaluated results. This study is discussed in more detail in Section III, Study 13.
- *Impact Evaluation of 2010 Prescriptive Lighting Installations*
This study evaluated the large C&I prescriptive lighting end-use, which includes all lighting systems and controls, Advanced Lighting Design (ALD) or performance lighting, and refrigerated LED case lights. The study presents realization rates for gross energy savings, on-peak and seasonal summer and winter demand savings, and coincidence factors at the statewide level using 12 months of metered data. The net effect for the Company was to decrease energy savings for this Program. The study is discussed in more detail in Section III, Study 14.
- *Impact Evaluation of 2011 Custom Refrigeration, Motor and Other Installations*
This study produces realization rates for annual kWh, summer and winter peak kW, and percent on peak for the large C&I custom electric component of refrigeration, motors, and "other" measure types. The net effect for the Company was to decrease energy savings for this Program. This study is discussed in more detail in Section III, Study 15.
- *Process Evaluation of the 2012 Bright Opportunities Program*
This study was a process evaluation of the Bright Opportunities Program which provides "upstream" incentives to distributors of energy efficient lamps and bulbs. The evaluation studied the design and delivery of the program, barriers to the adoption of efficient lighting technologies under this design, advantages of an "upstream" design versus a "downstream" design, and provided an estimated net-to-gross ratio based on free-ridership and spillover. The net-to-gross ratio impacted the 2012 savings and resulted in an overall decrease in savings for the Company. The study is discussed in more detail in Section III, Study 16.
- *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.

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).

b. C&I Large Retrofit

Purpose/Goal: The C&I Large 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 a unique billing account that has received a financial incentive for the completed implementation of one or more electric energy efficiency measures.

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
- Combined Heat & Power

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 Program is Discussed and Approved:The program was discussed in detail in the Company’s 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

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

Table II.C.5: C&I 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	\$	64,608,830			34,338,200		-47%
Performance Incentive	\$	3,572,620			2,140,644		-40%
Participants	Accounts	1,011			906		-10%
Program Cost / Participant	\$	63,906			37,901		-41%
Savings & Benefits							
Energy							
Lifetime	MWh	2,384,327	1,406,485	-41%	1,355,054	-4%	-43%
Annualized	MWh	190,711	111,828	-41%	106,370	-5%	-44%
Average Measure Life	yrs	13	13	1%	13	1%	2%
Demand							
Lifetime	kW	347,991	171,578	-51%	161,797	-6%	-54%
Annualized							
Summer		27,528	13,733	-50%	12,831	-7%	-53%
Winter		25,672	15,173	-41%	14,923	-2%	-42%
Average Measure Life	yrs	13	12		13		
NEB (Lifetime)	\$	-12,324,688	4,822,702	-139%	17,538,647	264%	-242%
Cost-Effectiveness							
TRC Benefits	\$	310,869,324			188,137,692		-39%
TRC Costs	\$	114,350,250			58,699,204		-49%
Net Benefits	\$	196,519,073			129,438,488		-34%
BCR	n/a	2.72			3.21		18%

Savings and costs were lower than planned in 2012. Preliminary lifetime and annual MWh savings were both 41% lower than planned. Moreover, preliminary lifetime summer, and winter kW savings were 51%, 50%, and 41% lower than planned, respectively. In spite of falling short of goal in 2012, the Company successfully brought energy efficiency services to more customers in its C&I Large Retrofit Program than in 2011. Unique participants in the program increased

by 5% from 860 unique participants in 2011 to 906 unique participants in 2012. In addition to serving more customers in 2012, the average lifetime energy savings per customer project increased by 22 % from 1,230 lifetime MWh in 2011 to 1,495 lifetime MWh in 2012¹⁰. The program also had a greater focus on smaller customers who are served through this program in 2012 compared to 2011. The five largest completed projects made up only 9 % of 2012 lifetime savings compared to 40% of lifetime savings in 2011. The Company strives to make energy efficiency services available as broadly as possible to its customer base and was successful in doing that in 2012.

The Company continues to identify and implement strategies that are focused on continuing its successful outreach to smaller and medium sized large C&I customers while also focusing on completing more large projects with its largest customers. These strategies and tactics include but are not limited to:

- An increased focus on key vertical market segments;
- Effectively managing the increased volume of technical studies anticipated with increased participation;
- Increasing strategic partnerships with key trade allies¹¹;
- Becoming increasingly sophisticated and strategic in marketing approaches with a view toward increasing participation by large business customers
- Investing in tools that will increase the effectiveness of the energy efficiency sales effort over time;
- Increasing training for existing and new staff involved in the energy efficiency effort.

Evaluated NEBs were 217% higher than planned. This variance was due to the application of results from the *Commercial and Industrial Non-Energy Impacts Study*, which was previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2013-2015 Three-Year Energy Efficiency Plan, D.P.U. 12-109. This study added NEIs to HVAC and custom measures.

EM&V studies included in the Annual Report that apply to this program:

¹⁰ A large portion of 2011 savings resulted from one large CHP project. The Company has excluded this project from these calculations.

¹¹ National Grid expanded its Project Expeditor ("PEX") partnerships by more than 50% in early 2013 to better serve its Large C&I customers while increasing the number of completed projects. In addition, National Grid is working to streamline the application process by: training the PEXs to provide technical assistance studies while reducing the amount of time required to bring proposals to customers; dedicating technical resources specifically to review PEX applications and technical assistance studies to improve the turnaround times for these applications; training PEXs about National Grid systems and tools; and authorizing the PEXs to pre-inspect projects and enter measures in the Company's tracking system.

- *Impact Evaluation of 2011-2012 Prescriptive VSDs*
This study produced realization rates for annual kWh for prescriptive VSDs. The study decreased program savings for the Company's 2012 evaluated results. This study is discussed in more detail in Section III, Study 13.
- *Impact Evaluation of 2010 Prescriptive Lighting Installations*
This study evaluated the large C&I prescriptive lighting end-use, which includes all lighting systems and controls, Advanced Lighting Design (ALD) or performance lighting, and refrigerated LED case lights. The study presents realization rates for gross energy savings, on-peak and seasonal summer and winter demand savings, and coincidence factors at the statewide level using 12 months of metered data. The net effect for the Company was to decrease energy savings for this Program. The study is discussed in more detail in Section III, Study 14.
- *Impact Evaluation of 2011 Custom Refrigeration, Motor and Other Installations*
This study produces realization rates for annual kWh, summer and winter peak kW, and percent on peak for the large C&I custom electric component of refrigeration, motors, and "other" measure types. The net effect for the Company was to decrease energy savings for this Program. This study is discussed in more detail in Section III, Study 15.
- *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.

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. C&I Small Retrofit

Purpose/Goal: The primary objective of the C&I Small Retrofit 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 included direct install retrofit business customers below 300kW.

Definition of Program Participant: A program participant is defined as a unique billing account that installed one or more of the eligible C&I Small Retrofit measures.

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 were selected through a competitive bidding process to implement the program. These vendors 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 Program is Discussed and Approved: The program was discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116, Exhibit NG-1. The program was approved by the Department on January 28, 2010 in Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 09-116.

Table II.C.6 provides information on the performance of the C&I Small Retrofit Program.

Table II.C.6: C&I Small 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	\$	24,319,537			20,588,433		-15%
Performance Incentive	\$	991,783			1,006,084		1%
Participants	Accounts	2,123			2,013		-5%
Program Cost / Participant	\$	11,455			10,228		-11%
Savings & Benefits							
Energy							
Lifetime	MWh	515,713	569,408	10%	538,545	-5%	4%
Annualized	MWh	42,976	45,922	7%	43,029	-6%	0%
Average Measure Life	yrs	12	12	3%	13	1%	4%
Demand							
Lifetime	kW	123,681	119,153	-4%	112,974	-5%	-9%
Annualized	kW						
Summer		10,307	9,648	-6%	9,026	-6%	-12%
Winter		5,270	6,395	21%	6,698	5%	27%
Average Measure Life	yrs	12	12		13		
NEB (Lifetime)	\$	-306,484	-2,234,868	629%	6,622,848	-396%	-2261%
Cost-Effectiveness							
TRC Benefits	\$	84,037,110			88,425,750		5%
TRC Costs	\$	37,475,486			27,580,235		-26%
Net Benefits	\$	46,561,624			60,845,515		31%
BCR	n/a	2.24			3.21		43%

Preliminary Winter kW savings was 21% higher than planned. This variance was due to the installation of more efficient lighting than planned, which has high energy and winter demand savings, but a low cost.

Preliminary NEBs were 629% lower than planned value because of a difference in the data used for planning versus preliminary results. The Company does not forecast benefits associated with individual measures, but rather uses past program performance to plan with. The project types and therefore the NEBs were significantly different in the actual results.

Evaluated NEBs were 393% higher than preliminary. This variance was due to the application of results from the *Commercial and Industrial Non-Energy Impacts Study*, which was previously filed in the Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid 2013-2015 Three-Year Energy Efficiency Plan, D.P.U. 12-109. This study added NEIs to HVAC and custom measures.

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).

EM&V studies included in the Annual Report that apply to this program:

- *Massachusetts Small Business Direct Install: 2010-2012 Impact Evaluations*
This report produced lighting fixture and lighting control measure realization rates for annual kWh and summer and winter peak kW, as well as on-peak coincidence factors. The net effect of these evaluations decreased energy and demand savings for these measures. The full report is discussed in Section III, Study 12.
- *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.

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 electric 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
- Massachusetts ENERGY STAR® Lighting Program: Early Impacts of EISA study
- Process Evaluation of the 2012 Bright Opportunities Program

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 calibrated engineering models developed by the evaluation team 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 electric PAs conducted a process evaluation of the 2012 Bright Opportunities Program, which is a C&I upstream lighting program. The preponderance of the evidence indicates that the Bright Opportunities Program is a well-designed and well-run program. The study showed generally high program satisfaction levels from end users and participating trade allies, lack of barriers to program participation, generally high program net-to-gross ratios, and also lack of significant complaints from program implementers. Interim gross impact evaluation results suggest that gross savings are being forecasted accurately. Additional information on this process evaluation and the updated NTG values are discussed in more detail in Appendix C, Study 16.

The Massachusetts ENERGY STAR[®] Lighting Program: Early Impacts of EISA Study sought to synthesize the results from the four lighting evaluation tasks reported separately (consumer survey, onsite saturation, shelf-stocking survey, and supplier interviews) as well as highlight the effects of the first full-year of implementation of the increased lighting efficiency standards mandated by the Energy Independence and Security Act (“EISA”) on the Massachusetts residential lighting market. Through consumer and supplier surveys, the study found that consumers and suppliers report an increased availability of CFLs and LEDs on store shelves, and a decreased availability of filament incandescent bulbs. The various results did not provide full clarity on how EISA has changed the availability of A-line halogen incandescent bulbs, but the study speculates that most likely the availability increased in 2012. Another interesting finding of the study was regarding 100-watt incandescent bulbs. Even though their manufacture and import was banned in January 2012, a dwindling but still sizable number of these bulbs remained on store shelves throughout 2012, well after their EISA phase out. Finally, the sixty-watt incandescent bulbs fill 22 percent of all sockets in Massachusetts homes, making it the most popular bulb in homes. Therefore, the full impact of EISA will not be understood on the lighting market—including on consumer lighting purchases and stockpiling behavior—until after the January 2014 phase-out of this bulb. This study is discussed in more detail in Appendix C, Study 8.

Table III.A summarizes the EM&V studies that have not been included in previous Annual Reports. Please note: studies 19, 20, and 21 apply to gas 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	
Massachusetts Consumer Survey Results Winter-2012	App. C, Study 4	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 Lighting Shelf Survey and Pricing Analysis	App. C, Study 5	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Lighting Retailer, Supplier Perspectives on the Massachusetts ENERGY STAR Lighting Program	App. C, Study 6	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	
Massachusetts ENERGY STAR® Lighting Program: Early Impacts of EISA	App. C, Study 8	Study not submitted for approval	
Residential Pilot Studies			

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)
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
Residential Lighting Controls Initiative Evaluation	App. C, Study 10	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
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
Impact Evaluation of 2011-2012 Prescriptive VSDs	App. C, Study 13	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 2010 Prescriptive Lighting Installations	App. C, Study 14	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 Refrigeration, Motor and Other Installations	App. C, Study 15	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100 through D.P.U. 12-111	
Process Evaluation of the 2012 Bright Opportunities Program	App. C, Study 16	Study was approved in January 2013 with the 2013-2015 Three-Year Plan, D.P.U. 12-100	

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)
		through D.P.U. 12-111	
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	
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	
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	All Studies are implemented as planned
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 ≥96%	0.31	0.08	0.77
Boilers, Overall	0.31		0.77
Furnaces, AFUE ≥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 ≥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 ≥ 0.67	0.13	0.13	1.00
Tankless Water Heaters, Energy Factor ≤ 0.94	0.37	0.26	0.89
Tankless Water Heaters, Energy Factor ≥ 0.95	0.28		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.

4. Massachusetts Consumer Survey Results Winter-2012

Type of Study: Market Assessment

Evaluation Conducted by: NMR Group

Date Evaluation Completed: 5/30/2013

Evaluation Objective and High Level Findings: This consumer survey was performed in December 2012 and January 2013 with the objective of tracking key lighting market indicators and understanding likely and actual consumer responses to the increased lighting efficiency standards mandated by the Energy Independence and Security Act of 2007 (EISA).

Key findings include the following:

Conclusion 1: Customer satisfaction with CFLs remains steady, with roughly one-half of respondents being “very satisfied” with the bulbs, and three out of four being “very or somewhat” satisfied. A persistent concern with CFLs in Winter 2012 relates to their mercury content and disposal issues.

Conclusion 2: The study results show that those households using many CFLs (experts) demonstrated a high level of lighting “savvy” compared to those households using few or none of the bulbs (novices).

Conclusion 3: Consumers seem to like the idea of LED bulbs but remain concerned about the high price point. Consumers seem particularly optimistic about the LED’s lack of mercury and better dimming performance compared to CFLs.

Conclusion 4: No bulb stands out as the likely “standard” replacement to the incandescent being phased out by EISA, but consumers tended to prefer a “higher wattage” incandescent for replacement of 75 Watt incandescents over other bulb types.

Conclusion 5: Consumers remain relatively unaware of A-line CFLs.

Conclusion 6: About one-fifth of consumers say they would consider stockpiling bulbs, but only 9% admit to stockpiling 100 Watt incandescents in 2012.

Conclusion 7: Consumers are becoming more familiar with the term “lumens” and understand that it means light output or brightness, but they still buy bulbs based on wattage or wattage equivalence.

Programs to which the Results of the Study Apply:

- Residential ENERGY STAR® Lighting (Electric)

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: The evaluators suggest continued tracking of CFL satisfaction throughout future consumer surveys in order to see if satisfaction remains stable in the post-EISA period, when CFLs will face serious competition from less efficient screw-in halogen bulbs and very efficient and long-lasting screw-in LED bulbs.

Recommendation 2: Despite evidence that some consumers are having difficulties finding 100-Watt incandescent bulbs on store shelves, one-half of shoppers for these bulbs were able to buy them. Therefore, if they are not already doing so, when developing energy and demand savings assumptions post-EISA, the PAs should consider assuming that the former “baseline” incandescent bulbs will remain available for at least one year and not adjust their delta Watts to account for lower energy use of halogens or other bulb types until after that year.

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.

Savings Impact: There are no savings impacts.

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

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: The study relied on a telephone survey of randomly selected customers of each program administrator in Massachusetts. The evaluators surveyed a total of 600 customers. The study used the Statistical Package for Social Sciences (SPSS) to analyze the data, yielding descriptive statistics to summarize survey responses.

A copy of the complete study can be found in Appendix C, Study 4.

5. Residential Lighting Shelf Survey and Pricing Analysis

Type of Study: Market Assessment

Evaluation Conducted by: NMR Group

Date Evaluation Completed: 6/8/2013

Evaluation Objective and High Level Findings: This evaluation involved the performance of a light bulb shelf-stocking survey and a hedonic pricing regression analysis. The results of the shelf-stocking survey demonstrated that participating stores carry a greater proportion of energy-efficient CFLs and LEDs over incandescent or halogen bulbs. Moreover, the proportion of shelf space devoted to energy-efficient bulbs has increased in partner stores since 2010. Program incentives serve to reduce the price of specialty and standard CFLs by about \$1.00 to \$2.00, but there is evidence that the program partners are not passing along the full incentive to consumers. The report suggests supplementary approaches for estimating the impact of the program on in-store prices that could be implemented early in the next evaluation cycle.

Programs to which the Results of the Study Apply:

- Residential ENERGY STAR® Lighting (Electric)

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

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

Savings Impact: There are no savings impacts.

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

Application of Results: Prospectively

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 5.

6. **Retailer, Supplier Perspectives on the Massachusetts ENERGY STAR Lighting Program**

Type of Study: Technology Evaluation

Evaluation Conducted by: NMR Group

Date Evaluation Completed: 6/12/2013

Evaluation Objective and High Level Findings: The objective of this study was to perform in-depth interviews with lighting manufacturers and high-level buyers and conduct surveys with store managers in order to understand their perceptions of the current impacts of EISA on the lighting market as well as to explore the perspectives on the growing LED market and program impacts on the lighting market.

Major conclusions of this extensive research effort included the following, but additional important findings can be found in the full report:

- **Impacts of EISA of Bulb Stocking and Sales:** Participating suppliers and store managers generally believed that their stocking and sales of CFLs and LEDs had increased since EISA while those of incandescent bulbs had decreased. Most also thought that the stocking and sales of halogen bulbs had remained about the same.
- **Stockpiling of Incandescent Bulbs:** The suppliers did not all agree on whether stockpiling was a concern. Only 107 of the 240 store managers thought EISA had changed consumers' bulb purchasing habits and, of these 107, just 22% noted stockpiling behavior among these habits. Suppliers who had noted stockpiling argued that both consumers and retailers exhibited the behavior and that it applied more to 60-Watt bulbs than to 75-Watt or 100-Watt.
- **Concerns about Halogen Market Share:** Suppliers believed that the removal of program supports for CFLs and LEDs would increase the likelihood that consumers would choose halogen bulbs instead of CFLs and LEDs to replace incandescent bulbs. They even feared that some consumers may backslide from CFLs and LEDs to halogens, as halogens are being promoted as "energy efficient."
- **Sales of LED bulbs:** Over one-half of store managers said they sold LEDs bulbs (although some may have sold non-ENERGY STAR® models), with A-line, spot/reflectors, and nightlights being the most commonly sold styles. About one-half of the managers characterized LED sales as either good or excellent. General purpose bulbs tended to be the best sellers.
- **Barriers to LED sales:** Both stores that currently carry and those that have decided not to carry LEDs cite the high price of the bulbs as the greatest barriers to increased sales. However, they also remained optimistic about future LED sales based on the expectation that prices would continue to fall and the technology would continue to improve.

Programs to which the Results of the Study Apply:

- Residential ENERGY STAR® Lighting (Electric)

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.

Savings Impact: There are no savings impacts.

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

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: Although there are no recommendation conclusions, the study relied on ten in-depth interviews with lighting manufacturers and high-level retail buyers as well as telephone surveys with 240 participating store managers. Interviewees and survey respondents were asked questions about the lighting market, their experience with the program, changing lighting technology, and their estimation of the impacts of EISA.

A copy of the complete study can be found in Appendix C, Study 6.

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 incandescents 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.

8. Massachusetts ENERGY STAR® Lighting Program: Early Impacts of EISA

Type of Study: Technology Evaluation

Evaluation Conducted by: NMR Group

Date Evaluation Completed: 6/12/2013

Evaluation Objective and High Level Findings: The objective of this study was to identify what the results from the four lighting evaluation tasks reported separately (consumer survey, onsite saturation, shelf-stocking survey, and supplier interviews) tell us about the effects of the first full-year of implementation of the increased lighting efficiency standards mandated by the Energy Independence and Security Act (EISA) on the Massachusetts residential lighting market. The key conclusions of the study include the following:

- **Awareness of EISA:** Fewer than one-half of consumers were aware of the increased lighting efficiency standards mandated by EISA; about two-third of program participating store managers were aware of EISA.
- **Bulb Availability:** Consumers and suppliers report—and the shelf-stocking survey confirms—an increased availability of CFLs and LEDs on store shelves. At the same time, the availability of filament incandescent bulbs has decreased. The various results did not provide clarity on how EISA has changed the availability of A-line halogen incandescent bulbs, but it is most likely that it has also increased. Even though their manufacture and import was banned in January 2012, a dwindling but still sizable number of 100-Watt incandescent bulbs remained on store shelves throughout 2012.
- **Bulb Purchase Behavior:** The onsite saturation study conducted in early 2013 did not show significant changes in the types of bulbs observed in Massachusetts household when compared to 2012. In general, the consumer survey and the supplier interviews point to increased purchases of CFLs and LEDs, decreased purchases of incandescents, and stable purchases of halogen bulbs.
- **Stockpiling of Incandescents:** The evaluators did not find evidence of widespread stockpiling of incandescent bulbs, but there were indications that some households—and retailers—had engaged in the behavior. The limited stockpiling that is occurring tends to be focused on 60-Watt incandescent bulbs and not on the already phased-out 75-Watt and 100-Watt incandescents.
- **Big Unknown – 60-Watt Incandescent Phase-out:** Sixty-Watt incandescent bulbs fill 22% of all sockets in Massachusetts homes, making this the most popular bulb in use in homes. Hence we will not be able fully to understand the effect of EISA on the lighting market—including on consumer lighting purchases and stockpiling behavior—until after the January 2014 phase-out of this bulb.

Programs to which the Results of the Study Apply:

- Residential ENERGY STAR Lighting (Electric)
- Residential New Construction and Major Renovation (Electric)
- Residential Mass Save (Home Energy Services) (Electric)
- Multifamily Retrofit (Electric)
- Low-Income Residential New Construction and Major Renovation (Electric)
- Low-Income 1-4 Family Retrofit (Electric)
- Low-Income Multifamily Retrofit (Electric)

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.

These recommendations are in addition to the ones submitted in individual task reports.

Recommendation 1: The PAs should track the lighting markets in select comparison areas with varying levels and models of residential lighting programs.

Recommendation 2: The PAs should continue rebates for standard CFLs and LEDs at least through 2015 (one year after 40- and 60-Watt incandescent phase-out) in order to keep more energy-efficient bulbs on shelves and prevent backsliding of the market to halogen incandescents.

Recommendation 3: The PAs should continue efforts to educate consumers about new lighting terminology such as lumens and light temperature, how to select the best bulb, and the variety of highly energy-efficient light bulbs available to meet residential lighting needs.

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 have, however, committed to increase education efforts to improve consumer education, as stated in their approved Three Year Plan.

Savings Impact: There are no savings impacts

Formulas Used in Impact Analysis: There are no savings impacts

Application of Results: Prospectively

How the Study Came to the Recommended Conclusions: The evaluators performed telephone surveys, in-home onsite lighting inventories, in-store shelf-stocking studies, and in-depth interviews and surveys with suppliers to arrive at these conclusions. More detail on each of these methods can be found in their individual report templates.

A copy of the complete study can be found in Appendix C, Study 8.

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.

10. Residential Lighting Controls Initiative Evaluation

Type of Study: Process Evaluation

Evaluation Conducted by: The Cadmus Group, Inc.

Date Evaluation Completed: 6/5/2013

Evaluation Objective and High Level Findings: This evaluation was performed between August 2012 and May 2013. The objectives of the evaluation were to analyze the energy-saving potential of replacing traditional dimming switches with advanced dimming controls and to investigate the compatibility of those controls with efficient bulb technologies. Key conclusions included:

Conclusion 1: The compatibility of dimming controls and LEDs was an issue. Participants, implementation staff, and program managers all noted difficulties finding working combinations of dimmers and bulbs.

Conclusion 2: Survey and metering data revealed that some participants operated their lights more after installation of the new dimmers and bulbs; however, savings still resulted since savings were largely driven by the lamp replacement.

Conclusion 3: In order for an impact evaluation of lighting use with dimmer replacements to be successful, it is important to have detailed tracking of implementation activities, including an equipment inventory with product specifications; a time-stamped contact log of all customer interactions; and a dated tracking matrix showing what equipment was replaced or adjusted at each appointment.

Programs to which the Results of the Study Apply:

- N/A (Study results not applied to any program)

Evaluation Recommendations and Program Administrator Response: Due to the inconclusive findings, the evaluation did not include formal recommendations.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study: There are no recommendations for the PA to adopt.

Savings Impact:

Savings Category	Total Verified Gross Impacts	Average Impact per Site
Demand Impacts	2.11 kW	0.26 kW
Energy Savings	1,987 kWh/yr	248 kWh/yr

Formulas Used in Impact Analysis: A combined approach of field data collection and laboratory testing was used to estimate energy and demand savings.

- **On-site inventory:** Pre- and post-installation information was collected for the fixtures and controls in each participant’s room or area of interest.
- **Pre- and post-metering:** Meters were deployed at participant sites prior to the installation of dimmer controls and bulbs. These loggers recorded illuminance levels from the lamps controlled by the dimmers for six to eight weeks before and after measure installation.
- **Lab testing of dimmer controls:** Laboratory testing was used to analyze the relationship between power and illuminance (lumens per square foot) and the dimmer switch settings.
- **Analysis:** The illuminance field data, the laboratory power data, and other supporting information were synthesized to analyze the energy impacts of the initiative. Operating hours for each group of bulbs attached to a lighting control were calculated, both at a gross, on-off level, as well as at each discrete dimmable level. Gross energy savings were calculated by aggregating metered hours of use at each dimmable level with the laboratory-tested energy used at that level. The reported demand impacts are the difference between the pre- and post-install maximum wattage values. Coincident peak demand impacts were not estimated or reported.

Application of Results: Results from the initiative will not be applied because results were inconclusive and because the initiative was not associated with an existing program.

How the Study Came to the Recommended Conclusions: The study included 16 participants who agreed to have their existing dimming controls and bulbs exchanged for new controls and LED bulbs through the initiative. Meters were installed on the affected controls and bulbs for six weeks before and after the installation of new measures. Data collected from these meters were mapped to laboratory testing data that triangulated illuminance, power, and dimmer position for each dimmer/bulb combination. Results from the mapping were used to calculate energy and demand savings.

A copy of the complete study can be found in Appendix C, Study 10.

- 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

Type of Study: Impact Evaluation

Evaluation Conducted by: The Cadmus Group, Inc. and Navigant

Date Evaluation Completed: 1/29/2013

Evaluation Objective and High Level Findings: The Cadmus Group and Navigant Consulting prepared this summary evaluation report. This summary evaluation report compares the results of two previously filed impact evaluations with a billing analysis conducted in 2012 for the C&I Small Retrofit program, and recommends the appropriate program impact factors for future years. The objectives from each evaluation were:

Non-Controls Lighting Evaluation for the Massachusetts Small Business Direct Install Program: Multi-Season Study. This study was conducted during 2010-2011 and filed with the 2011 annual report. The impact evaluation was conducted to provide independent estimates of annual energy savings and peak demand impacts for the retrofit installation of high-efficiency lighting fixtures through the C&I Small Retrofit programs. The impact evaluation focused on savings due to the equipment change only and does not include savings due to the installation of lighting controls.

The study showed a statewide combined energy realization rate (included HVAC interaction) of 102%, combined summer coincidence factor of 72%, and combined winter coincidence factor of 44% for non-controlled lighting fixture retrofit projects.

Small Business Direct Install Program: Pre/Post Lighting Controls Study. This study was conducted during 2011-2012 and filed with the 2013-2015 three year plan. The impact evaluation was conducted to provide independent estimates of annual energy savings and peak demand impacts for the retrofit installation of lighting control installations through the C&I Small Retrofit programs. The impact evaluation focused on savings due to the installation of lighting controls only and does not include savings due to the retrofit of associate lighting fixtures.

The study showed a statewide combined energy realization rate (included HVAC interaction) of 42%, combined summer coincidence factor of 17%, and combined winter coincidence factor of 11% for retrofit lighting occupancy sensor installations.

Billing Analysis. This study's goal was to assess the overall energy impact of all C&I Small Retrofit program projects, including non-lighting projects, implemented in 2010 and 2011.

The study found a statewide program energy realization rate of 66%. However, through internal consultation and further analysis, the evaluators concluded that the result was influenced by exogenous factors for which the study could not control, and that the true realization rate was higher than 66%.

The summary report recommended the program use the evaluation results based on the metering study results: statewide combined energy realization rate for lighting fixtures of 102% and

statewide combined energy realization rate for lighting controls of 42% (see Table below). For non-lighting measures, it was recommended to maintain existing evaluation results.

Programs to which the Results of the Study Apply:

- C&I Small Retrofit (Electric)

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

Note: The recommendations from the Multi-Season study were included in the evaluation summary for that report, filed with the 2011 annual report. This evaluation summary includes only the recommendations from the Pre/Post Lighting Controls Study and the Billing Analysis.

Recommendation 1: Based on the Pre- and Post-Installation Lighting Occupancy Sensor study: the wide-ranging patterns of pre-installation HOU, including some lighting systems that operated less frequently before the controls were installed, were a surprise to the PAs and the evaluators, and were only detected with pre-installation metering. For future evaluations of control-based efficiency measures, the PAs should continue to perform pre- and post-installation metering studies in order to capture the true impacts.

Recommendation 2: Based on the Billing Analysis: If the PAs are to continue using billing analysis as a method for estimating savings achieved by the SBDI Program, we strongly recommend that more detailed information be collected from program participants, particularly building occupancy and vacancy. If obtaining such data is not feasible, the evaluators recommends that the PAs consider only using billing analyses in cases where it is highly unlikely that any exogenous factors correlate with the implementation of energy conservation measures. In practice, billing analyses would likely only be appropriate in cases where participants are highly homogenous and have consistent patterns of consumption (e.g., all participant buildings are government offices).

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.

Future evaluations of the types described above may incorporate these recommendations, based on the types of customers being studied, uncertainty around existing equipment and operations, and the additional cost and time necessary to collect more detailed information.

Savings Impact: The evaluation results for lighting fixture installations are similar to previous evaluations, which have consistently verified energy and demand realization rates close to 100%. The summer and winter peak coincidence factors were also similar to previous years.

The evaluation results for lighting control installations are much lower than previously estimated, primarily due to findings regarding the pre-retrofit operating hours. However, these results had poor precision due to the variation in the site-level realization rates.

Formulas Used in Impact Analysis: Program adjusted gross impacts are calculated by applying the total combined energy and demand realization rates to the program gross energy and demand tracking estimates:

Adjusted gross energy impacts are calculated by applying the kWh Realization Rate (kWh_{RR}) and the HVAC electric interaction factor ($HVAC_{ELEC}$) to the tracking gross energy savings.

Summer and winter peak demand impacts are calculated by applying the connected demand realization rate (kW_{RR}), peak coincidence factor (CF_{SP} for summer, CF_{WP} for winter) and HVAC demand interaction factor ($HVAC_{SP}$ for summer, $HVAC_{WP}$ for winter) to the tracking connected kW savings

Application of Results:Retroactively

How the Study Came to the Recommended Conclusions: The billing analysis was conducted for all projects implemented in 2010 and 2011, using participant tracking and usage data provided by each PA and performing data screening and analysis methods to estimate the program realization rate for the statewide program, each measure category, and each PA.

During the analysis, the evaluators identified irregularities in the participant billing data and identified potential sources of bias in the results due to omitted variables. The team surmised that the most likely drivers of drivers of the unexpectedly low realization rates were (1) changes in economic activity, (2) changes in facility occupancy rates, and/or (3) changes in the program participant and/or project characteristics. The team determined that appropriate data to control for these effects were not available and would be difficult and expensive to research.

The team conducted additional research to explain the results and concluded that there was sufficient rationale to reject the results of the billing analysis. These findings included:

- (1) Evidence of increases in commercial vacancies in Massachusetts over the past four years, including the program years of interest for the evaluation,
- (2) Observed correlations between building vacancies and participation in commercial retrofit efficiency programs, based on contemporaneous research performed in California by the Cadmus Group, and
- (3) Demonstration that the absence of participant-specific details on vacancies (and thus not being able to control for it within the model) results in biased parameter estimates in this study.

Based on these findings and additional discussions with the Program Administrators and EEAC Consultants, the evaluators recommended rejecting the billing analysis results and maintaining the results of the metering studies.

A discussion of these findings and the final recommendation is documented in the memorandum “2012 Billing Analysis Findings and Recommendations,” dated October 24, 2012.

A copy of the complete study can be found in Appendix C, Study 12.

13. Prescriptive VSD Impact Evaluation

Type of Study: Impact Evaluation

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 5/9/2013

Evaluation Objective and High Level Findings: This report presents the results of the Impact Evaluation of Prescriptive Variable Speed Drives (VSD) conducted by DNV KEMA and DMI between 2011 and 2012. The objective of this impact evaluation is to begin to quantify how well prescriptive VSD installations are performing and to estimate the energy and demand savings resulting from a sample of (26) VSDs installed in Massachusetts between 2011 and 2012 using both pre- and post-installation metering. Data collected as part of this evaluation is intended to be used to help inform the savings factors used in future updated TRMs.

Key findings include the following:

- Annual kWh realization rate was 94% with a relative precision of +/- 23% at the 80% confidence interval.
- Failure to install controls or configure manual VSD speeds is the most common reason for a poor realization ratio.
- Automatic controls are required by the prescriptive VSD applications but are infrequently installed.
- VSD installations were observed to replace existing and failed VSDs and received incentives.
- A small number of motor types are miscategorized. For example, a swimming pool circulation pump was categorized as a hot water circulating pump.
- Manually set fixed VSD speeds are common. This results in constant post-retrofit power demand and very high summer demand reduction realization ratios.
- In some cases comparable energy savings could have been achieved through proper balancing and without a VSD installation. This approach would be less costly and achieve faster payback periods.
- The TRM assumes that hot water pumps will operate during summer months and chilled water pumps operate during winter months. In most cases, these seasonal motor types were shut down and did not operate during the off seasons.
- Summer kW reductions were significantly higher than predicted by the TRM due to the post-retrofit motor operating with manual controls at constant input kW.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation (Electric)

- C&I Large Retrofit (Electric)

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: Many VSDs are installed but never utilized. The motors were observed to operate at 60 Hz after the installation. Post-inspections should be performed to ensure that automatic controls are installed as required by the prescriptive applications.

Recommendation 2: VSD installation dates were found to vary significantly from installation of control sequences. In the majority of installations, the VSD was installed several weeks or months before any type of control sequence was implemented. During this period VSDs would typically operate at 60 Hz. The standard protocol for this evaluation was to await confirmation of the controls installation rather than encourage the installation by calling for updates. In some cases DMI installed kW meters for the pre-retrofit condition, but VSDs were never installed. It is recommended that a six-month follow-up is performed before the full incentive is paid so that proper operation can be confirmed.

Recommendation 3: Multiple instances were observed in which the VSD retrofit was replacing an existing drive. In all of these cases, the facility operator reported that the existing drives were failing and had operational issues. It appeared that these failing VSDs were approximately 15 years old or more. The prescriptive VSD application states that incentives are not available to VSDs replacing existing drives. Evaluated savings for two of these installations were found to be small or even zero based on metering data. It is recommended that a pre-inspection is done to identify whether or not an existing VSD is being replaced.

Recommendation 4: In at least one case energy savings resulted primarily due to proper balancing rather than VSD control of the motor. Prior to the VSD retrofit, a chilled water pump was providing an excess of water to end users and the motor was observed to operate at over 100% load. The VSD installation was used to essentially balance the chilled water flow. This resulted in significant energy savings, the majority of which could have been achieved simply through balancing and without installation of a VSD. It is recommended that a pre-inspection be done to identify cases in which a VSD might not be the most economical solution.

Recommendation 5: Even though the energy realization rate of 94% was good for a program like this, the individual metered VSD energy realization rates varied from -2% to 407%. The -2% case was the only one that was negative, but 15 drives had a realization rate less than 100%. The remaining 10 drives had a realization rate greater than 100%, and in most cases, they were significantly greater. It is recommended that this realization rate be applied to the TRM energy savings estimates as an immediate step.

Recommendation 6: The MA PAs and EEAC should also look to improve upon the motor level savings assumptions following the completion of the current Northeast Energy Efficiency Partnerships (NEEP) VSD Load Shape study expected to be completed in late

2013. This study includes post-installation metering on hundreds of drives, which would help to refine the TRM savings assumptions for certain motor, and possibly building types.

Recommendation 7: The TRM claims summer kW reductions for hot water pumps and winter kW reductions for chilled water pumps. In most cases, hot water pumps were observed to be shut down for the summer months and chilled water pumps shut down for winter months. It is not expected that this would apply to all of these motor types, but based on the sample observed in this evaluation, it appears that the TRM should be adjusted downwards. Currently, it appears that the TRM assumes 100% of these motors will operate during their off-seasons. It is recommended that the TRM be reviewed, and appropriate adjustments be made to ensure that demand savings are realistic for certain measure types. Consider near-zero summer kW reduction for hot water pumps and near-zero winter kW reduction for chilled water pumps

Recommendation 8: Summer On-Peak kW reductions in the TRM are generally very close to zero for motor types not related to heating. This seems to be a reasonable assumption for motors with automatic controls as it would be expected that an appropriately-sized motor would operate near full load on a design day; however, the evaluation observed significantly more motors with manual controls than expected, with the motors operating below full-load input kW. Since the TRM predicts near-zero summer kW reductions, this results in very high realization ratios. . It is recommended the PA's examine the TRM summer On-Peak kW reduction values for accuracy.

Recommendation 9: It is not recommended that the realization rates for demand savings from this study are applied to the TRM due to the poor precisions. However, we think that the observations noted above, plus the results of the aforementioned NEEP study, can be used together to improve upon the savings estimates in the TRM.

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: While the overall realization ratio is close to 100%, there is a significant variation at the motor level, and many motors are either close to 0% or much higher than 100%. Overall, the onsite savings were lower than the tracking estimates with a realization rate of 94%.

Formulas Used in Impact Analysis: A custom 8,760 hour spreadsheet model was used for each motor metered. Savings were typically developed using time-of-use trends, while very few were developed using outdoor air temperature trends depending on the operation of the motor and VSD.

Application of Results: Retrospectively

How the Study Came to the Recommended Conclusions: This study attempted to obtain pre and post installation metering on retrofit VSD installations. The recommended sample size of 44 drives was not achieved due to several issues involved in trying to obtain pre installation metering. The final sample size was 26 drives. Evaluators conducted pre and post metering on each of the 26 drives using true power meters. Savings were developed by comparing the

metered pre installation energy use and the metered post installation energy use, and annualized in an 8,760 hour spreadsheet model.

A copy of the complete study can be found in Appendix C, Study 13

14. Impact Evaluation of 2010 Prescriptive Lighting Installations

Type of Study: Impact Evaluation

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 6/21/2013

Evaluation Objective and High Level Findings: This document summarizes the work performed by DNV KEMA between 2011 and 2013 to quantify the actual energy and demand savings of 56 prescriptive lighting projects installed through the Massachusetts Energy Efficiency Program Administrator's (PAs) C&I New Construction & Major Renovation and C&I Large Retrofit programs in 2010. Note that this document presents the final results following 12 months of metering for the four prescriptive lighting categories of interest, systems, controls, Advanced Lighting Design and refrigerated LED case lighting.

The final study results, produced following 12 months of monitoring, will be used to determine the final realization rates for prescriptive lighting energy efficiency projects installed in the C&I New Construction & Major Renovation and C&I Large Retrofit programs in 2012. This report presents realization rates for gross energy savings and savings factors at the statewide level using 12 months of metered data collected from each site. These savings factors should be applied to future Technical Reference Manual (TRM) updates. Key findings include the following:

- Lighting systems energy kWh realization rate including HVAC interactive effects was 112.3% with a relative precision of +/-7.9% at the 90% confidence interval.
- Lighting controls energy kWh realization rate including HVAC interactive effects was 72.0% with a relative precision of +/-23.2% at the 90% confidence interval.
- Advanced Lighting Design energy kWh realization rate including HVAC interactive effects was 124.6% with a relative precision of +/-7.6% at the 90% confidence interval.
- Refrigerated LED case lighting systems energy kWh realization rate including HVAC interactive effects was 94.3% with a relative precision of +/-6.3% at the 90% confidence interval.
- A comparison of 3-month metering interim results vs. 12-month metering results showed that energy savings were generally over-estimated in the 3-month analysis. The comparison analysis also found that the most representative 3-month metering period occurred between September and November.

Programs to which the Results of the Study Apply:

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

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.

General Lighting:

Recommendation 1: For future lighting impact evaluations, three month data collection should be sufficient to estimate annual energy savings. It is recommended that the PAs consider monitoring for a minimum of three months. Also consider including a winter or summer month in that period if possible.

Lighting Systems:

Recommendation 2: It is recommended that the lighting systems component of the TRM be updated to reflect these new results.

Recommendation 3: It is recommended that the PAs continue to use site specific data when estimating lighting hours of use.

Lighting Controls:

Recommendation 4: Depending on the outcome of the current lighting controls market study, a pre/post metering lighting controls study may be needed in the future.

Recommendation 5: To help implementation and TA vendors and produce more reliable estimates of hours reduced, it is recommended that the PAs consider requiring pre-installation metering to establish an estimate of baseline hours.

Recommendation 6: Until a new pre/post lighting controls impact evaluation is done, it is recommended that the lighting controls component of the TRM be updated to reflect these new results.

Advanced Lighting Design:

Recommendation 7: It is recommended that for all Advanced Lighting Design projects, the PAs try to collect the final lighting as-built, which would be used to adjust the proposed connected kW savings.

Recommendation 8: It is recommended that the PAs and EEAC consider updating the TRM using these realization rates and savings factors.

Refrigerated LED Case Lighting:

Recommendation 9: This report recommends that the TRM be updated to utilize a refrigeration system efficiency of 1.9 kW/Ton. This value is based on a larger proportion of lower temperature freezer cases than cooler cases found in these applications.

Recommendation 10: It is recommended that in all future freezer/cooler case LED lighting applications, lighting controls be considered.

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: Results from this study will be applied to the gross energy and demand savings to produce net energy and demand savings adjusted for actual conditions found in the field such as technology, documentation, quantity, operation, interactive HVAC effects and coincidence with system the peak.

Formulas Used in Impact Analysis:

Summer Coincidence Factor = Summer Coincidence * Summer kW HVAC Interactive Effect Factor

Gross Adjusted Summer kW = Gross kW * Connected kW Realization Rate * Summer Coincidence Factor

Winter Coincidence Factor = Winter Coincidence * Winter kW HVAC Interactive Effect Factor

Gross Adjusted Winter kW = Gross kW * Connected kW Realization Rate * Winter Coincidence Factor

kWh Realization Rate = Connected kWh Realization Rate * Hours-of-Use Realization Rate * kWh HVAC Interactive Effect Factor

Gross Adjusted kWh = Gross kWh * kWh Realization Rate

Application of Results: Retrospectively

How the Study Came to the Recommended Conclusions: Data collection included 12 months of metering using mostly time-of-use lighting loggers. The sample was designed to achieve 90/10% precision for energy savings for each measure. The sample sizes were 34 lighting systems, 26 lighting controls, 10 advanced lighting design and 10 refrigerated LED lighting sites.

A copy of the complete study can be found in Appendix C, Study 14.

15. Impact Evaluation of 2011 Custom Refrigeration, Motor and Other Installations

Type of Study: Impact Evaluation
Evaluation Conducted by: DNV KEMA
Date Evaluation Completed: 6/18/2013

Evaluation Objective and High Level Findings: This document summarizes the work performed by DNV KEMA, DMI and SBW Consulting during 2012 and 2013 to quantify the actual energy and demand savings due to the installation of 48 custom refrigeration, motor and other (RMO) measures installed through the Massachusetts Energy Efficiency Program Administrator's (PAs) Commercial & Industrial (C&I) New Construction & Major Renovation and C&I Large Retrofit programs in 2011.

The objective of this impact evaluation is to provide verification or re-estimation of electric energy and demand savings estimates for 48 custom RMO projects installed in 2011 through site-specific inspection, monitoring, and analysis. The results of this study will be used to determine the final realization rates to be applied to custom RMO energy efficiency measures installed in the C&I New Construction & Major Renovation and C&I Large Retrofit programs in 2012. This evaluation report presents realization rates for gross energy savings for all PAs. It also provides realization rates for on-peak summer and winter demand savings for all PAs except for Western Massachusetts Electric (WMECo). For WMECo, realization rates for summer and winter seasonal peak savings are provided. For National Grid, realization rates for percent on-peak energy savings are also provided. Realization rates for each of these parameters are also provided at the statewide level.

Key findings include the following:

Custom Refrigeration:

Statewide energy kWh realization rate of 110.5% with a relative precision of +/-12.2% at 90% confidence.

National Grid energy kWh realization rate of 118.8% with a relative precision of +/-17.7% at 90% confidence.

NSTAR energy kWh realization rate of 112.7% with a relative precision of +/-5.7% at 90% confidence.

Cape Light Compact energy kWh realization rate of 75.0% with a relative precision of +/-73.2% at 90% confidence.

WMECo energy kWh realization rate of 65.8% with a relative precision of +/-18.3% at 90% confidence.

Custom Motor:

Statewide energy kWh realization rate of 91.4% with a relative precision of +/-3.7% at 90% confidence.

National Grid energy kWh realization rate of 88.5% with a relative precision of +/-4.8% at 90% confidence.

NSTAR energy kWh realization rate of 134.2% with a relative precision of +/-0.0% at 90% confidence.

WMECo energy kWh realization rate of 77.7% with a relative precision of +/-0.0% at 90% confidence.

Custom Other:

Statewide energy kWh realization rate of 61.4% with a relative precision of +/-1.9% at 90% confidence.

National Grid energy kWh realization rate of 31.0% with a relative precision of +/-4.3% at 90% confidence.

WMECo energy kWh realization rate of 270.7% with a relative precision of +/-0.0% at 90% confidence.

Programs to which the Results of the Study Apply:

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

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.

Statewide:

Recommendation 1: Make sure customers and TA vendors understand they need to be prepared to provide assistance if their project is selected for evaluation.

Recommendation 2: Ensure sufficient time is allowed for logging data for projects with seasonal variability.

Recommendation 3: All PAs should require more complete pre-retrofit or baseline documentation.

Recommendation 4: PAs should work together to require consistent methodologies and documentation for similar projects across different PAs.

Recommendation 5: Consider specifying documentation requirements for compressed air leak repairs.

Recommendation 6: Consider more of a whole system approach for grouping measures for evaluation.

Recommendation 7: Require TA vendors to provide metering for retrofit projects.

Recommendation 8: Consider specifying TA verification of savings via commissioning, and in some cases, pre/post metering for specific measures.

Cape Light Compact:

Recommendation 9: Perform closer review of large savings measures.

Recommendation 10: Include interactive refrigeration savings.

National Grid:

Recommendation 11: Require adequate savings documentation.

Recommendation 12: Verify proposed load assumptions as part of the final inspection of new construction projects.

Recommendation 13: Verify proposed item count assumptions as part of the final inspection.

Recommendation 14: Verify plant operating hours using whole building interval data.

Recommendation 15: Ensure consistent use of data throughout the calculations.

NSTAR:

Recommendation 16: Provide sufficient documentation for understanding the determination of measure savings.

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: Custom refrigeration savings were generally greater than tracking assumptions with a statewide realization rate of 110.5%. Custom motor savings were somewhat lower than tracking estimates with a statewide realization rate of 91.4%. Custom other had a low realization rate of 61.4% due to some underperforming sampled sites.

Formulas Used in Impact Analysis: Evaluated savings were developed using custom analysis methods which were similar to the methods to develop tracking estimates.

Application of Results: Retrospectively

How the Study Came to the Recommended Conclusions: Data collection included true power metering, amperage metering and time-of-use metering. In some cases, the evaluation relied on existing customer metering when necessary. The sample was designed to achieve 90/20% precision for energy savings for each measure and each PA. The sample sizes were 28 refrigeration sites, 13 motor sites, and 7 other sites.

A copy of the complete study can be found in Appendix C, Study 15.

16. Process Evaluation of the 2012 Bright Opportunities Program

Type of Study: Process Evaluation

Evaluation Conducted by: DNV KEMA

Date Evaluation Completed: 6/14/2013

Evaluation Objective and High Level Findings: The evaluation objectives included:

- Determining whether this program, which is brand-new, is appropriately designed;
- Determining whether the program is being delivered in an efficient/effective manner;
- Providing estimates of net-to-gross ratios for the program net of free-ridership; and
- Providing preliminary estimates of participant spillover for the program.

The high level findings included:

- The preponderance of the evidence indicates that the Bright Opportunities Program is a well-designed and well-run program. This evidence includes:
 - Generally high program satisfaction levels from end users and participating trade allies;
 - Lack of barriers to program participation (beyond unawareness of the program);
 - Generally high program net-to-gross ratios; and
 - Lack of significant complaints from program implementers.
- The recommended net-to-gross ratios for the lighting products discounted by the program were 82 percent for LED bulbs and 74 percent for linear fluorescent lamps. The evaluation calculated the participant spillover to be not statistically different from zero.

Programs to which the Results of the Study Apply:

- C&I New Construction and Major Renovation(Electric)

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: Do more marketing of the program, especially to end users.

Recommendation 2: Encourage participating trade allies to do more to educate their customers about the source and size of the buydown discounts.

Recommendation 3: Do more consumer education about the use of LED bulbs with dimmer switches.

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: The recommended net-to-gross ratios for the lighting products discounted by the program were 82 percent for LED bulbs and 74 percent for linear fluorescent lamps. The evaluation calculated the participant spillover to be not statistically different from zero.

Formulas Used in Impact Analysis:

Net Summer kW Savings = Gross Adjusted Summer kW * Net-to-Gross ratio

Net Winter kW Savings = Gross Adjusted Winter kW * Net-to-Gross ratio

Net kWh Savings = Gross Adjusted kWh * Net-to-Gross ratio

Application of Results: Retroactively

How the Study Came to the Recommended Conclusions: Data collection activities included:

- Conducting interviews with staff from the program and from Ecova, the main implementation contractor;
- Completing telephone surveys with 200 program participants; and
- Conducting in-depth interviews with 25 participating lighting distributors, 8 nonparticipating lighting distributors, and 25 participating lighting contractors.

A copy of the complete study can be found in Appendix C, Study 16.

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

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

20. Standard Boiler Research Plan and Interview Results Memo

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

21. Impact Evaluation of 2011 Custom Gas Installations

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

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 OPowerHER:

$$\text{Savings Estimate Ratio}_{u,c,f} = \frac{(\text{Estimated Modeled Savings}) = \sum_{i=0}^3 n * kWh Savings_{u,c,i,f}}{(\text{OPOWER Reported Savings}) = \sum_{i=0}^3 n * kWh Savings_{u,c,i,f}}$$

(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 Wooldidge (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:

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

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, 2011¹².

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.

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/	Noise Reduction	Annual	\$2.83	67%	\$1.90	35.4%	\$2.50

¹² 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%20Crosscutting%20NEIs%20Final%20Report%20081511.pdf)

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Percent ROF	Overall NEI Value (\$/Year)
	Heat Pump	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 Increase	One Time	\$29.17	50%	\$14.59		\$19.27
Hot Water	Storage	Home	Annual	\$2.13	33%	\$0.70	58.4%	\$1.30

Measure Category	Measure	NEI	Duration	Full NEI Value (\$/Year)	EE Portion of NEI	ROF NEI Value (\$/Year)	Percent ROF	Overall NEI Value (\$/Year)
System	Water Heater	Durability						
		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 Adjust-ment	Adjusted NEI Value (\$/Year)
Cooling System	Central Air Conditioner / Heat Pump	Thermal Comfort	Annual	\$3.92	100%	\$3.92		\$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		\$2.53
		Health Benefits		\$0.16		\$0.16		\$0.08
Heating System	Boilers between 90 and 96% AFUE	Thermal Comfort	Annual	\$48.63	100%	\$48.63		\$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		\$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		\$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		\$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 HEHE and Cool Smart evaluation,¹³ 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.

¹³ 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		

Table III.B: Evaluation Studies in Next Annual Report		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
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

Table III.B: Evaluation Studies in Next Annual Report		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
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

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 Renovation	48,563	3%	9,939	1%	(38,624)	-3%
Residential Cooling & Heating Equipment	48,563	2%	31,979	1%	(16,584)	-1%
Multi-Family Retrofit	48,563	1%	52,930	1%	4,367	0%
MassSAVE	48,563	0%	728,766	3%	680,203	3%
Behavior/Feedback Program	48,563	1%	146,764	4%	98,200	3%
ENERGY STAR Lighting	48,563	0%	119,934	1%	71,371	1%
ENERGY STAR Appliances	48,563	2%	115,096	3%	66,533	2%
Residential Education Program	295,000	26%	5,959	1%	(289,041)	-25%
Workforce Development	-	0%	268	0%	268	0%
Heat Loan Program	-	0%	713	0%	713	0%
R&D and Demonstration	48,563	17%	63,987	20%	15,424	3%
Deep Energy Retrofit	48,563	4%	7,165	1%	(41,398)	-3%
Behavior/Feedback Pilot	-	0%	-	0%	-	0%
Residential New Construction & Major Renovation - Major Renovation statewide pilot	53,288	20%	632	0%	(52,656)	-20%
Residential New Construction Multi Family (4-8 story) statewide pilot	53,806	18%	921	0%	(52,886)	-18%
Residential New Construction Lighting Design statewide pilot	49,013	71%	273	1%	(48,740)	-70%
Residential New Construction V3 Energy Star Homes statewide pilot	-	0%	-	0%	-	0%
Heat Pump Water Heater Pilot	-	0%	-	0%	-	0%
Residential Technical Development	-	0%	-	0%	-	0%
Hot Roofs	-	0%	-	0%	-	0%
Home Automation	-	0%	-	0%	-	0%
Community based Pilot	48,563	35%	2,232	3%	(46,331)	-31%
Statewide Marketing & Education	-	0%	0	0%	0	0%
EEAC Consultants	-	0%	-	0%	-	0%
DOER Assessment	244,162	100%	361,075	100%	116,913	0%
Sponsorships & Subscriptions	342,801	100%	108,374	100%	(234,427)	0%
Residential (Total)	1,523,701	2%	1,757,007	3%	233,306	1%
Low Income						
Low-Income Residential New Construction	48,563	14%	77,077	27%	28,514	13%
Low-Income Retrofit	97,126	0%	429,934	2%	332,808	2%
Statewide Marketing & Education	-	0%	0	0%	0	0%
Low-Income Energy Affordability Network Funding	551,481	100%	86,697	100%	(464,784)	0%
DOER Assessment	104,641	100%	154,747	100%	50,106	0%
Low Income (Total)	801,811	3%	748,454	4%	(53,357)	1%
Commercial & Industrial						
C&I New Construction and Major Renovation	454,030	1%	770,574	3%	316,544	2%
C&I Large Retrofit	412,500	1%	1,218,259	4%	805,759	3%
C&I Small Retrofit	412,500	2%	272,520	1%	(139,980)	0%
Community based Pilot	-	0%	-	0%	-	0%
C&I New Construction and Major Renovation - Government	-	0%	-	0%	-	0%
Large C&I Retrofit - Government	-	0%	-	0%	-	0%
C&I Small Retrofit - Government	-	0%	-	0%	-	0%
Statewide Marketing & Education	-	0%	0	0%	0	0%
EEAC Consultants	-	0%	-	0%	-	0%
DOER Assessment	524,337	100%	786,246	100%	261,909	0%
Sponsorships & Subscriptions	263,764	100%	103,443	95%	(160,322)	-5%
Commercial & Industrial (Total)	2,067,132	2%	3,151,043	4%	1,083,911	2%
GRAND TOTAL	4,392,644	2%	5,656,504	3%	1,263,860	1%

The change from Planned to Actual percent of Total Program Costs was calculated as the difference of the other two percentages in the table above. The same calculation was performed

at the sector level. No sector showed avariance greater than ten percent between planned and actual Program, Planning & Administration costs as a percent of total program costs.

C. Competitive Procurement

As shown in the right hand column in Table IV.B, "Total Activities," overall spending on combined PP&A, sales, technical assistance, and training, evaluation and marketing services were less than planned in each sector in 2012. The Company was able to perform these services and deliver energy savings while spending less than budgeted amounts. The difference from planned to actual spending on Total Outsource Activities and Total In House Activities generally tracked the difference in the spending on Total Activities for the same reason.

Table IV.B: Outsourced & Competitively Procured Services									
Customer Sector	In-House Activities		Outsourced Activities						TOTAL Activities
			Competitively Procured		Non-Competitively Procured		Total Outsourced Activities		
	\$	% of Total Activities	\$	% of Total Outsource	\$	% of Total Outsource	\$	% of Total Activities	\$
Residential									
Planned	1,629,740	8%	13,600,680	70%	5,818,451	30%	19,419,131	92%	21,048,871
Actual	688,734	3%	9,257,744	47%	10,452,096	53%	19,709,840	97%	20,398,574
% Difference from Planned to Actual	-58%	-4%	-32%	-23%	80%	23%	1%	4%	-3%
Low-Income									
Planned	1,106,474	16%	0	0%	6,013,442	100%	6,013,442	84%	7,119,916
Actual	118,024	3%	649,946	15%	3,671,384	85%	4,321,330	97%	4,439,354
% Difference from Planned to Actual	-89%	-13%	0%	15%	-39%	-15%	-28%	13%	-38%
Commercial & Industrial									
Planned	8,798,784	40%	1,157,120	9%	11,804,212	91%	12,961,333	60%	21,760,116
Actual	4,371,751	29%	4,260,895	40%	6,382,017	60%	10,642,913	71%	15,014,663
% Difference from Planned to Actual	-50%	-11%	268%	31%	-46%	-31%	-18%	11%	-31%
TOTAL									
Planned	11,534,998	23%	14,757,800	38%	23,636,106	62%	38,393,906	77%	49,928,904
Actual	5,178,509	13%	14,168,586	41%	20,505,497	59%	34,674,083	87%	39,852,592
% Difference from Planned to Actual	-55%	-10%	-4%	2%	-13%	-2%	-10%	10%	-20%

D. Low-Income Spending

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

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	Value	% Change
Residential	\$ 71,250,873	33%	\$ 65,331,072	40%	\$ (5,919,801)	7%
Low-Income	\$ 24,804,450	11%	\$ 18,927,211	12%	\$ (5,877,239)	0%
Commercial & Industrial	\$ 121,459,507	56%	\$ 78,825,202	48%	\$ (42,634,305)	-8%
TOTAL	\$ 217,514,830	100%	\$ 163,083,485	100%	\$ (54,431,345)	0%

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 VII: Performance Incentives Summary				
Incentive Components	Threshold	Design	Exemplary	Actual Incentive
Savings Mechanism	\$ 4,327,983	\$ 5,770,644	\$ 7,213,304	\$ 5,128,023
Value Mechanism	\$ 2,773,055	\$ 3,697,407	\$ 4,621,758	\$ 3,572,839
Performance Metrics	\$ 1,029,992	\$ 1,373,322	\$ 1,716,653	\$ 1,147,225
Total Incentive (before-tax)	\$ 8,131,029	\$ 10,841,373	\$ 13,551,716	\$ 9,848,087
Total Incentive (after-tax)	\$ 4,941,633	\$ 6,588,844	\$ 8,236,055	\$ 5,985,175

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 Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, D.P.U. 11-108 (“2012 MTM”). The Company earned \$9,768,348 in actual before-tax incentives, which is 90% of design level. The tax rate used to calculate the after-tax total incentive is 0.39225.

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. The Company applied the 25 percent EM&V impact bandwidth to the savings and/or value mechanisms, as shown on Attachment D-1.

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 and taking into account the 25 percent EM&V impact bandwidth. The Company achieved 88% of its planned benefits and 96% 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 (subject to the +/- 25 percent impact bandwidth), the Company calculated the lifetime benefits and net benefits that each program achieved. The benefits were multiplied by the savings payout rate of \$0.006638419 and the net benefits were multiplied by the value payout rate of \$0.0064295 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 at Appendix D, Section 3.

2012 SUMMARY OF PERFORMANCE METRIC ACHIEVEMENT

The chart below summarizes the Company’s achievement level for each performance metric in 2012. Supporting documentation for each metric follows this summary page.

Residential Metric Number And Name	Achievement Level	Notes
1. Mass Save/Weatherization: Deeper Savings {Electric & Gas} – Statewide	Design (100% of design)	2012 Conversion Rate = 37%
2. Mass Save/Weatherization: Lost Opportunity/ Market Opportunity {Electric & Gas} – Statewide	Exemplary (125% of design)	See Supporting Documentation
Low-Income Metric Number And Name	Achievement Level	Notes
1. Best Practices Program Strategies Research & Technical Review of Potential New Measures {Electric & Gas} – Statewide	Exemplary (125% of design)	See Supporting Documentation
2. Multi-family Building Inventory Electric & Gas} – Statewide	Exemplary (125% of design)	See Supporting Documentation
Commercial & Industrial Metric Number And Name	Achievement Level	Notes
C&I #1 Retrofit -- Depth of savings	Did not meet threshold	X=18, Y=110% (threshold) X*Y=20
C&I #2 New Construction -- Comprehensiveness and depth of savings	Did not meet threshold	X=32%, Y=110% (threshold) X*Y=35%
C&I #3 Direct Install Electric and Gas Integration	Did not meet threshold	X=15%, Z=110% (threshold) X*Z=17%
C&I #4 Combined Heat & Power	Did not meet threshold	X=17, Y=110% (threshold) X*Y=19
Other Funding Metric Number And Name	Achievement Level	Notes
1. “Other financing capital” metric	Exemplary (125%)	2012 loans issued = \$26,229,368
2. Cost Efficiency of Program Expenditures	Design (117% of design)	4.89

Please see Appendix D, Section 3

VI. AUDITS

Other than the National Grid Audit Report No.0223 and National Grid Audit Report 0338 filed with the Company's 2010 Electric Energy Efficiency Annual Report, there were no other audits performed.

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.