Cape Light Compact

Annual Report on Energy Efficiency Activities in 2011

Submitted to the
Massachusetts Department of Public Utilities
and the Massachusetts Department of Energy Resources

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I. INTRODUCTION

In the second full year of the three-year energy efficiency plans, as reviewed and approved by the Department of Public Utilities (the "Department") in D.P.U. 09-116 through 09-127 (the "Gas and Electric Orders"), program year 2011 continued to build on the successes of program year 2010 and showed remarkable success with respect to goal attainment and achievement of real benefits for the environment and the economy in the Commonwealth of Massachusetts. Among the many awards and accomplishments achieved during program year 2011, the American Council for an Energy-Efficient Economy ranked Massachusetts number one in the nation for its energy efficiency efforts. Collectively, the Program Administrators ("PAs") were able to deliver on their goals during program year 2011, as established in the Gas and Electric Orders and as submitted in each PA's 2011 Mid-Term Modifications filed on October 29, 2010, while maintaining the balance between meeting the budget for their programs and complying with the directives of the Green Communities Act in ensuring that they make available all cost-effective energy efficiency opportunities.

Overall, the PAs worked diligently with the Department, the Department of Energy Resources ("DOER"), the Energy Efficiency Advisory Council ("EEAC"), and other interested stakeholders to meet what were intentionally designed to be very challenging 2011 program year goals. In many cases, achievements in savings and benefits exceeded those goals. Program year 2011 performance showed that aggressive savings levels were achieved for Residential, Low-Income, and Commercial & Industrial ("C&I") programs. PAs worked well to implement the programs in the field while also continuing the unprecedented ramp up of spending and savings levels for energy efficiency programs so as to meet goals not just for program year 2011, but for the full life of the three-year plans.

The accomplishments of 2011 were achieved despite a struggling economy, a stagnant new construction market, historically low natural gas prices and a significant increase in savings goals. In the wake of challenges, including record setting weather events, the PAs continued to proactively work toward developing new delivery techniques to reach untouched customer sets and to convince customers to move forward with commitments to invest in energy efficiency.

In addition to the achievements for each PA's program implementation efforts, the PAs have made significant progress integrating gas and electric energy efficiency services, and remain committed to furthering progress in both the residential and non-residential sectors. While working to achieve their programmatic goals for 2011, the PAs have worked diligently to establish statewide marketing of energy efficiency program offerings through the use of the Mass Save® label, which won the Association of Energy Services Professionals ("AESP") Outstanding Achievement in Marketing and Communications Award in 2011. Simultaneously, the PAs have engaged in 30 studies across a wide span of program sectors to ensure that the evaluation, measurement and verification ("EM&V") elements of these program offerings remain a critical and vital tool to evaluate and transform measures in the future to meet demand in an ever changing marketplace. The PAs have worked diligently with financial institutions to explore outside financing options to better serve their C&I customers.

The PAs have continued to be engaged in the monthly EEAC process in 2011, and have worked collaboratively with the EEAC's consultants to meet stringent reporting and data collection deadlines so as to adequately monitor and review where the Plans' efforts have succeeded, and where improvement could be anticipated for the future. In all, while actively involved in program implementation efforts, the PAs have also been heavily immersed in the policy and planning that will allow for accurate data development, evaluation and measurement of successes and areas in need of modification, transparent codes and standards, and the framework necessary to ensure the ability to continue to offer successful and sustainable energy efficiency programs in the Commonwealth.

Given the unprecedented nature of these efforts and the significantly ambitious goals established in these Plans, the PAs contend that the 2011 program year performance has been an unmitigated success and has continued to exceed the expectations established by the Plan. The PAs continue their endeavors to achieve deeper savings from participating customers, and have worked to reach a broader range of customers for the implementation of all cost-effective program offerings.

A. Purpose of Annual Report

The Cape Light Compact is pleased to provide its Energy Efficiency Annual Report ("Annual Report") for 2011. The purpose of the Annual Report is to:

- Provide a comparison of the Cape Light Compact'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 significant variances between the Cape Light Compact'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 Cape Light Compact's proposed modifications to program implementation, if any, during upcoming years.
- Describe the EM&V activities undertaken by the Cape Light Compact (both individually and jointly with other Program Administrators ("PAs")) 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 Program Administrators propose to collect.[1]

B. Organization of Annual Report

The Cape Light Compact's 2011 Annual Report is organized as follows:

- Section I.C provides summary information on program performance at the portfolio and sector levels.

1 Since the Cape Light Compact, as a public entity and municipal aggregator, does not collect any performance incentives, this section of the Annual Report is not applicable to the Cape Light Compact.

- 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 PA proposes to collect.
- Section VI addresses audits conducted during the past 5 program years.
- Section VII provides detailed supporting documentation.

C. Summary of Program Portfolio

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

In 2011, the Cape Light Compact invested 25% more funds toward energy efficiency programs and services in our communities than in the 2010 program year. Since the passage of the Green Communities Act, and implementation of all available cost-effective efficiency opportunities, the Compact expenditures have increased from approximately $5 million annually to over $16 million – this more than tripling of investments in energy efficiency represents the Towns and Counties continued commitment to serving our customers.

The Cape Light Compact highlights just a few of the many accomplishments in this second year 2011 of its three-year, 2010-2012, energy efficiency plan:

- Achieved a 82% increase in total TRC benefits with only a 29% increase in TRC costs, and yielding a 116% increase in net benefits as compared to 2010;
- Continued expansion of Commercial & Industrial Program implementation throughout Barnstable County by continuing to identify and manage projects funded by both the U.S. Department of Energy's Energy Efficiency Conservation Block Grant and the U.S. Department of Agriculture Grant;
- Celebrated the 2011 NEEP Business Leaders Award for Cape Air, the largest regional airline in the U.S. Also celebrated Seacrest Resort with a Mass Saver award for its extensive effort to increase the business' efficiency through participation in Cape Light Compact C&I Programs; and,
- Received, along with other regional PAs, the 2011 ENERGY STAR® Award for Sustained Excellence, 2011 ENERGY STAR® for Homes Leadership in Housing Award, and the 2011 Outstanding Achievement in Marketing and Communications Award from the Association of Energy Services Professionals.

Tables[2] I.A and I.B provide summary information on program performance at the portfolio and customer sector levels, respectively.

2 The Cape Light Compact is also providing the Department of Public Utilities 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.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	$	$ 24,899,683			$ 16,908,160		-32%
Performance Incentive	$	$ -			$ -		0%
Savings and Benefits							
Energy							
Lifetime	MWh	427,440	259,140	-39%	262,352	1%	-39%
Annualized	MWh	39,225	25,465	-35%	25,198	-1%	-36%
Demand							
Lifetime	kW	125,034	48,488	-61%	41,940	-14%	-66%
Annualized							
Summer	kW	8,962	4,140	-54%	3,749	-9%	-58%
Winter	kW	6,822	4,149	-39%	4,308	4%	-37%
NEB (Lifetime)	$	$ 37,146,350	$ 20,366,013	-45%	$ 34,042,288	67%	-8%
Cost-Effectiveness							
TRC Benefits	$	$ 101,463,125			$ 69,262,085		-32%
TRC Costs	$	$ 28,835,527			$ 19,357,560		-33%
Net Benefits	$	$ 72,627,598			$ 49,904,525		-31%
BCR		3.5			3.6		2%

The Planned Values in Table I.A and all subsequent tables that contain Planned Values in this Annual Report (except as otherwise noted) are based upon the Planned Values as contained in Attachment A to the Memorandum of Agreement, submitted to the Department on April 15, 2012 in Cape Light Compact, D.P.U. 10-146.

As shown in Table 1.A above, significant[3] variances exist at the portfolio level for:

- All metrics between planned and preliminary values,
- Most metrics between planned and evaluated values, with the exception of Lifetime NEBs and BCR, and
- Lifetime NEBs between preliminary and evaluated values.

Each sector contributed to these variances as follows:

- Residential (for Lifetime Energy, Annualized Energy, Lifetime Demand, Summer Demand, Winter Demand, TRC Benefits, TRC Costs, and Net Benefits): Please reference section II.A.1 for a more detailed discussion of the cause of the variances for this sector.
- Low-Income (for Lifetime Energy, Annual Energy, Lifetime Demand, Summer Demand, Winter Demand, NEB (Lifetime), TRC Benefits, Net Benefits and BCR): Please reference section II.B.1 for a more detailed discussion of the cause of the variances for this sector.
- C&I (for Total Program Costs, Lifetime Energy, Annual Energy, Lifetime Demand, Summer Demand, Winter Demand, NEB (Lifetime), TRC Benefits, TRC Costs, and Net

3 Unless otherwise noted, "significant" variances are defined throughout this Annual Report as variances of +/-20% or more between the stated values at the program, sector or portfolio level.

Benefits): Please reference section II.C.1 for a more detailed discussion of the cause of the variances for this sector.

Table I.B
Customer Sector Summary

Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential				
TRC Benefits	$	$ 57,600,761	$ 43,051,507	-25%
TRC Costs	$	$ 14,802,121	$ 11,206,807	-24%
Net Benefits	$	$ 42,798,641	$ 31,844,700	-26%
BCR		3.9	3.8	-1%
Low-Income				
TRC Benefits	$	$ 10,098,012	$ 6,529,481	-35%
TRC Costs	$	$ 2,854,275	$ 2,489,571	-13%
Net Benefits	$	$ 7,243,737	$ 4,039,910	-44%
BCR		3.5	2.6	-26%
Commercial & Industrial				
TRC Benefits	$	$ 33,764,352	$ 19,681,097	-42%
TRC Costs	$	$ 11,179,131	$ 5,661,182	-49%
Net Benefits	$	$ 22,585,221	$ 14,019,915	-38%
BCR		3.0	3.5	15%
Total				
TRC Benefits	$	$ 101,463,125	$ 69,262,085	-32%
TRC Costs	$	$ 28,835,527	$ 19,357,560	-33%
Net Benefits	$	$ 72,627,598	$ 49,904,525	-31%
BCR		3.5	3.6	2%

As shown in Table 1.B above, significant variances exist at the sector level between planned and evaluated values for Residential TRC Benefits, TRC Costs, and Net Benefits; Low-Income TRC Benefits, Net Benefits, and BCR; and C&I TRC Benefits, TRC Costs, and Net Benefits.

- Within the Residential sector, the Residential New Construction & Major Reovation, Residential Cooling & Heating Equipment, Multi-Family Retrofit, Mass Save, ENERGY STAR® Lighting and ENERGY STAR® Appliance programs are contributing to the variance between planned and evaluated values. Please reference section II.A.2 for a more detailed discussion of the cause of the variances by program within this sector.
- Within the Low-Income sector, the Low-Income Residential New Construction, Low-Income 1 to 4 Family Retrofit and Low-Income Multi-Family Retrofit programs are contributing to the variance between planned and evaluated values. Please reference

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

- Within the C&I sector, the C&I New Construction and Major Renovation, C&I Large Retrofit and C&I Small Retrofit programs are contributing to the variance between planned and evaluated values. Please reference section II.C.2 for a more detailed discussion of the cause of the variances by program within this sector.

II. PROGRAM PERFORMANCE

The purpose of this section is to provide detailed information on program performance at the sector and program levels for the Residential, Low-Income, and C&I sectors.

A. Residential Sector Programs

1. Summary

During 2011, the Cape Light Compact implemented the following Residential programs and Residential pilots:

Residential Programs (Statewide)

- Residential New Construction & Major Renovation
- Residential Cooling & Heating Equipment
- Multi-Family Retrofit
- Mass Save
- ENERGY STAR® Lighting
- ENERGY STAR® Appliances

Residential Pilots (Statewide)

- Deep Energy Retrofit
- Residential New Construction & Major Renovation - Major Renovation Statewide Pilot
- Residential New Construction - Multi-Family (4-8 story) Statewide Pilot[4]
- Residential New Construction - Lighting Design Statewide Pilot

Residential Pilots (Non-Statewide & Cape Light Compact-Specific)

- Heat Pump Water Heating Pilot (Non-Statewide)
- Power Monitor Pilot (Cape Light Compact-Specific)

2. Residential Sector Performance Highlights

During 2011, the Cape Light Compact built upon existing residential programs and significantly expanded initiatives to increase participation in all residential programs. Selected highlights are presented below:

4 Though the Cape Light Compact supports this statewide pilot, Cape Light Compact does not have enough Multi-Family (4 to 8-story) homes in its service territory to be able to participate in this pilot.

- Residential New Construction and Major Renovation - In 2011, with over 100 communities adopting the Stretch Energy Code, this program, also known as the Massachusetts New Homes with ENERGY STAR program, faced a market in which energy codes continued to change. Single family development remained slow, and opportunities to capture future energy savings were becoming increasingly difficult. To address these barriers, the program engaged in code support activities and offered technical assistance as well as incentives to meet this new code. The program also increased market penetration while providing energy savings for residents. During 2011, the program provided multiple trainings and participated in several recruitment events targeted at builders and allies new to performance-based construction. The program 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. Finally, the Program Administrators in western Massachusetts participated in the *Western Massachusetts Storm Recovery Program*. The storm recovery program contacted all of the communities affected by the tornado and distributed thousands of flyers to builders, building code offices, homeowners, tornado relief centers, town meetings/events and churches.

- Residential Cooling and Heating Equipment - The program, also known as the COOL Smart program, started the year with a strong volume of equipment rebate production for high efficiency equipment, and successfully achieved its 2011 equipment rebate goal. COOL Smart actively planned and conducted quality installation training sessions, including system design, duct diagnostics, brushless fan motors and ENERGY STAR Heating, Ventilation and Air Conditioning ("HVAC") quality installation online training. The annual COOL Talk meeting was held at which program achievements were highlighted, HVAC contractor feedback obtained and a program preview of 2012 presented. Contractor outreach, training and education was enhanced through joint electric and gas integration through the establishment of circuit rider outreach for COOL Smart through the GasNetworks™ existing vendor, and joint participation of COOL Smart and GasNetworks at the Plumbing Heating Cooling Contractors Annual Trade Show and the annual GasNetworks fall conference. A request for proposals ("RFP") was completed and a statewide vendor was selected for COOL Smart rebate processing.

- Multi-Family Retrofit - The Multi-Family Market Integrator continued to be an invaluable resource to the PA multi-family working group in 2011. Monthly activity reports were developed to track program progress. The Multi-Family Market Integrator continued to report a trend of successfully enrolled facilities, which was the result of the relationships they have built with property owners, authorized representatives and property managers. In addition, the statewide Mass Save advertising campaign was noted as a source of program inquiry.

  Most PAs were close to or exceeded program goals in 2011, with a strong enrollment and high level of pipeline projects into the residential multi-family retrofit program. The PAs continue to integrate the C&I program, where applicable, to better address the whole

facility and maximize savings opportunities. Energy efficient lighting, instant savings measures, and weatherization were in high demand from this market sector.

- Mass Save – In 2011 the Mass Save/Residential Conservation Services program was fully integrated with the gas Weatherization program to provide customers with fuel blind energy services through the Home Energy Services ("HES") program. Mid-year, the program transitioned to offering customers one comprehensive Home Energy Assessment ("HEA") and incorporated additional market actors. Two groups of Mass Save participating contractors, Home Performance Contractors ("HPCs") and Independent Installation Contractors ("IICs"), now provide services in addition to those offered by the lead vendor.

  After the integration of additional contractors into the program, a Contractor Best Practices Working Group ("BPWG") was developed to continue PA commitment to ongoing communication with participating contractors in the program. The group serves as a forum to provide an open line of communication between PAs, lead vendors, HPCs and IICs to discuss any matters related to the program with an independent third-party facilitator. BPWG achievements in 2011 include:
    - Assistance with contractor permit acquisition and a continued focus on improving and streamlining the process
    - Subsidized marketing materials offered to both IICs and HPCs
    - A contractor portal on the Mass Save website for easy access to contractor relevant documents
    - Development of a form and process for pricing adjustments
    - Customer acquisition assistance for contractors bringing in customers who move forward implementing weatherization work
    - Various lead vendor process enhancements
    - Workforce development including subsidies for various trainings:
      - Weatherization boot camps
      - Combustion safety training
      - Weatherization crew chief training
      - Building analyst training

  In 2011, the HEAT Loan program continued to offer micro loans ($500-$2,000) and the program has increased the amount that a property owner can borrow ($2,000 - $25,000). HEAT Loan offerings were extended to include many gas customers in municipal electric territory. Additionally, PAs saw an increase in both the average loan amount and the number of customers financing multiple measures.

- ENERGY STAR Lighting - In 2011, the ENERGY STAR Lighting program provided strong results for all the PAs, with all the PAs meeting or exceeding savings goals. LED fixtures were well received by customers, allowing the PAs to adjust rebate levels incrementally downward with minimum impact on sales. Specialty and "Hard-to-Reach" categories also performed well in most areas. The PAs transitioned to the new incentive fulfillment contractor in the last half of 2011 for most programs.

- ENERGY STAR Appliances – The ENERGY STAR Appliances program results varied by Program Administrator. ENERGY STAR refrigerators and freezers were once again strong performers for this program, with ENERGY STAR televisions also performing well. Other measures like computers, LCD monitors, pool pumps and room air conditioners lagged behind expectations due to rapid changes in technology and some products not meeting program criteria. The sales of Advanced Power Strips (Smart Strips) varied by PA, due mostly to retail availability. School fundraisers and "Pop-up" retail accounted for a large number of sales of this product. The refrigerator/freezer recycling program did not perform well for most PAs. The PAs successfully transitioned all aspects of this program to the new incentive fulfillment contractor in the last half of 2011.

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.

Tables II.A.4 through II.A.15 provide detailed information on the performance of each residential program and pilot program, 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	$	$ 12,386,208			$ 9,998,543		-19%
Performance Incentive	$	$ -			$ -		0%
Savings and Benefits							
Energy							
Lifetime	MWh	173,570	122,820	-29%	116,688	-5%	-33%
Annualized	MWh	19,364	14,718	-24%	13,742	-7%	-29%
Demand							
Lifetime	kW	62,921	18,218	-71%	13,708	-25%	-78%
Annualized							
Summer	kW	4,182	1,751	-58%	1,506	-14%	-64%
Winter	kW	3,763	2,767	-26%	2,858	3%	-24%
Non-Electric Benefits (Lifetime)	$	$ 29,343,909	$ 12,078,006	-59%	$ 27,570,036	128%	-6%
Cost-Effectiveness							
TRC Benefits	$	$ 57,600,761			$ 43,051,507		-25%
TRC Costs	$	$ 14,802,121			$ 11,206,807		-24%
Net Benefits	$	$ 42,798,641			$ 31,844,700		-26%
BCR		3.9			3.8		-1%

Within the Residential sector, the following programs are contributing to the variance between planned and evaluated values:

- Residential New Construction & Major Renovation (for TRC Benefits, Net Benefits and BCR): Please reference section II.A.2a for a more detailed discussion of the cause of the variances for this program.
- Residential Cooling & Heating Equipment (for TRC Benefits, Net Benefits and BCR): Please reference section II.A.2b for a more detailed discussion of the cause of the variances for this program.
- Multi-Family Retrofit (for TRC Benefits, TRC Costs, Net Benefits and BCR): Please reference section II.A.2c for a more detailed discussion of the cause of the variances for this program.
- Mass Save (for TRC Benefits, TRC Costs and Net Benefits): Please reference section II.A.2d for a more detailed discussion of the cause of the variances for this program.
- ENERGY STAR® Lighting (for TRC Benefits, TRC Costs, Net Benefits and BCR): Please reference section II.A.2e for a more detailed discussion of the cause of the variances for this program.
- ENERGY STAR® Appliances (for TRC Benefits, Net Benefits and BCR): Please reference section II.A.2f for a more detailed discussion of the cause of the variances for this program.

Each of the programs listed have impact evaluations reflected in the change from Preliminary to Evaluated results, which are described as referenced above.

Table II.A.2

Residential Sector Summary of End-Uses

End Uses	Units (Lifetime)	Preliminary Year-End Results	Evaluated Results	% Change from Preliminary
Lighting				
Energy	MWh	86,793	81,488	-6%
Demand	kW	8,802	8,269	-6%
NEB (Lifetime)	$	$ 718,652	$ 676,414	-6%
HVAC				
Energy	MWh	12,894	11,975	-7%
Demand	kW	4,615	4,009	-13%
NEB (Lifetime)	$	$ 1,519,104	$ 1,757,431	16%
Motors & Drives				
Energy	MWh	231	107	-54%
Demand	kW	28	30	7%
NEB (Lifetime)	$	$ (6,868)	$ (2,938)	-57%
Refrigeration				
Energy	MWh	8,398	6,937	-17%
Demand	kW	997	839	-16%
NEB (Lifetime)	$	$ -	$ 90,556	0%
Hot Water				
Energy	MWh	389	370	-5%
Demand	kW	78	92	18%
NEB (Lifetime)	$	$ 662,941	$ 506,965	-24%
Process				
Energy	MWh	3,401	3,401	0%
Demand	kW	207	402	94%
NEB (Lifetime)	$	$ -	$ -	0%
End Use Behavior				
Energy	MWh	201	201	0%
Demand	kW	56	23	-60%
NEB (Lifetime)	$	$ -	$ -	0%
Envelope				
Energy	MWh	10,338	12,035	16%
Demand	kW	3,395	4	-100%
NEB (Lifetime)	$	$ 9,183,723	$ 24,541,154	167%
Solar Hot Water				
Energy	MWh	175	175	0%
Demand	kW	40	40	0%
NEB (Lifetime)	$	$ 454	$ 454	0%
Total				
Energy	MWh	122,820	116,688	-5%
Demand	kW	18,218	13,708	-25%
NEB (Lifetime)	$	$ 12,078,006	$ 27,570,036	128%

Table II.A.3

Residential Program Summary

Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential New Construction & Major Renovation				
TRC Benefits	$	$ 928,618	$ 900,567	-3%
TRC Costs	$	$ 353,163	$ 298,496	-15%
Net Benefits	$	$ 575,455	$ 602,071	5%
BCR		2.6	3.0	15%
Residential Cooling and Heating Equipment				
TRC Benefits	$	$ 1,852,339	$ 1,227,181	-34%
TRC Costs	$	$ 1,000,298	$ 828,767	-17%
Net Benefits	$	$ 852,041	$ 398,414	-53%
BCR		1.9	1.5	-20%
Residential Multi-Family Retrofit				
TRC Benefits	$	$ 2,845,701	$ 822,225	-71%
TRC Costs	$	$ 561,476	$ 229,159	-59%
Net Benefits	$	$ 2,284,225	$ 593,066	-74%
BCR		5.1	3.59	-29%
Residential MassSave				
TRC Benefits	$	$ 38,952,913	$ 30,158,402	-23%
TRC Costs	$	$ 8,864,976	$ 7,088,516	-20%
Net Benefits	$	$ 30,087,937	$ 23,069,886	-23%
BCR		4.4	4.3	-3%
Residential ENERGY STAR® Lighting				
TRC Benefits	$	$ 11,717,686	$ 8,469,498	-28%
TRC Costs	$	$ 2,609,910	$ 1,389,972	-47%
Net Benefits	$	$ 9,107,776	$ 7,079,526	-22%
BCR		4.5	6.1	36%
Residential ENERGY STAR® Appliances				
TRC Benefits	$	$ 1,303,504	$ 1,473,634	13%
TRC Costs	$	$ 458,251	$ 529,423	16%
Net Benefits	$	$ 845,253	$ 944,211	12%
BCR		2.8	2.8	-2%

Table II.A.3				
Residential Program Summary (cont'd)				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Deep Energy Retrofit				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	$ 80,000	$ 48,648	-39%
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a
Residential New Constr & Maj Reno - SW Pilot				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	$ 278,452	$ 16,892	-94%
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a
Residential New Constr MF (4-8 story) SW Pilot				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	n/a	n/a	n/a
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a
Residential New Constr Lighting Design SW Pilot				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	$ 22,222	$ 5,562	-75%
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a
Heat Pump Water Heater Pilot				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	$ 11,111	$ 10,898	-2%
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a
Power Monitor Pilot				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	$ 161,667	$ 338,722	110%
Net Benefits	$	n/a	n/a	n/a
BCR		n/a	n/a	n/a

Table II.A.3				
Residential Program Summary (cont'd)				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Hard-To-Measure Initiatives				
TRC Costs	$	$ 400,595	$ 421,752	5%
Total				
TRC Benefits	$	$ 57,600,761	$ 43,051,507	-25%
TRC Costs	$	$ 14,802,121	$ 11,206,807	-24%
Net Benefits	$	$ 42,798,641	$ 31,844,700	-26%
BCR		3.9	3.8	-1%

3. Residential Programs

a. Residential New Construction & Major Renovation

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

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 count of the number of unique households served by the program.

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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.4. provides information on the performance of Residential New Construction & Major Renovation.

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	$	$ 235,663			$ 298,496		27%
Performance Incentive	$	$ -			$ -		0%
Participants	hhlds	47			69		47%
Program Cost / Participant	$	$ 5,014			$ 4,326		-14%
Savings and Benefits							
Energy							
Lifetime	MWh	2,850	3,535	24%	3,252	-8%	14%
Annualized	MWh	287	271	-6%	233	-14%	-19%
Average Measure Life	Yrs	10	13	31%	14	7%	41%
Demand							
Lifetime	kW	566.2	730.3	29%	703.2	-4%	24%
Annualized							
Summer	kW	38.6	40.8	5%	37.1	-9%	-4%
Winter	kW	75.1	47.9	-36%	40.9	-15%	-46%
Average Measure Life	Yrs	15	18	22%	19	6%	29%
Non-Electric Benefits (Lifetime)	$	$ 535,505	$ 198,795	-63%	$ 459,593	131%	-14%
Cost-Effectiveness							
TRC Benefits	$	$ 928,618			$ 900,567		-3%
TRC Costs	$	$ 353,163			$ 298,496		-15%
Net Benefits	$	$ 575,455			$ 602,071		5%
BCR		2.6			3.0		15%

This program generated higher than expected costs and participants due to one, relatively large multi-family project which contributed a greater number of units than expected. Because of the multi-family nature of almost half of the units, there were fewer opportunities for CFLs because of the trend to install hard-wired fixtures, appliances and more opportunities for longer-term measures, such as insulation in a new construction setting.

The lifetime energy savings are higher than expected, while the annualized energy savings are in line with expectations. The difference can be attributed to the increase in heating and cooling measures like insulation. The lifetime and annual summer demand savings see a similar trend because of the measure mix. The annualized winter kW is lower due to a decrease in lighting from plan, and the longer average measure lives reflect this change in the measure mix.

The lifetime NEBs are primarily affected by the heating and water heating fuels used by the units, which was driven by the one multi-family project.

In addition to the evauation studies described below, results of the Non-Energy Impact Study filed with the 2012 Mid-Term Modification are incorporated in the 2011 evaluated results and reflects a significant increase from the preliminary values.

Because the total benefits associated with the program increased while the total resource costs decreased, the net benefits and BCR are greater than planned, and the program is cost-effective.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Massachusetts Residential New Construction Home Buyer Survey*: This study examined what buyers look for in a new home, awareness of ENERGY STAR homes, the role of ENERGY STAR certification in new home shopping, perceptions of ENERGY STAR homes, and reactions to recent changes in the program. The study also provides updates of similar surveys conducted in 2002, 2003, 2004, and 2006. The results of this study did not impact the 2011 evaluated results. This study is discussed in more detail in Section III, Study 1.
- *Massachusetts Residential New Construction Focus Groups with Participant Builders*: This study assessed participating builders' experience with the Program and their reactions to changes made in 2011 and changes which may be forthcoming in 2012. The results of this study did not impact the 2011 evaluated results. This study is discussed in more detail in Section III, Study 2.
- *Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle*: This study was conducted in partnership with DOER to assess compliance with basic building code prescriptive path requirements at the end of the 2006 International Energy Conservation Code (IECC) code cycle, provide a preliminary assessment of how current new single-family residential building characteristics compare to current User Defined Reference Home (UDRH) inputs, and conduct audits of energy efficient lighting and appliances within the homes. The study also compared building practices, equipment efficiencies, and other characteristics in custom versus spec built homes. Results from this study reduced the electric savings based on the penetration rates of high efficiency lighting and appliances. This study is discussed in more detail in Section III, Study 3.
- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE

definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Company saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

b. Residential Cooling & Heating Equipment

Purpose/Goal: The purpose of the Residential Cooling and 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 furnaces with Electronic Commutated Motors ("ECMs").

Targeted Customers: The program targeted residential customers in the market to purchase new or replacement heating, ventilation, and air conditioning ("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.

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 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 Gas Networks.

- Mass Save participants were referred to COOL Smart for HVAC measures using COOL Smart literature, which is part of the standard Mass Save 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 process rebates, 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

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	$	$ 890,256			$ 725,658		-18%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	1,056			1,214		15%
Program Cost / Participant	$	$ 843			$ 598		-29%
Savings and Benefits							
Energy							
Lifetime	MWh	10,208	6,790	-33%	6,666	-2%	-35%
Annualized	MWh	585	377	-35%	371	-2%	-37%
Average Measure Life	Yrs	17	18	3%	18	0%	3%
Demand							
Lifetime	kW	6,615.2	3,967.5	-40%	3,409.4	-14%	-48%
Annualized							
Summer	kW	409.8	220.8	-46%	189.8	-14%	-54%
Winter	kW	54.8	62.7	14%	107.3	71%	96%
Average Measure Life	Yrs	16	18	11%	18	0%	11%
Non-Electric Benefits (Lifetime)	$	$ (161,035)	$ (143,924)	11%	$ 95,667	166%	159%
Cost-Effectiveness							
TRC Benefits	$	$ 1,852,339			$ 1,227,181		-34%
TRC Costs	$	$ 1,000,298			$ 828,767		-17%
Net Benefits	$	$ 852,041			$ 398,414		-53%
BCR		1.9			1.5		-20%

All of the significant variances in savings and benefits can be attributed to a change in the measure mix relative to the plan.

The lifetime and annualized energy savings were lower than planned. The primary reason for this change was that participants had a greater interest in air conditioning equipment (as compared to heating equipment and to air-conditioning and heating services) than planned. The lifetime, summer and winter demand savings are also impacted by a change in measure mix. The lifetime and summer demand savings were lower than planned because QIV participation was lower than expected. In an effort to increase contractor participation, the Compact encouraged contractors to attend trainings offered by their implementation vendor. The winter demand savings were slightly higher than planned and can be attributed to a greater interest in mini-split heat pumps, a measure which has summer and winter demand savings.

The increase in Winter demand results in part from higher demand savings for the Brushless Fan Motor measure in addition to changes to the summer and winter coincidence factors from both the Brushless Fan Motor impact evaluation and the Demand Impact Model, both as described in the evaluation studies below.

In addition, results of the Non-Energy Impact Study filed with the 2012 Mid-Term Modification are incorporated in the 2011 evaluated results and reflects a significant increase in lifetime NEBs from the preliminary values.

Because the total benefits decreased by a greater percentage than the costs associated with the program, the net benefits and BCR are less than planned. However, the program remains cost-effective.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Brushless Fan Motors Impact Evaluation*: This impact evaluation study was designed to quantify the energy savings associated with brushless fan motor (BFM) retrofits in residential HVAC applications. This study affected the 2011 Residential Cooling and Heating Equipment program by quantifying key metrics such as annual kWh savings and coincidence factors. The results of this study varied by PA; based on measure mix, the Compact saw a net decrease in evaluated results for 2011. This study is discussed in more detail in Section III, Study 8.
- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

c. Multi-Family Retrofit

Purpose/Goal: The purpose of the Residential 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 a residential dwelling unit served under this program.

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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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	$	$ 521,038			$ 229,159		-56%
Performance Incentive	$	$ -			$ -		0%
Participants	units	550			291		-47%
Program Cost / Participant	$	$ 947			$ 787		-17%
Savings and Benefits							
Energy							
Lifetime	MWh	6,114	5,237	-14%	3,925	-25%	-36%
Annualized	MWh	783	440	-44%	321	-27%	-59%
Average Measure Life	Yrs	8	12	52%	12	3%	56%
Demand							
Lifetime	kW	2,605.0	498.0	-81%	93.1	-81%	-96%
Annualized							
Summer	kW	155.1	36.8	-76%	13.3	-64%	-91%
Winter	kW	208.8	51.3	-75%	49.9	-3%	-76%
Average Measure Life	Yrs	17	14	-20%	7	-48%	-58%
NEB (Lifetime)	$	$ 1,813,642	$ 86,866	-95%	$ 383,574	342%	-79%
Cost-Effectiveness							
TRC Benefits	$	$ 2,845,701			$ 822,225		-71%
TRC Costs	$	$ 561,476			$ 229,159		-59%
Net Benefits	$	$ 2,284,225			$ 593,066		-74%
BCR	n/a	5.1			3.59		-29%

This program resulted in significant variances for all cost, savings, and benefits metrics. Despite greater decreases in benefits as compared to costs, the program remains cost-effective.

In general, the Cape Light Compact does not have many traditionally defined Residential Multi-Family customers in its territory (for example, high rises and apartment complexes). The majority of the Cape Light Compact Residential Multi-Family customers are condominium owners.

Annualized energy savings were significantly lower than planned because while electric measures like lighting and thermostats can be easily implemented, there are more significant barriers for condominium owners to implement weatherization measures. In many cases they need to involve the condominium association in the decision making process in order to implement a majority of the recommended weatherization measures. Yet because of savings attributed to the limited insulation and air sealing jobs, the lifetime savings were less severly impacted.

Lifetime, summer and winter demand savings were all lower than planned because of the change in measure mix. As noted above, the program did not see enough weatherization work

completed. The Compact began working with its implementation vendor to investigate opportunities to gain condominium associations support of implementing such measures and continue to look for opportunities such as working with the boards and facility managers. Lifetime NEBs were also impacted by the shift in measure mix from weatherization to lighting measures.

Since the Cape Light Compact did not spend its entire budget, it did not generate the savings and benefits that were planned for this program. TheCape Light Compact filing a 2012 Mid-Term Modification (D.P.U. 11-116) for the Multi-Family Retrofit program.

While the inclusion of Non Energy Impacts from the 2010 evaluation reflects a substantial increase to lifetime NEBs; the Multi-Family Retrofit program reflects a significant decrease in savings from preliminary results to planned because of impact factors from the Multi-Family Program Impact Analysis described below. The PAs agreed to use impact factors such as free ridership, spillover, in-service and persistence rates from this study in the 2011 Annual Report. While, the study also derived algorithms to use in calculating measure level savings for this program going forward, these algorithms will be used in the 2013 – 2015 three year plan.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Massachusetts Multifamily Market Characterization and Potential Study*: The primary objective of this market characterization study was to assess the potential energy efficiency savings available in multifamily buildings within Massachusetts. The results of this study did not impact the 2011 evaluated results but is being used to inform ongoing planning and program design. This study is discussed in more detail in Section III, Study 5.
- *Massachusetts Multifamily Program Process Evaluation*: This study assessed program processes and developed recommendations for program improvement by interviewing program staff, implementation staff, and customers. The results of this study did not impact the 2011 evaluated results but is being used to inform ongoing program design. This study is discussed in more detail in Section III, Study 6.
- *Massachusetts Multifamily Program Impact Analysis*: The objective of this impact evaluation was to provide program attribution information and a set of savings approaches that could be used by all PAs. These objectives were accomplished by interviewing key stakeholders, developing conclusions, and offering recommendations for future program improvement. 2011 results were negatively affected by the 18% free-ridership number derived from this study. This study is discussed in more detail in Section III, Study 7.
- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

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 condo association with multiple four-unit buildings). The program aims to reach the aforementioned customers who are interested in making their homes more energy efficient. The HES program is fuel-blind.

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

Targeted End-Uses:
- Lighting
- HVAC
- Hot Water
- Envelope
- Refrigeration

Delivery Mechanism: The Mass Save and gas Weatherization programs were fully integrated in 2011 and were implemented by each PA's competitively procured lead vendor. The PAs incorporated both HPCs (to provide audits and weatherization work) and IICs (to implement weatherization work) into the program.

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 include:
- Consistent statewide training
- Data reporting
- Achieving aggressive savings
- Customer satisfaction
- Quality Control standards
- Scheduling requirements
- Technical Assistance
- Maintain and report health and safety information

Two groups of Mass Save participating contractors, HPCs and IICs, provided services in addition to those services offered by the lead vendor. All participating contractors had to meet program eligibility and requirements. HPCs independently recruited customers, provided HEAs and implemented weatherization measures. IICs provided installation of weatherization measures for those customers who received a 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 a HPC or IIC, had to have a quality control inspection performed by the PA-vendor or third- party vendor when the work was completed. This ensured high quality was maintained, and installations met Building Performance Institute standards or similar standards set by the PAs.

After a competitive bidding process, the gas and electric PAs contracted 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 HES members on program successes and identified areas of possible improvement.

The HES members 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

Table II.A.7							
Mass Save							
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	$	$ 7,408,109			$ 6,038,032		-18%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	3,120			4,684		50%
Program Cost / Participant	$	$ 2,374			$ 1,289		-46%
Savings and Benefits							
Energy							
Lifetime	MWh	60,423	36,739	-39%	33,479	-9%	-45%
Annualized	MWh	5,244	4,448	-15%	3,780	-15%	-28%
Average Measure Life	Yrs	12	8	-28%	9	7%	-23%
Demand							
Lifetime	kW	42,954.8	5,595	-87%	2,059.3	-63%	-95%
Annualized							
Summer	kW	2,224.7	499	-78%	299.8	-40%	-87%
Winter	kW	786.9	784	0%	827.2	5%	5%
Average Measure Life	Yrs	19	11	-42%	7	-39%	-64%
Non-Electric Benefits (Lifetime)	$	$ 26,452,403	$ 11,430,019	-57%	$ 26,034,398	128%	-2%
Cost-Effectiveness							
TRC Benefits	$	$ 38,952,913			$ 30,158,402		-23%
TRC Costs	$	$ 8,864,976			$ 7,088,516		-20%
Net Benefits	$	$ 30,087,937			$ 23,069,886		-23%
BCR		4.4			4.3		-3%

The Mass Save program underwent significant program changes in 2011 that impacted production when on-boarding contractors for the new market model. As a result, there were less insulation and air sealing jobs completed than originally planned which resulted in a lower program cost per participant .

However, annualized energy savings were not significantly impacted because the number of assessments facilitated greater than expected lighting measures, which offset some of the savings that were anticipated from insulation and air sealing. This difference in the measure mix is reflected in the reduction of average measure lives.

The lifetime and annualized summer demand savings are lower than expected due to the measure mix that was mentioned above. The winter demand savings, however, are very close to the planned value. The lifetime NEB value is lower than expected due to the lower number of insulation and air sealing jobs.

Despite some of the challenges of transition, the program remained cost-effective.

While the inclusion of Non Energy Impacts from the 2010 evaluation reflects a substantial increase to lifetime NEBs; the Mass Save program reflects a significant decrease in savings mainly to summer and lifetime demand because of free rider and spillover values from the Net-

to-Gross evaluation described below. While this evaluation provided impact factors for the majority of measures in the program, the mix of measure installations in conjunction with updates from the demand impact model reflected the change in seasonal demand.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Home Energy Services Net-to-Gross Evaluation*: This impact evaluation determined measure-specific and program-level net-to-gross (NTG) ratios for the Home Energy Services (HES) program. The information was gathered through Customer Self-Reporting and Statistical Market Share Modeling/Discrete Choice. The study determined a total average NTG ratio of 113%, but depending on measure mix, the net effect will vary for each PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 4.
- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.
- *Home Energy Services Packaged Measure Pilot Evaluation*: This study was designed to evaluate a pilot initiative in the HES program that offered program participants a different incentive structure if they implemented a greater number of measures. Study conclusions and recommendations were based on interviews, surveys, and historical data. This study does not affect 2011 results. This study is discussed in more detail in Section III, Study 13.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

e. 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.

Targeted End-Uses: Residential lighting

Delivery Mechanism: This initiative utilizes an online catalog channel and an upstream incentives, 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.8. provides information on the performance of the ENERGY STAR® Lighting program.

Table II.A.8							
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	$	$ 2,018,330			$ 1,389,972		-31%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	75,225			53,279		-29%
Program Cost / Participant	$	$ 27			$ 26		-3%
Savings and Benefits							
Energy							
Lifetime	MWh	84,545	58,818	-30%	59,067	0%	-30%
Annualized	MWh	11,220	7,724	-31%	7,756	0%	-31%
Average Measure Life	Yrs	8	8	1%	8	0%	1%
Demand							
Lifetime	kW	8,729.5	6,214.5	-29%	6,195.9	0%	-29%
Annualized							
Summer	kW	1,162.7	812.9	-30%	812.0	0%	-30%
Winter	kW	2,368.5	1,656.0	-30%	1,654.1	0%	-30%
Average Measure Life	Yrs	8	8	2%	8	0%	2%
Non-Electric Benefits (Lifetime)	$	$ 703,394	$ 506,249	-28%	$ 506,249	0%	-28%
Cost-Effectiveness							
TRC Benefits	$	$ 11,717,686			$ 8,469,498		-28%
TRC Costs	$	$ 2,609,910			$ 1,389,972		-47%
Net Benefits	$	$ 9,107,776			$ 7,079,526		-22%
BCR		4.5			6.1		36%

This program resulted in significant variances for cost, savings and benefits metrics. As the decrease in costs was higher than the decrease in benefits, cost-effectiveness improved.

Annualized and lifetime energy savings were lower than planned. Even though goals were exceeded for Indoor Fixtures, LED bulbs and bare spirals, the Hard to Reach (HTR) category goals could not be met due to a limited number of retailers. Quite notable was the bare spiral measure for which demand was 400% greater than planned. Also, a new rebate processing vendor was brought on board, and the program experienced higher than expected administrative costs due to the transition as well as a delay in billing. The lifetime and annual summer and winter demand savings are also lower than planned due to the lower than anticipated levels of retailer participation in the HTR category as well as fewer specialty bulbs purchased than planned which had high winter and summer coincidence factors. Lifetime NEBs were lower than anticipated due to the fact that quantities were lower than planned.

The preliminary year end results are nearly the same as the evaluated results for energy savings and any differences can be attributed to an update to load shapes from the demand impact model described below. Incorporating results of the demand impact model also resulted in a slight decrease to kW savings.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.
- *Massachusetts Consumer Survey Results 2011*: This multipart study assessed market research conducted for energy-efficient light bulbs, with particular emphasis on establishing a baseline at the onset of the changes in lighting standards resulting from the Energy Independence and Security Act of 2007 (EISA). The study primarily focuses on 100 Watt bulbs, but addressed customer attitudes towards CFL, customer knowledge of EISA standards, customers understanding and usage of current lighting technology, as well as potential stockpiling of incandescent bulbs. This is only the first wave of the study, and more waves will follow up on other bulb wattages as the EISA standards take effect. The process evaluation has no impact on 2011 evaluated results. This study is discussed in more detail in Section III, Study 10.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

f. ENERGY STAR® Appliances

Purpose/Goal: The purpose of the 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 count of the number of unique households served by the program.

Targeted End-Uses:
- Refrigerators
- Freezers
- Televisions
- Room Air Cleaners
- Personal Desktop Computers
- LCD Computer Monitors
- Advanced Power Strips ("Smart Strips")

- Secondary refrigerators and freezers (recycling)
- Pool pumps

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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

Table II.A.9							
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	$	$ 358,766			$ 474,752		32%
Performance Incentive	$	$ -			$ -		0%
Participants	hhlds	11,030			4,001		-64%
Program Cost / Participant	$	$ 33			$ 119		265%
Savings and Benefits							
Energy							
Lifetime	MWh	9,429	11,700	24%	10,299	-12%	9%
Annualized	MWh	1,245	1,457	17%	1,282	-12%	3%
Average Measure Life	Yrs	8	8	6%	8	0%	6%
Demand							
Lifetime	kW	1,450.5	1,213.1	-16%	1,247.4	3%	-14%
Annualized							
Summer	kW	191.0	141.6	-26%	154.1	9%	-19%
Winter	kW	269.3	164.3	-39%	179.2	9%	-33%
Average Measure Life	Yrs	8	9	13%	8	-6%	7%
Non-Electric Benefits (Lifetime)	$	$ -	$ -	0%	$ 90,556	0%	0%
Cost-Effectiveness							
TRC Benefits	$	$ 1,303,504			$ 1,473,634		13%
TRC Costs	$	$ 458,251			$ 529,423		16%
Net Benefits	$	$ 845,253			$ 944,211		12%
BCR		2.8			2.8		-2%

This program experienced a significant variance from planned total program costs due to higher than anticipated interest in refrigerator and TV rebates. However, since the program benefits and total resoucrce costs increased similarly, the program remains cost-effective.

The program cost per participant was higher due to a shift in measure mix from room air conditioners and smart strips to refrigerators, refrigerator and freezer recycling, and TVs. Refrigerators have a higher incentive as compared to room air conditioners and smart strips. Also, administrative costs were higher than planned as a new rebate processing vendor was brought on board.

Annual and lifetime energy savings were higher than planned due to higher than anticipated interest in refrigerators and TVs. The change in the measure mix also contributed to lower than planned lifetime and annual summer and winter demand.

There were no significant changes from preliminary to evaluated results although actuals incorporated the Refrigerator/Freezer Recycling evaluation filed in the 2010 Annual Report as well as the Demand Impact Model, as noted below.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net increase in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

4. Residential Pilot Programs

The purpose of the Annual Report is to provide actual measured and verified cost, participation, savings and benefits data on the performance of programs. To the extent that such final actual data for pilots programs is available, it is provided in this report.

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 analyze the information gathered from the pilot to determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot, the Program Administrators utilize these pilot results to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program.

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

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

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 and program manager.

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 "deeper" energy-savings initiative, knowing that prohibitive costs and project complexities are barriers to deep energy retrofit participation. Ultimately, achievement of this goal is measured by the pilot's cost-effectiveness. It was determined that this pilot is not cost-effective and therefore is no longer being offered to new customers in 2012.

Docket/Exhibit where the Program is Discussed and Approved: The Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.10. provides information on the performance of the Deep Energy Retrofit Pilot. Because of the nature of the pilot programs, the table for this pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.10							
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	$	$ 80,000			$ 48,648		-39%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	n/a			4		n/a
Program Cost / Participant	$	n/a			$ 12,162		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	$ 80,000			$ 48,648		-39%
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

The Cape Light Compact's evaluated total program costs are significantly lower than planned due to lower participation than anticipated. Planned budgets for 2010 were not fully spent, and while there was interest in the program, uptake was not as high as expected. As a result, in 2011, a Mid-Term Modification was filed (D.P.U. 10-147) which requested a significant reduction in budget. Challenges of participant planning, financing and general project understanding continued and in 2011 there was one completed project.

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

The pilot's performance and the results of the impact evaluations described above will be used to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program in the 2013-2015 three-year plan.

b. Residential New Construction & 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 analyze the information gathered from the pilot to determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot, the Program Administrators utilize these pilot results to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program.

Targeted Customers: This program targeted customers who want to build an addition on their existing home.

Definition of Pilot Program Participant: A count of the number of unique households served by the program.

Targeted End-Uses:

- Lighting
- HVAC
- Hot Water
- Envelope

Delivery Mechanism: The Program Administrators, along with the JMC, included this pilot as an offering under the Massachusetts New Homes with ENERGY STAR program. This pilot combines elements of the Residential New Construction program (for the addition) and the Mass Save program (for the existing portion) to provide a comprehensive whole-house approach. Each home in the program had a HERS analysis performed in order to better understand the existing structure. Recommendations were provided to the homeowner for the existing portion (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: 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.11. provides information on the performance of the Residential New Construction & Major Renovation – Major Renovation Statewide Pilot. Because of the nature of the pilot programs, the table for this pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.11

Residential 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	$	$ 278,452			$ 16,892		-94%
Performance Incentive	$	$ -			$ -		0%
Participants	hhlds	n/a			2		n/a
Program Cost / Participant	$	n/a			$ 8,446		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	$ 278,452			$ 16,892		-94%
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

The Cape Light Compact clearly did not have enough interest and participation in 2011, which impacted total costs. Challenges to the pilot program include smaller than expected additions and coordinating with renovation schedules. Although the Compact made a decision in mid-2011 to allow additions of any size, the production was not greatly increased. The Compact continues to look at ways to address this market, but it remains difficult to influence renovations.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Memo: Major Renovations Pilot Evaluation*: As follow up to the preliminary report on non-participant interviews issued in 2011, this memo briefly summarizes findings from interviews with homeowners, architects and builders involved with projects completed by the end of 2011. The memo focuses on satisfaction with the Pilot and suggestions for how the Pilot could be improved or made more user-friendly. In addition, it summarizes a discussion with a HERS rater who worked with 5 of the 11 completed projects. The results of this study did not impact the 2011 evaluated results. This study is discussed in more detail in Section III, Study 11.

The pilot's performance and the results of the impact evaluations described above will be used to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program in the 2013-2015 three-year plan.

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 analyze the information gathered from the pilot to determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot, the Program Administrators utilize these pilot results to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program.

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

Definition of Pilot Program Participant: Participants are defined as the number of 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year

Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.12. provides information on the performance of the Residential New Construction – Multi-Family (4-8 story) Statewide Pilot. Because of the nature of the pilot programs, the table for this pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.12

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	$	n/a			n/a		n/a
Performance Incentive	$	n/a			n/a		n/a
Participants	units	n/a			n/a		n/a
Program Cost / Participant	$	n/a			n/a		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	n/a			n/a		n/a
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

Though the Cape Light Compact supports this statewide pilot, Cape Light Compact does not have enough Multi-Family (4- to 8-story) homes in its service territory to be able to participate in this pilot. Therefore, no budget was allocated to this pilot in the plan, and there are no results from 2011 to report.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Massachusetts Residential New Construction Four to Eight Story Multifamily Pilot Interview Findings*: This study assessed the strengths and areas in need of improvement of the three year pilot that was introduced to serve smaller, four to eight story buildings that do not qualify for ENERGY STAR certification but are too small for commercial programs. The report focused on the lessons learned from the pilot about addressing the energy efficiency potential of the mid-rise Multi-Family new construction market. The

results of this study did not impact the 2011 evaluated results. This study is discussed in more detail in Section III, Study 12.

d. Residential New Construction - Lighting Design Statewide Pilot

Description of Pilot/Specific Activities Intended to Study: The Program Administrators worked with lighting designers and build/design teams to identify creative ways 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 analyze the information gathered from the pilot to determine market viability, cost-effectiveness, and, if applicable, adoption rates. Following completion of the pilot, the Program Administrators utilize these pilot results to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program.

Targeted Customers: The 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 Pilot Program Participant: A participant is defined as a unique electric account served under this program.

Targeted End-Uses: Lighting and controls

Delivery Mechanism: The Program Administrators, along with the JMC, included elements of 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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.13. provides information on the performance of the Residential New Construction - Lighting Design Statewide Pilot. Because of the nature of the pilot programs, the table for this

pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.13

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	$	$ 22,222			$ 5,562		-75%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	n/a			1		n/a
Program Cost / Participant	$	n/a			$ 5,562		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	$ 22,222			$ 5,562		-75%
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

The Cape Light Compact's evaluated total program costs are significantly lower than planned due to lower participation than anticipated.

Although the Compact completed one project, many of the completed new construction projects have been affordable housing. Because of the nature of affordable housing, there is not generally overlighting or the need for a lighting designer in many cases. Therefore, the opportunities were limited in 2011.

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

The pilot's performance and the results of the impact evaluations described above will be used to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program in the 2013-2015 three-year plan.

e. Heat Pump Water Heater Pilot (Non-Statewide)

Description of Pilot/Specific Activities Intended to Study: This pilot was designed to study the reliability and energy savings of heat pump water heaters.

Why Implemented on Pilot Basis rather than as a Full Program: This initiative was offered as a pilot to determine if the initiative is cost-effective.

Targeted Customers: This pilot targeted residential customers with stand-alone electric water heaters.

Definition of Pilot Program Participant: A count of the number of unique households served by the pilot program.

Targeted End-Uses: Hot Water

Delivery Mechanism: The HPWHs were installed by a plumbing contractor in 2010. The units were monitored and evaluated by a third party contractor during 2011.

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

How Achievement of the Pilot's Stated Goal was Measured: The Pilot's stated goal was measured through an evaluation described in Section III.A.14c. The overall performance of the HPWHs shows great promise. In general, these HPWHs were more than twice as efficient as a traditional electric resistance tank water heater. The evaluation found minimal issues with these new units, which performed with remarkable energy and cost savings as compared to electric resistance water heaters.

Docket/Exhibit where the Program is Discussed and Approved: The Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.14. provides information on the performance of the Heat Pump Water Heater Pilot. Because of the nature of the pilot programs, the table for this pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.14							
Heat Pump Water Heater 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	$	$ 11,111			$ 10,898		-2%
Performance Incentive	$	$ -			$ -		0%
Participants	hhlds	n/a			-		n/a
Program Cost / Participant	$	n/a			$ -		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	$ 11,111			$ 10,898		-2%
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

The Cape Light Compact's plan tracked with actuals as two participants were planned[5] and two units were installed in 2011 in customers' homes. Due to the fact that the evaluated cost per participant was similar to planned costs, total program costs are not significantly different than planned.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Heat Pump Water Heaters Evaluation of Field Installed Performance*: This technical evaluation of Heat Pump Water Heaters (HPWH) was designed to quantify the in-situ performance of three types of HPWHs. The study evaluated 14 different units over the course of a year and the results will be applied to future analysis of HPHWs. The results of this study do not affect program results for 2011. This study is discussed in more detail in Section III, Study 14.

The pilot's performance and the results of the impact evaluations described above will be used to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program in the 2013-2015 three-year plan.

[5] Cape Light Compact D.P.U. 09-119. Response to AG Third Set of Information Requests. November 30, 2009. AG 3-6.

f. Power Monitor Pilot (Cape Light Compact-Specific)

Description of Pilot/Specific Activities Intended to Study: In 2009, the Cape Light Compact conducted Phase I of this pilot, in an effort to gain insight to behavioral aspects of energy use. The Compact identified 91 participants on Cape Cod and Martha's Vineyard and installed an in-home energy monitoring system in each participant's home. The monitoring system enables the participant to view their electricity consumption in real time, displaying energy usage down to the minute. Participants had access to an online dashboard, which offered participants feedback on their energy consumption and demand, savings metrics in kWh, dollars, and CO2 emissions and opportunities to learn about and sign up for energy saving activities (e.g., unplugging chargers when not in use). Participants were also part of a social networking system with other pilot members.

In March of 2010, an independent third party evaluation was completed of Phase I that was included in the Cape Light Compact's 2009 Annual Report. The results of the evaluation indicated a strong customer interest in the pilot, high levels of customer satisfaction with the pilot and significant energy savings. On average, customers saved 9.3 percent, controlling for temperature differences and for other Cape Light Compact program activity. This is equivalent to 2.9 kWh of saved electricity per day.

In the fall of 2010, Cape Light Compact supplemented its review of the Pilot program with qualitative in-depth interviews of ten participants. The interviews were conducted by an independent third party and discussed primarily participant's thoughts and patterns of interaction with the monitoring system and their feedback regarding suggestions on changes or features they would like to see in the energy monitoring system. Findings from these interviews provided insight into how and why participants are motivated to stay engaged with the system over longer periods of time and provide further evidence to the evaluation's conclusions.

As a result of the findings in the report and follow up interviews, the Compact extended the pilot by offering Phase II in 2011. Phase II of the pilot planned to include both residential and commercial participants but due to networking issues, there were no commercial participants. The purpose of Phase II and its associated evaluation is to provide the basis for determining whether to transition the Pilot into a Program. The evaluation of Phase II will further evaluate the savings associated with the pilot, as well as the persistence of the energy savings identified in Phase I.

Why Implemented on Pilot Basis rather than as a Full Program: This initiative was offered as a pilot to determine if the initiative is cost-effective. Once the evaluation of the pilot is completed, the pilot may be offered as a program in the future. Draft evaluation results are due at the end of August 2012 and will help to inform the next plan 2013-2015.

Targeted Customers: Phase I of this Pilot targeted year-round residential customers. Phase II of this Pilot targeted year-round residential customers, as well as a few small commercial customers but as noted above, there were no commercial participants.

Definition of Pilot Program Participant: A count of the number of unique households in which pilot hardware was installed.

Targeted End-Uses: The Pilot targets all residential and commercial end-uses through either motivating customers to change their behavior to save energy or to take energy saving actions.

Delivery Mechanism: The Cape Light Compact and its implementation vendor, Tendril, Inc. delivered this Pilot.

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

How Achievement of the Pilot's Stated Goal was Measured: An evaluation of the Pilot's first phase has been completed. The evaluation of the Pilot's second phase is in process.

Docket/Exhibit where the Program is Discussed and Approved: The Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.A.15. provides information on the performance of the Power Monitor Pilot. Because of the nature of the pilot programs, the table for this pilot program does not include savings and benefits. The Compact has provided all information that is available.

Table II.A.15							
Power Monitor 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	$	$ 161,667			$ 338,722		110%
Performance Incentive	$	$ -			$ -		0%
Participants	hhlds	n/a			n/a		n/a
Program Cost / Participant	$	n/a			n/a		n/a
Savings and 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							
Summer	kW	n/a	n/a	n/a	n/a	n/a	n/a
Winter	kW	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
Non-Electric Benefits (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	$	$ 161,667			$ 338,722		110%
Net Benefits	$	n/a			n/a		n/a
BCR		n/a			n/a		n/a

The Cape Light Compact's evaluated total program costs are significantly higher than expected because of carryover costs from 2010 for implementation and evaluation. Over the three year timeframe, the Compact is within planned costs.

Savings and benefits data for Phase II is not provided as the level and persistence of savings is currently being evaluated. The Cape Light Compact began its implementation of Phase II starting in the spring of 2011 and will review preliminary results this summer. Based on the findings from the evaluation, the Cape Light Compact will decide whether or not to include Power Monitor as a part of its program offerings in its 2013 – 2015 Three-Year Energy Efficiency Plan.

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

The pilot's performance and the results of the impact evaluations described above will be used to determine the future of the pilot and whether it will be adopted either as a stand alone program or as an additional measure offering within an existing program in the 2013-2015 three-year plan.

g. 2011 Energy Education Activities

The Compact is committed to energy education and outreach to its community and continues to be a nationally recognized leader in the design and implementation of its energy education programs. As a unique energy efficiency administrator and municipal aggregator, the Compact strives to support the community in efforts to encourage the development of deeper and broader knowledge of energy efficiency technology and practices, moving towards an energy-literate society.

Toward this goal, the Compact's Energy Education Program continues to see a substantial increase in its outreach within the school population through its innovative programs (see Appendix E5 for more detail). Highlights of these programs included:

- Over 100 education based presentations, field trips and all-school Energy Carnivals: students learn the basic lessons of energy efficiency, energy forms and energy sources in a first-hand, fun and engaging way. Over 5,000 students and teachers were reached.
- A Standards-based graduate level course for teachers to introduce and reinforce energy education concepts for the classroom
- 2 informal science educator workshops for science and nature center staff
- 5 Teacher Workshops in partnership with NSTAR and NEED and in-service training for school systems reaching over 150 teachers in our service territory.

We were proud to have five of our schools recognized by the National Energy Education Development Project ("NEED") for their outstanding work in energy education outreach to their communities:

State Elementary Rookie of the Year - The Forestdale School's 5th Grade
State Middle School of the Year - Bourne Middle School's Energy Savers Club
National and State Elementary School of the Year - Eastham Elementary School's 5th Grade
State Senior School of the Year - Sandwich High School
National and State Special Project of the Year - Harwich Middle School Energy Adventure Seekers Club

Our greatest successes were seen with the "kids as teachers" model where high school and middle school students were trained and studied to present information on energy efficiency, renewable energy, and related topics to younger students and community members. As evidenced in requested programs from year to year, schools have moved towards adopting energy education into their yearly scope and sequence of classroom activities and thus continue to reach more individuals.

The Compact continues its collaboration with NEED of Manassas, VA, a 501(C)3 non-profit educational organization affiliated with the Department of Energy in Washington, D.C. Using a model for science-based facts, the Compact and NEED created curriculum materials to align

with the Massachusetts state standards for science and technology, allowing teachers to introduce lesson plans discussing energy efficiency and conservation.

B. Low-Income Sector Programs

1. Summary

During 2011 the Cape Light Compact implemented the following low-income programs[6]:

- Low-Income Residential New Construction
- Low-Income 1-4 Family Retrofit
- Low-Income Multi-Family Retrofit

2. Low-Income Sector Performance Highlights

During 2011, the PAs continued to leverage all applicable revenue streams available and built on the current Department of Housing and Community Development low-income energy efficiency program to deepen efficiency penetration consistent with a comprehensive, whole house/building approach. The program was able to leverage American Recovery and Reinvestment Act ("ARRA") funds slated for Public Housing Authority heating system replacements by providing minimal co-payments toward upgrades. This allowed PAs to not only achieve significant savings at a lower cost, but also enabled ARRA funding to stretch further with the replacement of more units. Some of the PAs were close to their goal in terms of therm/kWh savings as well as spending. However, some PAs were notably under in production and spending as a result of the extensive use of available ARRA funding instead of PA funds. Additionally, spending was affected by the composition of customers in each PA's service area, particularly the proportion of low-income customers in the territory.

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 levels, respectively.

Tables II.B.4 through II.B.6 provide detailed information on the performance of each low-income program.

6 The Cape Light Compact did not offer any pilot programs in the low-income sector this year.

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	$	$ 2,854,275			$ 2,489,571		-13%
Performance Incentive	$	$ -			$ -		0%
Savings and Benefits							
Energy							
Lifetime	MWh	23,249	9,802	-58%	11,264	15%	-52%
Annualized	MWh	2,249	864	-62%	958	11%	-57%
Demand							
Lifetime	kW	2,640.1	1,007.9	-62%	1,228.4	22%	-53%
Annualized							
Summer	kW	242.2	85.5	-65%	107.5	26%	-56%
Winter	kW	490.5	197.6	-60%	159.4	-19%	-67%
Non-Electric Benefits (Lifetime)	$	$ 7,229,071	$ 6,659,255	-8%	$ 5,124,685	-23%	-29%
Cost-Effectiveness							
TRC Benefits	$	$ 10,098,012			$ 6,529,481		-35%
TRC Costs	$	$ 2,854,275			$ 2,489,571		-13%
Net Benefits	$	$ 7,243,737			$ 4,039,910		-44%
BCR		3.5			2.6		-26%

Within the Low-Income sector, the following programs are contributing to the variance between planned and evaluated values as well as the variance from preliminary to evaluated:

- Low-Income Residential New Construction (for TRC Benefits, TRC Costs, Net Benefits, and BCR): Please reference section II.B.a for a more detailed discussion of the cause of the variances for this program.
- Low-Income 1 to 4 Family Retrofit (for Net Benefits and BCR): Please reference section II.B.b for a more detailed discussion of the cause of the variances for this program.
- Low-Income Multi-Family Retrofit (for TRC Benefits, TRC Costs, Net Benefits, and BCR): Please reference section II.B.c for a more detailed discussion of the cause of the variances for this program.

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	4,934	5,415	10%
Demand	kW	463	632	36%
NEB (Lifetime)	$	$ 174,637	$ 179,933	3%
HVAC				
Energy	MWh	161	115	-28%
Demand	kW	1	-	-100%
NEB (Lifetime)	$	$ 521,486	$ 368,972	-29%
Refrigeration				
Energy	MWh	3,536	2,407	-32%
Demand	kW	506	291	-43%
NEB (Lifetime)	$	$ 96,695	$ 99,001	2%
Hot Water				
Energy	MWh	9	3	-69%
Demand	kW	1	0	-65%
NEB (Lifetime)	$	$ 71,065	$ 32,198	-55%
End Use Behavior				
Energy	MWh	351	320	-9%
Demand	kW	34	37	10%
NEB (Lifetime)	$	$ 874,884	$ 40,943	-95%
Envelope				
Energy	MWh	812	3,003	270%
Demand	kW	3	268	8574%
NEB (Lifetime)	$	$ 4,920,488	$ 4,403,638	-11%
Total				
Energy	MWh	9,802	11,264	15%
Demand	kW	1,008	1,228	22%
NEB (Lifetime)	$	$ 6,659,255	$ 5,124,685	-23%

Table II.B.3				
Low-Income Program Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Low-Income New Construction & Major Renovation				
TRC Benefits	$	$ 44,988	$ -	-100%
TRC Costs	$	$ 33,772	$ 2,280	-93%
Net Benefits	$	$ 11,216	$ (2,280)	-120%
BCR		1.3	-	-100%
Low-Income Single Family Retrofit				
TRC Benefits	$	$ 7,666,827	$ 6,207,959	-19%
TRC Costs	$	$ 2,046,395	$ 2,273,099	11%
Net Benefits	$	$ 5,620,433	$ 3,934,860	-30%
BCR		3.7	2.7	-27%
Low-Income Multi-Family Retrofit				
TRC Benefits	$	$ 2,386,196	$ 321,522	-87%
TRC Costs	$	$ 745,334	$ 171,741	-77%
Net Benefits	$	$ 1,640,862	$ 149,781	-91%
BCR		3.20	1.87	-42%
Hard-To-Measure Initiatives				
TRC Costs	$	$ 28,774	$ 42,450	48%
Total				
TRC Benefits	$	$ 10,098,012	$ 6,529,481	-35%
TRC Costs (incl HTM Initiatives)	$	$ 2,854,275	$ 2,489,571	-13%
Net Benefits	$	$ 7,243,737	$ 4,039,910	-44%
BCR		3.5	2.6	-26%

3. Low-Income Programs

a. Low-Income Residential New Construction

Purpose/Goal: The purpose of the Low-Income 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 residential dwelling unit served under this program.

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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

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	$	$ 33,772			$ 2,280		-93%
Performance Incentive	$	$ -			$ -		0%
Participants	units	9			-		-100%
Program Cost / Participant	$	$ 3,752			$ -		-100%
Savings and Benefits							
Energy							
Lifetime	MWh	111	-	-100%	-	0%	-100%
Annualized	MWh	14	-	-100%	-	0%	-100%
Average Measure Life	Yrs	8	-	-100%	-	0%	-100%
Demand							
Lifetime	kW	62.1	-	-100%	-	0%	-100%
Annualized							
Summer	kW	3.3	-	-100%	-	0%	-100%
Winter	kW	4.2	-	-100%	-	0%	-100%
Average Measure Life	Yrs	19	-	-100%	-	0%	-100%
Non-Electric Benefits (Lifetime)	$	$ 23,464	$ -	-100%	$ -	0%	-100%
Cost-Effectiveness							
TRC Benefits	$	$ 44,988			$ -		-100%
TRC Costs	$	$ 33,772			$ 2,280		-93%
Net Benefits	$	$ 11,216			$ (2,280)		-120%
BCR		1.3			-		-100%

Building timelines and demands in the new construction program are unpredictable in a given year. As evidenced in the table above, there were no completed units in 2011. With production schedules that are tied to funding cycles, many low-income new construction projects began in 2011 with expected completion in 2012.

As a result, there are big variances from expected production that result in commensurate variances in energy, demand and NEB savings. Although there were no project completions in 2011, costs were incurred for projects likely to be completed in 2012.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Demand Impact Model User Manual*: The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact did not see an impact in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.
- *Additional Non-Energy Impacts for Low Income Programs*: This additional research clarified and expanded the research performed in the Residential and Low-Income Non-Energy Impacts Evaluation (filed in D.P.U 11 -116). Values were updated for certain additional Non-Energy Impacts. Savings were not impacted by this research, however, if

the Compact had completed units this evaluation would have impacted benefits for the Compact. The additional research is discussed in more detail in Section III, Study 28.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

b. Low-Income 1 to 4 Family Retrofit

Purpose/Goal: The purpose of the Low-Income 1-4 Family Retrofit program was to increase energy efficiency and reduce the energy cost burden for income-eligible customers through the installation of electric energy efficiency measures to achieve deeper and broader energy savings consistent with a comprehensive, whole house approach.

Targeted Customers: This program targeted residential customers living in one- to four-unit dwellings who are at or below 60 percent of the state median income level and who are qualified to receive fuel assistance and/or utility discount rate(s). For two- to four-unit dwellings, 50 percent of the occupants must qualify as low-income.

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

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 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 lead vendor/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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.B.5. provides information on the performance of Low-Income 1 to 4 Family Retrofit.

Table II.B.5

Low-Income 1 to 4 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	$	$ 2,046,395			$ 2,273,099		11%
Performance Incentive	$	$ -			$ -		0%
Participants	accts	1,282			699		-45%
Program Cost / Participant	$	$ 1,596			$ 3,252		104%
Savings and Benefits							
Energy							
Lifetime	MWh	17,558	9,011	-49%	10,421	16%	-41%
Annualized	MWh	1,603	783	-51%	872	11%	-46%
Average Measure Life	Yrs	11	12	5%	12	4%	9%
Demand							
Lifetime	kW	2,201.9	955.9	-57%	1,197.5	25%	-46%
Annualized							
Summer	kW	198.1	79.6	-60%	103.1	30%	-48%
Winter	kW	379.4	180.0	-53%	138.7	-23%	-63%
Average Measure Life	Yrs	11	12	8%	12	-3%	5%
Non-Electric Benefits (Lifetime)	$	$ 5,465,430	$ 6,406,733	17%	$ 4,901,963	-23%	-10%
Cost-Effectiveness							
TRC Benefits	$	$ 7,666,827			$ 6,207,959		-19%
TRC Costs	$	$ 2,046,395			$ 2,273,099		11%
Net Benefits	$	$ 5,620,433			$ 3,934,860		-30%
BCR		3.7			2.7		-27%

This program provided significantly higher incentives per home than planned due to a shift to more comprehensive visits geared towards serving customers in one year instead of over the course of multiple years. As a result, fewer participants were served with the program budget as compared to plan.

The significant decline in lifetime energy savings, annual energy savings, lifetime demand savings, summer demand savings and winter demand savings relative to plan is due to the focus on weatherization rather than electric measures such as CFLs. Given that weatherization measures have non-electric benefits that are not captured in the energy and demand savings, a better comparison of the program performance is shown in lifetime NEB where benefits are more aligned with plan .

Despite the fact that higher program costs generated lower program benefits, this program remained cost-effective.

Savings from the Low-Income 1-4 Family Impact evaluation fluctuated in both directions with substantial changes in kW savings and lifetime NEBs. While several of the evaluations below impacted the variances, the major offsets were attributed to the Program Impact Evaluation, The Demand Impact Model (described below) and the results of the Non-Energy Impact Study filed with the 2012 Mid-Term Modification.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Massachusetts Multifamily Market Characterization and Potential Study:* The primary objective of this market characterization study was to assess the potential energy efficiency savings available in multi-family buildings within Massachusetts. The results of this study did not impact the 2011 evaluated results but is being used to inform ongoing planning and program design. This study is discussed in more detail in Section III, Study 5.
- *Demand Impact Model User Manual:* The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.
- *Massachusetts 2011 Low Income Program Process Evaluation:* This study assessed program processes with a particular focus on identifying similarities and differences in the perspectives and assumptions of program staff, implementation staff, and customers regarding program goals, design and implementation across the PAs. The study produced recommended improvements for process-related issues, identified areas where the program changed in 2011, and followed up on topics initially researched in 2010. This evaluation has no impact on 2011 evaluated results. This study is discussed in more detail in Section III, Study 16.
- *Low Income Single Family Program Impact Evaluation:* This impact evaluation quantified the gross per-unit savings generated by each Low Income measure. The results of this study were applied to 2011 program results and were determined by utilizing both billing and engineering analyses. The impact of this study varied for each PA based on planning assumptions and measure mix. The 2011 evaluated results had a net increase for the Compact due to this study. This study is discussed in more detail in Section III, Study 17.
- *Additional Non-Energy Impacts for Low Income Programs:* This additional research clarified and expanded the research performed in the Residential and Low-Income Non-Energy Impacts Evaluation (filed in D.P.U. 11-116). Values were updated for certain additional Non-Energy Impacts. Savings were not impacted by this research, however, there was a net increase to benefits for the Compact. The additional research is discussed in more detail in Section III, Study 28.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

c. Low-Income Multi-Family Retrofit

Purpose/Goal: The purpose of the Low-Income Multi-Family Retrofit program 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 program targeted public housing authorities, non-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: Depending on the PA, a participant is considered either a dwelling unit or a unique electric account number served in a facility with five or more units.

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 CAP Agencies on all aspects of the program design and implementation. All PAs worked in conjunction with LEAN as well as the Multi-Family Advisory Committee comprised of LEAN, Community Development Corporations, Public Housing Authorities and other nonprofit owners of low-income non-institutional multi-family housing. The Multi-Family Advisory Committee was tasked with prioritizing low-income multi-family projects for each PA, using benchmarking software called WegoWise. The lead vendor/CAP agencies were responsible for providing coordination of energy efficiency services to the customers, working with installation contractors to ensure that the proper initiative guidelines were enforced, ensuring that the customers met the eligibility requirements for program participation as well as providing the lead vendor/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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

Table II.B.6. provides information on the performance of Low-Income Multi-Family Retrofit.

Table II.B.6

Low-Income 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	$	$ 745,334			$ 171,741		-77%
Performance Incentive	$	$ -			$ -		0%
Participants	units	258			73		-72%
Program Cost / Participant	$	$ 2,889			$ 2,353		-19%
Savings and Benefits							
Energy							
Lifetime	MWh	5,579	791	-86%	843	7%	-85%
Annualized	MWh	633	81	-87%	86	7%	-86%
Average Measure Life	Yrs	9	10	11%	10	-1%	11%
Demand							
Lifetime	kW	376.1	52	-86%	30.9	-41%	-92%
Annualized							
Summer	kW	40.7	6	-85%	4.4	-26%	-89%
Winter	kW	107.0	18	-84%	20.7	17%	-81%
Average Measure Life	Yrs	9	9	-5%	7	-20%	-24%
NEB (Lifetime)	$	$ 1,740,178	$ 252,522	-85%	$ 222,722	-12%	-87%
Cost-Effectiveness							
TRC Benefits	$	$ 2,386,196			$ 321,522		-87%
TRC Costs	$	$ 745,334			$ 171,741		-77%
Net Benefits	$	$ 1,640,862			$ 149,781		-91%
BCR	$	3.2			1.9		-42%

This program experienced significant negative variances for all cost, savings and benefits metrics relative to plan. Despite the greater decrease in benefits as compared to costs, the program remains cost-effective.

The significant variances in total program costs, participants, lifetime and annualized energy savings as well as lifetime, annual summer and winter demand savings and lifetime NEBs is due to the influx of ARRA funding and the focus on single family homes. Because of this, the majority of projects focused on electric-only measures, which, together with longer-than-expected project lead times, led to the budget and savings goals not being met for 2011.

Incorporating the results from the demand impact model resulted in a significant decrease for Summer and Lifetime demand savings; the model also calculated coincidence factors which reflects the seasonal allocation of demand .

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Massachusetts Multifamily Market Characterization and Potential Study:* The primary objective of this market characterization study was to assess the potential energy efficiency savings available in multifamily buildings within Massachusetts. The results of this study did not impact the 2011 evaluated results but is being used to inform ongoing planning and program design. This study is discussed in more detail in Section III, Study 5.
- *Demand Impact Model User Manual:* The Demand Impact Model User Manual was updated to reflect new load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by PA. The Compact saw a net decrease in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 9.
- *Massachusetts 2011 Low Income Program Process Evaluation:* This study assessed program processes with a particular focus on identifying similarities and differences in the perspectives and assumptions of program staff, implementation staff, and customers regarding program goals, design and implementation across the PAs. The study produced recommended improvements for process-related issues, identified areas where the program changed in 2011, and followed up on topics initially researched in 2010. This evaluation has no impact on 2011 evaluated results. This study is discussed in more detail in Section III, Study 16.
- *Additional Non-Energy Impacts for Low Income Programs:* This additional research clarified and expanded the research performed in the Residential and Low-Income Non-Energy Impacts Evaluation (filed in D.P.U 11 -116). Values were updated for certain additional Non-Energy Impacts. Savings were not impacted by this research, however, there was a net increase to benefits for the Compact. The additional research is discussed in more detail in Section III, Study 28.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

C. Commercial & Industrial Sector Programs

1. Summary

During 2011, the Cape Light Compact implemented the following Commercial & Industrial ("C&I") programs[7]:

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

2. C&I Sector Performance Highlights

During 2011, 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:

- **Gas/Electric Integration** - Building on the transition which took place in 2010, gas and electric integration continued to grow and run more smoothly. Program Administrators identified multi-fuel leads and worked closely with their counterparts in the same service territory to develop combined gas and electric projects for their customers. With these advancements, the Program Administrators realized increased savings and participation as vendors became more comfortable identifying and installing gas measures.
- **MOU Agreements** – The use of these innovative agreements, focused on long-term energy savings with large C&I customers, continued to expand across the Commonwealth in 2011. The adoption of MOUs by an increased number of customers in 2011 will serve to yield energy savings in years to come as the agreements ramp up, lifting performance of both New Construction/Major Renovation and Large Retrofit projects.
- **Upstream Initiative** - New Construction program savings were bolstered during the fourth quarter of 2011 by the introduction of the Upstream Lighting initiative, which was launched in September of 2011. In just a few months, this initiative resulted in over $5 million of incentives, supporting over 340,000 High Performance T8, High Output T5, and LED lamps by the end of the year. Overall, the emergence and advancement of LED products helped evolve programs in 2011, as costs came down and product became more readily available and reliable.

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

Tables II.C.1 through II.C.3 provide summary information on the performance of the commercial & industrial programs at the sector, end use, and program levels, respectively.

Tables II.C.4 through II.C.6 provide detailed information on the performance of each commercial & industrial program.

7 The Cape Light Compact did not offer any pilot programs in the commercial and industrial sector this year.

Table II.C.1
Commercial & Industrial Sector Summary

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	$ 9,659,199			$ 4,420,046		-54%
Performance Incentive	$	$ -			$ -		0%
Savings and Benefits							
Energy							
Lifetime	MWh	230,622	126,518	-45%	134,400	6%	-42%
Annualized	MWh	17,612	9,883	-44%	10,497	6%	-40%
Demand							
Lifetime	kW	59,472.88	29,261.20	-51%	27,003.44	-8%	-55%
Annualized							
Summer	kW	4,538.25	2,303.42	-49%	2,135.33	-7%	-53%
Winter	kW	2,567.72	1,185.24	-54%	1,289.68	9%	-50%
Non-Electric Benefits (Lifetime)	$	$ 573,369	$ 1,628,752	184%	$ 1,347,567	-17%	135%
Cost-Effectiveness							
TRC Benefits	$	$ 33,764,352			$ 19,681,097		-42%
TRC Costs	$	$ 11,179,131			$ 5,661,182		-49%
Net Benefits	$	$ 22,585,221			$ 14,019,915		-38%
BCR		3.0			3.5		15%

The Cape Light Compact has a history of significant variances between plan and actual costs, savings and benefits for its C&I programs. As a smaller Massachusetts PA, small absolute changes in total program costs, savings and benefits result in significant variances. As a result, relatively small changes in the timing or scale and scope of a few projects can add up to a significant variance in total program costs, savings and benefits. Also, the small number of Large C&I customers on Cape Cod and Martha's Vineyard make forecasts of expenditures, savings and benefits for this program particularly challenging.

Within the C&I sector, as shown below in Table II.C.3, the following programs are contributing to the variance between planned and evaluated values:

- C&I New Construction and Major Renovation (for TRC Benefits, TRC Costs and Net Benefits): Please reference section II.C.a for a more detailed discussion of the cause of the variances for this program.
- C&I Large Retrofit (for TRC Benefits, TRC Costs, Net Benefits and BCR): Please reference section II.C.b for a more detailed discussion of the cause of the variances for this program.
- C&I Small Retrofit (for TRC Costs, TRC Benefits and Net Benefits): Please reference section II.C.c for a more detailed discussion of the cause of the variances for this program.

Impact evaluation studies apply to the following C&I sector programs:

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

- C&I Small Retrofit

However, the combined effect of the impact evaluation studies at the sector level is not significant, as evidenced by the fact that the overall Evaluated Results % Change from Preliminary, shown in Table II.C.1, is not significant.

Table II.C.2

Commercial & Industrial Sector Summary of End-Uses

End Uses	Units (Lifetime)	Preliminary Year-End Results	Evaluated Results	% Change from Preliminary to Evaluated
Lighting				
Energy	MWh	72,465	75,273	4%
Demand	kW	19,110	18,034	-6%
NEB (Lifetime)	$	$ 1,249,464	$ 932,235	-25%
HVAC				
Energy	MWh	30,864	33,225	8%
Demand	kW	6,932	5,779	-17%
NEB (Lifetime)	$	$ 137,061	$ 148,763	9%
Motors				
Energy	MWh	5,427	5,362	-1%
Demand	kW	2,119	2,065	-3%
NEB (Lifetime)	$	$ -	$ -	0%
Refrigeration				
Energy	MWh	14,544	17,160	18%
Demand	kW	362	374	3%
NEB (Lifetime)	$	$ -	$ -	0%
Hot Water				
Energy	MWh	51	102	102%
Demand	kW	-	-	0%
NEB (Lifetime)	$	$ 21,649	$ 43,740	102%
Compressed Air				
Energy	MWh	825	911	10%
Demand	kW	64	70	10%
NEB (Lifetime)	$	$ -	$ -	0%
Envelope				
Energy	MWh	2,343	2,367	1%
Demand	kW	674	681	1%
NEB (Lifetime)	$	$ 220,578	$ 222,829	1%
Total				
Energy	MWh	126,518	134,400	6%
Demand	kW	29,261	27,003	-8%
NEB (Lifetime)	$	$ 1,628,752	$ 1,347,567	-17%

Table II.C.3				
Commercial & Industrial Program Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Commercial & Industrial New Construction & Major Renovation				
TRC Benefits	$	$ 9,138,214	$ 5,122,234	-44%
TRC Costs	$	$ 1,695,196	$ 1,088,578	-36%
Net Benefits	$	$ 7,443,018	$ 4,033,656	-46%
BCR		5.4	4.7	-13%
Commercial & Industrial Large Retrofit				
TRC Benefits	$	$ 3,791,075	$ 5,801,782	53%
TRC Costs	$	$ 1,137,872	$ 784,097	-31%
Net Benefits	$	$ 2,653,203	$ 5,017,686	89%
BCR		3.3	7.4	122%
Commercial & Industrial Small Retrofit				
TRC Benefits	$	$ 20,835,063	$ 8,757,081	-58%
TRC Costs	$	$ 8,319,822	$ 3,708,041	-55%
Net Benefits	$	$ 12,515,241	$ 5,049,040	-60%
BCR		2.5	2.4	-6%
Hard-To-Measure Initiatives				
TRC Costs	$	$ 26,241	$ 80,466	207%
Total				
TRC Benefits	$	$ 33,764,352	$ 19,681,097	-42%
TRC Costs (incl HTM Initiatives)	$	$ 11,179,131	$ 5,661,182	-49%
Net Benefits	$	$ 22,585,221	$ 14,019,915	-38%
BCR		3.0	3.5	15%

3. 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 – commercial, industrial, institutional, and government customers.

Definition of Program Participant: A count of the number of unique sites where one or more projects were completed during the program year, plus the number of unique sites participating in the Upstream Lighting buy-down initiative during the year.

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 Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

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	$	$ 1,287,876			$ 837,336		-35%
Performance Incentive	$	$ -			$ -		0%
Participants	sites	79			163		106%
Program Cost / Participant	$	$ 16,302			$ 5,137		-68%
Savings and Benefits							
Energy							
Lifetime	MWh	59,213	28,053	-53%	29,561	5%	-50%
Annualized	MWh	3,841	2,294	-40%	2,395	4%	-38%
Average Measure Life	Yrs	15	12	-21%	12	1%	-20%
Demand							
Lifetime	kW	15,699.7	9,158.09	-42%	7,645.58	-17%	-51%
Annualized							
Summer	kW	1,034.4	687.40	-34%	583.98	-15%	-44%
Winter	kW	720.3	294.00	-59%	282.63	-4%	-61%
Average Measure Life	Yrs	15	13	-12%	13	-2%	-14%
Non-Electric Benefits (Lifetime)	$	$ 678,718	$ 815,186	20%	$ 755,824	-7%	11%
Cost-Effectiveness							
TRC Benefits	$	$ 9,138,214			$ 5,122,234		-44%
TRC Costs	$	$ 1,695,196			$ 1,088,578		-36%
Net Benefits	$	$ 7,443,018			$ 4,033,656		-46%
BCR		5.4			4.7		-13%

C&I New Construction had more than double the expected number of participants in 2011 as compared to planned, but was under budget because cost per participant was significantly lower than anticipated in 2011. There are several explanations for the lower cost per participant:

- First, the economic climate in 2011 continued to make it difficult to plan for C&I New Construction and Major Renovation projects, and a number of project scopes were scaled back between planning and implementation phases, just as in 2010.
- Second, the Cool Choice program continued to be well subscribed by customers in 2011. As was the case last year, Cool Choice incentives per customer tended to be substantially lower than other new construction projects.
- Lastly, the Upstream Lighting buy-down program was launched in September of 2011 as an initiative within New Construction, and proved immediately popular, contributing the majority of additional program participants at a substantially lower cost per participant.

Lifetime and annual energy savings were also significantly lower than planned in 2011 with an even greater variance than in program spending. There were a couple of reasons for this variance in savings being so much greater than the budget variance:

- First, there was a shift in measure mix to HVAC measures from other non-lighting measures. Since HVAC has a higher cost than most non-lighting measures, the program

achieved less savings on a dollar per dollar basis than expected from this substantial portion of budget, contributing to a greater overall variance in savings.

- Second, there was also a small but not insignificant increase in the cost of energy for a substantial portion of program savings in lighting, due to the somewhat more expensive savings in Upstream Lighting buy-down than other program lighting, largely associated with LED lamps.

Lifetime demand savings, and annualized summer and winter demand savings were similarly lower than planned due to the shift in measure mix. Winter demand savings were more impacted than summer, at almost half of what was expected, due to the shift in measure mix to HVAC measures, which have higher summer coincidence factors.

By contrast, non-electric benefits were higher than plan. This was due to other fuel benefits for HVAC measures that were not anticipated in the plan. Also, the Compact installed more lighting measures than planned. A deemed savings change resulted in a change to the negative NEB value for lighting that quantifies the reduction in lighting waste heat, making this value a lower negative value.

Lastly, the BCR declined compared to planned, due to the increased cost of savings associated with greater HVAC in the measure mix and the increased cost associated with the addition of Upstream Lighting. This was somewhat mitigated by the increase in NEBs over what was expected. Despite these changes, the program remains cost-effective.

There were no significant changes from preliminary to evaluated results.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Impact Evaluation of 2010 Custom Process and Compressed Air Installations:* This study produced realization rates for annual kWh, summer on-peak and seasonal peak kW, and winter on-peak and seasonal peak kW for those custom projects in the Process and Compressed Air end-use category. The net effect on each PA's program is dependent on the previous realization rates being incorporated into each PA's screening tool, and may therefore differ. The results of this study did not impact Cape Light Compacts 2011 evaluated results. The study is discussed in more detail in Section III, Study 20.
- *Impact Evaluation of 2010 Custom Lighting Installations:* This study produced realization rates for annual kWh, summer on-peak and seasonal peak kW, and winter on-peak and seasonal peak kW for those custom projects in the Lighting end-use category. The net effect on each PA's C&I New Construction and C&I Retrofit programs is dependent on the previous realization rates being incorporated into each PA's screening tool, and may therefore differ. The study is discussed in more detail in Section III, Study 21.
- *Massachusetts Large Commercial & Industrial Process Evaluation:* The study examines key process topics identified by the EEAC, PAs and the DOER including how to improve integration and coordination, concerns about the adequacy of staffing levels, how to achieve deeper savings, whether medium-sized C&I customers are being adequately

served by the programs, the adequacy or program tracking databases, and program satisfaction. The results of this study did not impact the 2011 evaluated results. The study is discussed in more detail in Section III, Study 22.

- *HVAC Market Characterization and Penetration Analysis:* This study estimates the market penetration of energy-efficient equipment in the Massachusetts commercial HVAC market, gauges the level of large C&I program influence on market penetration, and characterizes the market for emergency replacement. The results of this study did not impact the 2011 evaluated results. The study is discussed in more detail in Section III, Study 23.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

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 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 count of the number of unique sites where one or more projects were completed during the program year.

Targeted End-Uses:

- Lighting
- Motors and Drives
- HVAC
- Refrigeration
- Envelope
- Water Heating

Delivery Mechanism: Program Administrator staff, trade allies and project administrators performed most sales, marketing, program administration, and implementation functions while outside contractors were retained for technical review of applications, on-site energy analysis,

technical and design assistance for comprehensive projects, project commissioning services, and the actual measure installations, including turn-key services.

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

Docket/Exhibit where the Program is Discussed and Approved: The Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

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

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	$	$ 941,260			$ 561,096		-40%
Performance Incentive	$	$ -			$ -		0%
Participants	sites	23			25		9%
Program Cost / Participant	$	$ 40,924			$ 22,444		-45%
Savings and Benefits							
Energy							
Lifetime	MWh	25,270	46,035	82%	48,536	5%	92%
Annualized	MWh	1,923	2,952	53%	3,109	5%	62%
Average Measure Life	Yrs	13	16	19%	16	0%	19%
Demand							
Lifetime	kW	7,621.57	5,703.22	-25%	5,593.58	-2%	-27%
Annualized							
Summer	kW	610.3	388.16	-36%	378.44	-3%	-38%
Winter	kW	378.8	228.77	-40%	231.73	1%	-39%
Average Measure Life	Yrs	12	15	18%	15	1%	18%
Non-Electric Benefits (Lifetime)	$	$ (6,385)	$ (37,185)	-482%	$ (34,885)	6%	-446%
Cost-Effectiveness							
TRC Benefits	$	$ 3,791,075			$ 5,801,782		53%
TRC Costs	$	$ 1,137,872			$ 784,097		-31%
Net Benefits	$	$ 2,653,203			$ 5,017,686		89%
BCR		3.3			7.4		122%

In 2011, this program achieved much higher savings than expected, at significantly lower costs than expected, and at a significantly lower cost per participant. This increase in savings, which was achieved at a much lower cost, in turn drives a much higher than expected BCR for this program.

The variance in the Large Retrofit program budget is driven by the following factors:

- The incentive associated with a very large HVAC project was not taken by the customer because of federal vendor contract restrictions. This participant was first served by the Compact through a fully funded technical assistance (TA) study, and based upon that TA study, the customer installed equipment that resulted in annual savings in excess of 1000 MWh – constituting roughly 40% of the program's annual and lifetime energy savings, the largest portion of program savings from a single project.
- Approximately 1/4 of lifetime program savings were from Refrigeration measures that were achieved at a much lower than expected $/MWh. These measures were a much more significant share of program activity than anticipated. Also, the type of refrigeration measure installed was much less costly than other types of refrigeration measures. Furthermore, we believe that the project costs for these installations were lower than expected due to the buying power of the customers' parent companies.

Program costs per participant were similarly lower than planned for the following reasons:

- The incentive associated with the very large government project was not paid out despite receiving technical assistance to steer the customer towards the most efficient equipment possible.
- Refrigeration incentives were less than 20% of their expected $/MWh and provided the second largest portion of lifetime MWhs at approximately 25% of total savings.

Higher than expected program energy savings were driven by the following factors:

- Both HVAC and Refrigeration end-use measures were installed at far greater rates than expected for planned program activity, and at much lower $/MWh than expected for those measures. These two categories of measures therefore added significantly to program savings without comparable use of program budget funds.
- The change in measure mix for program year 2011 to include less Lighting and greater HVAC and Refrigeration also drove the increase in measure life and a corresponding increase in lifetime savings.

Decreases in demand savings were also driven by the change in measure mix, as the HVAC project had lower summer and winter coincidence than the Lighting measures.

Despite a deemed savings value change that resulted in a less negative NEB value for the reduction in lighting waste heat making, non-electric benefits were significantly lower than plan in 2011 due to a difference in the Lighting measure mix.

There were no significant changes from preliminary to evaluated results.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *2010 Combined Heat and Power Impact Evaluation Methodology and Analysis Memo:* This study produced realization rates for annual kWh, therms, and fuel impacts for those CHP projects in the CHP end-use category. The net effect on each PA's program is dependent on the difference between the new realization rate and the previous realization

rate incorporated into each PA's screening tool, and may therefore differ. The study is discussed in more detail in Section III, Study 19.

- *Impact Evaluation of 2010 Custom Process and Compressed Air Installations:* This study produced realization rates for annual kWh, summer on-peak and seasonal peak kW, and winter on-peak and seasonal peak kW for those custom projects in the Process and Compressed Air end-use category. The net effect on each PA's program is dependent on the previous realization rates being incorporated into each PA's screening tool, and may therefore differ. The study is discussed in more detail in Section III, Study 20.
- *Impact Evaluation of 2010 Custom Lighting Installations:* This study produced realization rates for annual kWh, summer on-peak and seasonal peak kW, and winter on-peak and seasonal peak kW for those custom projects in the Lighting end-use category. The net effect on each PA's C&I New Construction and C&I Retrofit programs is dependent on the previous realization rates being incorporated into each PA's screening tool, and may therefore differ. The study is discussed in more detail in Section III, Study 21.
- *Massachusetts Large Commercial & Industrial Process Evaluation:* The study examines key process topics identified by the EEAC, PAs and the DOER including how to improve integration and coordination, concerns about the adequacy of staffing levels, how to achieve deeper savings, whether medium-sized C&I customers are being adequately served by the programs, the adequacy of program tracking databases, and program satisfaction. The results of this study did not impact the 2011 evaluated results. The study is discussed in more detail in Section III, Study 22.
- *HVAC Market Characterization and Penetration Analysis:* This study estimates the market penetration of energy-efficient equipment in the Massachusetts commercial HVAC market, gauges the level of large C&I program influence on market penetration, and characterizes the market for emergency replacement. The results of this study did not impact the 2011 evaluated results. The study is discussed in more detail in Section III, Study 23.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

c. C&I Small Retrofit

Purpose/Goal: The primary objective of the C&I Small Retrofit Program was to provide cost-effective, comprehensive electric, gas, oil and propane retrofit services to small business customers on a turn-key basis using the same delivery model throughout the Commonwealth. The Compact also provides application-based project services to small business customers under the umbrella of this program.

Targeted Customers: The target market for this program was business customers with average monthly demand below 300kW.

Definition of Program Participant: A count of the number of unique sites where one or more projects were completed during the program year.

Targeted End-Uses:
- Lighting
- HVAC
- Hot Water
- Motors & Drives
- Refrigeration
- Hot Water
- Envelope

Delivery Mechanism: Direct Install 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. Non-direct install program services were delivered via the retrofit application process as was the case for Large C&I Retrofit.

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

Docket/Exhibit where the Program is Discussed and Approved: The Cape Light Compact's 2011 plan was approved as part of its three-year plan (2010-2012) in the January 28, 2010 DPU order in Docket 09-119. Subsequently, the Cape Light Compact has filed updates to its three-year plan adjusting certain of its programs and pilots (referred to as its 2010 Mid-Year Revisions (D.P.U. 10-106, January 10, 2011); 2011 Mid-Term Modifications (D.P.U. 10-147, pending) and 2012 Mid-Term Modifications (D.P.U. 11-116, pending).

<u>All Fuels Comprehensive Retrofit Program (Cape Light Compact-specific component of the C&I Small Retrofit program)</u>

In 2010, the Compact expanded its small commercial and industrial retrofit program to include cost-effective thermal measures designed to save oil, propane and other unregulated fuels. These cost-effective measures mirrored those technologies identified as gas measures including, but not limited to: programmable thermostats, pre-rinse spray valves, pipe insulation, insulation, air sealing, EMS, hood controls and other custom measures, as deemed appropriate. In 2011, the Compact continued with its All Fuels approach.

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

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	$	$ 7,403,822			$ 2,941,149		-60%
Performance Incentive	$	$ -			$ -		0%
Participants	sites	884			472		-47%
Program Cost / Participant	$	$ 8,375			$ 6,231		-26%
Savings and Benefits							
Energy							
Lifetime	MWh	146,138	52,429	-64%	56,303	7%	-61%
Annualized	MWh	11,848	4,636	-61%	4,994	8%	-58%
Average Measure Life	Yrs	12	11	-8%	11	0%	-9%
Demand							
Lifetime	kW	36,151.6	14,400	-60%	13,764.29	-4%	-62%
Annualized							
Summer	kW	2,893.5	1,227.86	-58%	1,172.91	-4%	-59%
Winter	kW	1,468.6	662.46	-55%	775.32	17%	-47%
Average Measure Life	Yrs	12	12	-6%	12	0%	-6%
Non-Electric Benefits (Lifetime)	$	$ (98,964)	$ 850,751	960%	$ 626,628	-26%	733%
Cost-Effectiveness							
TRC Benefits	$	$ 20,835,063			$ 8,757,081		-58%
TRC Costs	$	$ 8,319,822			$ 3,708,041		-55%
Net Benefits	$	$ 12,515,241			$ 5,049,040		-60%
BCR		2.5			2.4		-6%

The Small Retrofit Program did not spend its budget in 2011 because it had only half as many participants as planned, and the cost per participant was lower than anticipated.

The program's reduced participation rate was especially evident in the government sector, which was originally expected to account for approximately 40% of program spending in 2011. Instead, actuals for this sector came in at less than half of the planned percent of overall spending. Since the Compact pays a higher incentive level for government projects (up to 100% incentive as compared to up to 80% incentive for non-government), it makes sense that a low showing on the government side would reduce per participant spending from expected levels for the program overall. Reduced program participation and spending likewise yielded correspondingly lower energy and demand savings than planned, coming in at less than half of what was originally planned.

In contrast, non-electric benefits were again significantly higher than plan in 2011. This is due to a difference in the Lighting measure mix. Additionally, a TRM correction resulted in a change to the negative NEB value for lighting that quantifies the reduction in lighting waste heat, making this value a less negative one.

Changes from preliminary to evaluated results came from the Non-Controls Lighting impact evaluation as noted below and impacted the whole program slightly. While there is a small

decrease in summer demand, the change to coincidence factors for winter demand reflects an increase. In addition, the heating penalty associated with the lighting was larger and caused a significant decrease to the penalty received, as reflected in the difference between preliminary NEBs and evaluated results.

The EM&V studies included in the Annual Report that apply to this program are as follows:

- *Non-Controls Lighting Evaluation for the Massachusetts Small Business Direct Install Program: Multi-Season Study:* This study improved on the 2010 impact evaluation of annual energy savings and peak demand impacts for the retrofit installation of high-efficiency lighting fixtures through the C&I Small Retrofit programs. Results from extended 2011 summer metering were added to winter metering from the 2010 study. Combining the two impact evaluations produced revised energy kWh and connected kW realization rates, summer and winter coincidence factors and HVAC interaction factors. The net effect for the Compact was to increase energy savings for this program. The study is discussed in more detail in Section III, Study 18.

The program's performance and the results of the impact evaluations described above will be used to adjust the planning estimates for the program in the next three-year plan for 2013-2015. Changes to this program are not currently expected to result in a mid-term modification for the remainder of the current three-year plan. [A mid-term modification was submitted for this program in the Compact's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in Compact, D.P.U. 11-116.]

III. EVALUATION MEASUREMENT AND VERIFICATION ACTIVITIES

The purpose of this section is to provide detailed information on the EM&V studies included in the Annual Report for each sector.

The Massachusetts Program Administrators completed thirty evaluation studies for the 2011 Annual Report. The following is a statewide summary of the subset of these evaluation studies that had significant impact on the final evaluated data.

The studies that had the most significant impact for electric Program Administrators were:

- Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation and Additional Non-Energy Impacts for Low Income Programs
- Low Income Single Family Program Impact Evaluation
- Demand Impact Model User Manual
- Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle
- Massachusetts Multifamily Program Impact Analysis
- 2010 Combined Heat and Power Impact Evaluation Methodology and Analysis Memo

In the Massachusetts Special and Cross-Sector Studies area, *the Residential and Low Income Non-Energy Impacts (NEI) study* had a large impact on overall residential and low income sector benefits based on the previously filed study in Cape Light Compact, D.P.U. 11-116. The supplemental research on non-energy impacts for low-income programs includes additional low income benefits that clarifies and expands the prior research performed in the *Residential and Low-Income Non-Energy Impacts Evaluation*. The additional information focused on lighting quality, refrigerator recycling, price hedging, and economic development, and the results have a significant positive impact on the benefits attributable to low-income programs. Additional information on the updated non energy benefit values for the low-income program can be found in Appendix C, Study 28.

The Low Income Single Family Program Impact Evaluation quantified the gross per-unit savings generated by each low-income measure through billing and engineering analyses. Depending on planning assumptions and measure mix, this study had a different impact on each of the Program Administrators because the results varied by measure. This study is discussed in more detail in Appendix C, Study 17.

The Demand Impact Model and User Manual updated previous demand impact factors to reflect the most recent load shape data, per-unit measure energy savings, and ISO-NE definitions of peak periods. The results of this study were applied to 2011 study results with the overall effect varying by Program Administrators and by program. This study had no impact on electric savings; it only changed demand and capacity factors. This study is discussed in more detail in Appendix C, Study 9.

The Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle was conducted in partnership with DOER to assess compliance with basic building code prescriptive path requirements at the end of the 2006 International Energy Conservation Code (IECC) code cycle. The report provides a preliminary assessment of how new single-family residential building characteristics compare to the current User Defined Reference Home baseline. The study compared efficiency lighting levels, building practices, equipment efficiencies, and other characteristics in custom versus spec built homes. The results from this study significantly reduced the electric savings based on the penetration rates of high efficiency lighting and appliances with NTG ratios between 79 percent and 11 percent. This study is discussed in more detail in Appendix C, Study 3.

The Massachusetts Multifamily Program Impact Analysis provides a set of savings approaches that can be used by all of the PAs as well as program attribution information. These objectives were accomplished by interviewing key stakeholders, analyzing the results, and offering recommendations for future program improvement. The overall impact of the report resulted in 2011 savings decreasing due to the 18 percent free-ridership number derived from this study. This study is discussed in more detail in Appendix C, Study 8.

The 2010 Combined Heat and Power Impact Evaluation Methodology and Analysis Memo was intended to determine kWh realization rates, thermal realization rates, and fuel impact realization rates at both the Program Administrator and statewide level. The kWh realization rate will inform the net savings calculations and the thermal realization rates and fuel impact realization will inform implementation and engineering accuracy of the project screening process. With the new impact results, the resulting realization rate for NSTAR Electric will increase net savings while the resulting realization rate for National Grid will decrease net savings. This study is discussed in more detail in Appendix C, Study 19.

A. Summary

Table III.A summarizes the EM&V studies that have not been included in previous Annual Reports.

Table III.A
Evaluation Studies in Annual Report

Studies	Location of Complete Study in Report	Docket and Exhibit Approving Planned Evaluation Studies	Implemented as Approved? (Y / N)
Residential Program Studies			
Massachusetts Residential New Construction Home Buyer Survey	App. C, Study 1	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	All studies are implemented as planned
Massachusetts Residential New Construction Focus Groups with Participant Builders	App. C, Study 2	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle	App. C, Study 3	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Home Energy Services Net-to-Gross Evaluation	App. C, Study 4	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Massachusetts Multifamily Market Characterization and Potential Study	App. C, Study 5	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Massachusetts Multifamily Program Process Evaluation	App. C, Study 6	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Massachusetts Multifamily Program Impact Analysis	App. C, Study 7	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Brushless Fan Motors Impact Evaluation	App. C, Study 8	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Demand Impact Model User Manual	App. C, Study 9	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	
Massachusetts Consumer Survey Results 2011	App. C, Study 10	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Residential Pilot Studies			
Major Renovations Pilot Evaluation	App. C, Study 11	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	All studies are implemented as planned
Massachusetts Residential New Construction Four to Eight Story Multifamily Pilot Interview Findings	App. C, Study 12	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Home Energy Services Packaged Measure Pilot Evaluation	App. C, Study 13	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	
Heat Pump Water Heaters Evaluation of Field Installed Performance	App. C, Study 14	Study is planned but not yet submitted for approval	
Solar Hot Water Pilot Program Evaluation	App. C, Study 15	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	

Table III.A Evaluation Studies in Annual Report (cont'd)			
Studies	Location of Complete Study in Annual Report	Docket & Exhibit Approving Planned Evaluation Studies	Implemented as Approved? (yes/no)
Low-Income Program Studies			
Massachusetts 2011 Low Income Program Process Evaluation	App. C, Study 16	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	All studies are implemented as planned
Low Income Single Family Program Impact Evaluation	App. C, Study 17	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	
Commercial & Industrial Program Studies			
Non-Controls Lighting Evaluation for the Massachusetts Small Business Direct Install Program: Multi-Season Study	App. C, Study 18	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U.	All studies are implemented as planned
2010 Combined Heat and Power Impact Evaluation Methodology and Analysis Memo	App. C, Study 19	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Impact Evaluation of 2010 Custom Process and Compressed Air Installations	App. C, Study 20	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Impact Evaluation of 2010 Custom Lighting Installations	App. C, Study 21	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Process Evaluation of the Large Commercial and Industrial Energy Efficiency Programs	App. C, Study 22	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
HVAC Market Characterization and Penetration Analysis	App. C, Study 23	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	
Special & Cross Sector Studies			
Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report	App. C, Study 26	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	All studies are implemented as planned
Massachusetts Umbrella Marketing Evaluation Report	App. C, Study 27	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Additional Non-Energy Impacts for Low Income Programs	App. C, Study 28	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	
Community-Based Partnerships 2011 Evaluation Final Report	App. C, Study 30	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	

B. Residential Program Studies

1. Massachusetts Residential New Construction Home Buyer Survey

Type of Study: Market Assessment

Objective of the Study: Examine what buyers look for in a new home, awareness of ENERGY STAR homes, the role of ENERGY STAR certification in new home shopping, perceptions of ENERGY STAR homes, and reactions to recent changes in the program. The study also provides updates of similar surveys conducted in 2002, 2003, 2004, and 2006.

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study: There are no recommendations. This study was informational, conducted to assess the role of energy efficiency in shopping for a newly constructed home as well as awareness and perceptions about the program.

#	Finding
1	The importance of getting a more efficient home with lower energy bills has steadily risen for all buyers of new homes from 2002 to 2010 with the mean ranking, using a scale from 0 to 10 where 0 is one of the least important factors and 10 is one of the most important factors, rising from 7.2 in 2002 to 9.0 in 2010.
2	Close to three out of five buyers of new homes are now aware of the ENERGY STAR label on new homes; this is more than twice the percentage who were aware at the time of the first Massachusetts home buyer survey in 2002; most of the increase in awareness occurred between 2006 and 2010.
3	Home buyers in 2010 are significantly more likely to discuss the energy efficiency of the new home, how much it would cost to heat and cool the home, and green building while shopping for or building a new home than they were in 2006. The percentage discussing energy efficiency in 2010 is 60% up from 37%; heating and cooling costs is 53% up from 25%; and green building is 26% up from 9%.
4	More than seven out of ten (72%) home buyers aware of ENERGY STAR homes believe they provide a little or a lot more value for the money, up from just over one-half (53%) in 2006.
5	Overall satisfaction with the program has remained high with nearly three-quarters of buyers of new ENERGY STAR homes who know they have ENERGY STAR homes saying they are 'satisfied' or 'extremely satisfied'. Asked to rate the importance of going through the Massachusetts program, after changes that do not require ENERGY STAR certification, three out of ten (30%) respondents say that going through the program would be very important if they were building or buying a new home today and an additional one-third (34%) believe program participation would be somewhat important.

How the Study Came to the Recommended Conclusions: Findings are based on telephone surveys of recent buyers of newly constructed homes in Massachusetts that were conducted from June through September of 2011. Surveys were completed with 100 households who had bought ENERGY STAR certified homes and 118 households who had bought homes that did not participate in the program.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: Though there were no specific recommendations from this study, the Findings indicate a positive trend. This upward trend in the growing importance of energy efficiency in new home purchases is communicated through mid stream actors such as real estate agents and mortgage bankers/brokers about long term affordability. The program continues to tap into the strong ally

relationships it has formed with the Real Estate and Mortgage industry to continue to provide trainings and marketing assistance on the importance of energy efficient new construction.

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

2. Massachusetts Residential New Construction Focus Groups with Participant Builders

Type of Study: Market Assessment

Objective of the Study: The objective of the study was to assess the participating builders' experience with the program and their reactions to changes made in 2011 and changes which may be forthcoming in 2012.

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study:

#	Recommendation
1	Capitalize on the theme that the program differentiates home builders in a positive manner throughout the marketplace. – On-going task
2	Continue to educate home buying consumers on the characteristics of energy-efficient homes and potential savings associated with living in an energy-efficient home. – Working with Real Estate market – mid stream marketing.
3	If program Tiers and HERS rating scores are mentioned at all in marketing materials to the home-buying consumer, provide simple and clear explanations of their significance.
4	Incorporate additional educational information into marketing materials for program participants. Further outreach is necessary to raise the awareness of participant builders with respect to changes in the program.
5	If the shift to an open HERS rater market occurs, provide clear marketing materials to builders emphasizing the advantages offered by HERS raters. Builders should also be made aware that HERS raters operate in a competitive market, charging varying fees and offering different services.

How the Study Came to the Recommended Conclusions: Findings are based on two focus groups conducted in June of 2011 with home builders who participated in the program before 2011.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: The program has incorporated the above recommendations as follows:

- By leveraging the National EPA ENERGY STAR Homes program websites Builder Partner Resource Center and Massachusetts specific builder marketing support, the program continues to assist and provide builder partners resources to stand out from their competitors. This is done through online support, marketing materials and through technical and sales trainings.
- Through the utilization of mid stream allies such as real estate professionals and mortgage brokers the program continues to educate the new residential home buying market on the benefits of purchasing an energy efficient new home. Value added benefits such as long term affordability, comfort and durability are discussed.
- Currently the program does not provide HERS Rating or Tier achievement directly to home buying consumers, however individual Raters may provide this information as part of their services, but this is decided outside of the programs requirements. All homes do receive a sticker indicating that it has participated in the program along with the final HERS Index and if it achieved ENERGY STAR.
- The program continues to provide several channels to distribute marketing materials, educational opportunities and programmatic updates. In 2011 the program launched a Massachusetts specific HERS Rater Website and Portal. The Portal allows program Raters to download the most recent program documentation, upload applications and incentive worksheets, report completions, view upcoming events and trainings and it also allows for the exchange of best practices and technical assistance on its message board. The program still also communicates information through email and fax blasts.
- Although the program currently provides Raters with an incentive to participate, the builder is made aware of this amount when they receive their participation confirmation letter. This shows not only the incentive the rater is receiving; it helps to establish a value and cost associated with the services provided. This will be beneficial in the upcoming years as the program moves towards decreasing Rater incentives.

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

3. Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle

Type of Study: Impact Evaluation

Objective of the Study: Homes were inspected between April and June of 2011 with three primary tasks in mind:

- Conducting a full HERS rating using REM/Rate software
- Filling out the 2006 IECC checklist developed by PNNL
- Providing program Sponsors with a mini baseline study of 50 non-ENERGY STAR-qualified homes completed at the end of the 2006 IECC code cycle

Programs to which the Results of the Study Apply:

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

Results of the Study and How the Study Determined those Results: This study was conducted in partnership with DOER to assess compliance with basic building code prescriptive path requirements at the end of the 2006 International Energy Conservation Code ("IECC") code cycle, provide a preliminary assessment of how current new single-family residential building characteristics compare to current User Defined Reference Home ("UDRH") inputs, and conduct audits of energy efficient lighting and appliances within the homes. The study also compared building practices, equipment efficiencies, and other characteristics in custom versus spec built homes.

#	Finding
1	Some current UDRH inputs may underestimate and others overestimate the energy efficiency of current building practices or equipment. Heating system efficiency inputs—the average efficiencies of gas (natural gas and propane) furnaces and boilers in inspected homes are higher than the current UDRH inputs, but wall, floor and ceiling insulation levels are lower.
2	The 2006 IECC prescriptive path insulation requirements for wood-frame walls, floors over unconditioned space and ceilings are, respectively, R-19, R-30 or cavity filled (minimum R-19), and R-38 with an allowance for R-30 in up to 500 feet of cathedral ceiling area. (*Note that a home failing to meet one or more 2006 prescriptive path requirements does not mean the home failed to comply with building code—the home may have complied under a performance-based compliance path that allows trade—offs.*) Most homes with wood framed walls (84%) had R-19 or higher insulation, 28% of homes with floors over unconditioned basements met the 2006 IECC prescriptive insulation requirement, 22% of homes with flat ceilings had R-38 or higher insulation, and no cathedral ceilings had R-38 insulation. However, 67% of homes with cathedral ceilings met the 2006 IECC prescriptive insulation requirement by having a total of 500 square feet or less of cathedral ceiling area insulated to R-30.
3	Twenty-one percent of the total number of bulbs counted in the non- ENERGY STAR Homes were energy efficient.
4	The majority of refrigerators and dishwashers installed in the non-ENERGY STAR homes were ENERGY STAR (73% and 89% respectively).

In most cases the difference between custom and spec homes is minimal. Custom homes tend to have higher R-value conditioned/ambient wall and flat ceiling insulation, while spec homes tend to have higher R-value floor and foundation wall insulation. Custom homes have slightly more efficient heating systems and spec homes have slightly more efficient water heating systems.

Spec homes have lower duct leakage and air infiltration. Custom homes have more energy-efficient light bulbs and slightly higher percentages of ENERGY STAR refrigerators and dishwashers. As an overall indicator of a home's energy efficiency, the HERS ratings conducted on the 50 inspected homes suggest there is little difference between the energy efficiency of custom homes (average HERS 85) and spec homes (average HERS 83); this difference is not statistically significant at the 90% confidence level.

How the Results of the Study Impact each Identified Program's Savings: Due to the penetration rate of energy efficient bulbs and appliances program savings from these measures are reduced accordingly.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): The penetration rates are incorporated into the savings calculations as free-ridership, accordingly the appropriate formula is as follows:

Net kWh savings = Gross kWh savings (100% – Free-ridership % + Spillover %)

Net kW savings = Gross kW savings (100% – Free-ridership % + Spillover %)

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: References to energy characteristics were not incorporated into the UDRH as this study looked at homes built under the 2006 IECC; the current code in Massachusetts is the 2009 IECC. The UDRH will be updated with results from the Full Baseline study, which looked at homes built under the 2009 IECC and will be completed during the summer of 2012.

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

4. 2011 Home Energy Services Net-to-Gross Evaluation

Type of Study: Impact Evaluation

Objective of the Study: To determine measure-specific and program-level net-to-gross ("NTG") values for several of the measures installed in the Home Energy Services program using information gathered from program tracking systems, participant surveys, and non-participant surveys.

Programs to which the Results of the Study Apply:

- Mass Save (Electric)
- Weatherization (Gas)

Results of the Study and How the Study Determined those Results:

Measure Category	Measure	Participant Free-ridership	Participant Spillover	Non-participant Spillover	NTG
Direct Installs	CFL	29%	2.5%	N/R	73%
	Air Sealing	8%	8%	28%	129%
Measures for which an Incentive was Offered	Insulation	25%	20%	28%	123%
	Refrigerator	14%	N/R	N/A*	86%
Overall					113%

Note: N/R = Not Reported, N/A = Not Available

The evaluation findings are based on results from an array of data collection activities and evaluation tasks, including participant and non-participant surveys and self-report and discrete choice (DC)-based assessments of measure-level NTG ratios.

How the Results of the Study Impact each Identified Program's Savings: The results of this study will be used to derive net energy savings by multiplying the gross reported savings by the NTG factors.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s):

$$NTG = 1 - FR + PS + NPS$$

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: The results of the study are adopted with the following exception. The NTG factors for CFLs were also based on this study but modified by agreement with the EEAC consultants on July 2, 2012 to account for the potential of participants who would have bought CFLs outside of the HES program but through the Upstream Lighting program, which was estimated to be 5%.

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

5. Massachusetts Multi-Family Market Characterization and Potential Study

Type of Study: Market Characterization

Objective of the Study: The objective of this study was to assess the potential energy efficiency savings available in multi-family buildings within Massachusetts. The results of this study will be used to inform ongoing energy efficiency planning and program design by identifying the quantity of available potential and determining how it is distributed across end uses in multi-family buildings.

Programs to which the Results of the Study Apply:

- Multi-Family Retrofit (Electric and Gas)
- Low-Income Multi-Family Retrofit (Electric and Gas)

Recommendations Derived from the Study: There are no recommendations from this study as the main purpose was to derive potential savings from multi-family buildings within Massachusetts.

How the Study Came to the Recommended Conclusions: Not Applicable.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: Not Applicable.

A copy of the complete study can be found in Appendix C, Study 5.

6. Massachusetts Multi-Family Retrofit Program Process Evaluation

Type of Study: Process Evaluation

Objective of the Study: The objective of this study was to assess program processes and identify similarities and differences between the perspectives and assumptions of program staff, implementation staff, and customers regarding program goals, design, and implementation.

Primary activities for this study were: (1) report the opinions and perspectives gathered through the interview process; (2) draw conclusions based on the information obtained; and (3) offer specific, actionable recommendations for future program improvement.

Programs to which the Results of the Study Apply:

- Multi-Family Retrofit (Electric & Gas)

Recommendations Derived from the Study:

#	Recommendations
1	Develop a comprehensive statewide Multi-Family program marketing and outreach plan that leverages a range of channels to make initial contact with both property managers and tenants and condo owners.
2	Continue to simplify the process for property managers. Via the Mass Save and/or PA Multi-Family websites, provide prospective participants with more detail on exactly how the program works, what measures could be included, the incentive levels, and sample proposals, in advance of calling the MMI.

3	Consider the costs, benefits, and appropriate incentives for additional standard program measures.
4	With each thermostat, leave behind easy to understand programming instructions in multiple languages.
5	Research and test program design and financing options with the aim of both increasing program participation and increasing savings from each property.
6	Provide materials (technical specifications, instructions) and websites for program participants to obtain technical information on measures and ensure that participants understand that they can contact the MMI for technical support.
7	Track program participation with unique identifiers for the building/facility (facility ID) and participating tenant units (unit #s and/or electric and gas account numbers for individually metered units).

How the Study Came to the Recommended Conclusions: The process evaluation focused on two key activities: (1) Assessing program processes; and (2) Identifying similarities in and differences between the perspectives and assumptions of program staff, implementation staff, and customers regarding program goals, design, and implementation.

The focus of this study was to report the opinions and various perspectives gathered through interviews with program stakeholders. Conclusions and recommendations were developed based on diverse opinions and perspectives.

Evaluation Task	Details
PA Program Manager Interviews (n=6)	Provided insight into PA's perspective of the Multi-Family program in 2011, the overall process of participation in the program, any changes that occurred over the last year, any issues or key topics that emerged, and the current status of the program.
Implementer and Multi-Family Market Integrator Interviews (n=4)	Provided insight into program implementation, the data collection and reporting process, and statewide program collaboration.
Literature Review / Benchmarking	Explored common industry practices and innovative approaches that are being undertaken by MF programs throughout North America.
Property Manager Survey (n=64)	Provided insight into satisfaction at the property management level, program delivery (in process), measure verification and persistence,

	and freeridership and spillover.
Tenant / Condo-owner Survey (n=73)	Provided insight into satisfaction at the individual tenant level, program delivery, verification and persistence of measures installed in tenant spaces, freeridership of tenant space CFLs, and spillover.
Property Manager Focus Group (n=9)	Provided additional insight into the validity of and rationales behind the measure verification, persistence, and net-to-gross results from the survey, as well as further discussion of key topics and testing alternative program design strategies identified during the literature review/benchmarking task
Program Database and Audit Data Review	Conducted a thorough review of program tracking databases, and a related review of program audit data not contained in the program tracking databases to determine what data are collected, understand the data details, determine the appropriate baseline for estimating measure-specific savings generated, and to determine the best way to aggregate and analyze the program data. The data review informed the subsequent engineering review (results of the engineering review are provided in a separate report.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: 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. Recommendations will be considered for implementation consistent with the 2013-2015 Three-Year Energy Efficiency Plan.

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

7. Massachusetts Multi-Family Retrofit Program Impact Analysis

Type of Study: Impact Analysis

Objective of the Study: This impact analysis has two primary objectives. First, the impact work aimed to provide a set of savings approaches (i.e., algorithms and deemed values) that can be used by all PAs (statewide) in future program years. Second, the analysis collected information to inform program attribution, including the measurement of installation rates, persistence, free-ridership, and spillover.

Programs to which the Results of the Study Apply:

- Multi-Family Retrofit Program (Gas and Electric)

Results of the Study and How the Study Determined those Results:

Measure Installation, Persistence, and Freeridership

Measure	PA Data Source	Installation Rate	Persistence Rate	FR (Weighted)	FR (n)
Common Area CFLs	All (except NSTAR)	91%	100%	31%	9
Dwelling CFLs	All (except NSTAR)	98%	99%	12%	3[1]
Dwelling CFLs	All (except NSTAR)	98%	99%	51%	49
Other CFLs	NSTAR	89%	100%	27%	6
Common Area Lighting Fixtures	All PAs	100%[2]	99%	20%	27
Dwelling Lighting Fixtures	All PAs	99%	100%	16%	31
Total Lighting (except CFLs in units where the occupant pays the electric bill)		**96%**	**100%**[3]	**18%**	**63**
Insulation/Air Sealing	All PAs	100%	100%	19%	22
Showerheads	Showerheads and aerators combined	100%	93%	15%	15
Aerators	Showerheads and aerators combined	100%	96%	15%	15
Programmable Thermostats	All PAs	100%	69%[4]	24%	20
Total (All)		**97%**	**100%**[3]	**18%**	**63**

1. For property managers that pay for dwelling electricity; 2. One respondent reported installing more measures than PA participant tracking data, 100% assumes respondent recall was inaccurate; 3. PM and Tenant combination 4. Installed and programmed;

Based on PM Survey Responses

Based on Tenant/Condo Owner Survey Responses

Summary of Proposed Savings Approaches

Measure Category	Primary Algorithm	Alternative Approach
Lighting – CFLs	$\Delta kWh = \frac{N \times \left(Watts_{pre} - Watts_{post}\right) \times Hrs}{1{,}000} XISR$	$\Delta kWh = \frac{N * \left(Watts_{post}\right) \times \Delta WattsMult \times}{1{,}000}$
Lighting – Linear Fluorescents	$\Delta kWh = \frac{(\Sigma[N_{pre} * Watts_{pre}) - \Sigma(N_{post} * Watts]_{post})) \times Hrs}{1{,}000}$	Same algorithm, but deemed values are provided for baseline wattage and operational hours.
Lighting – LED Exit Signs	$\Delta kWh = \frac{n \times \left(Watts_{pre} - Watts_{post}\right) \times Hrs}{1{,}000}$	Same algorithm but, some deemed input values are provided.
Lighting – Metal Halides	$\Delta kWh = \frac{(\Sigma[N_{pre} * Watts_{pre}) - \Sigma(N_{post} * Watts]_{post})) \times Hrs}{1{,}000}$	Same algorithm, but deemed values are provided for baseline wattage and operational hours.

Lighting – Occupancy Sensors	$\Delta kWh = \frac{(Watts_{controlled}) \times Hrs \times svg}{1{,}000}$	Same algorithm, but some deemed input values are provided.
Refrigerators	*Refrigerator Recycling* $\Delta kWh = \left[\left(\left(kWh_{pre} - kWh_{std}\right)\right) \times \frac{(12-8)}{12} + \left(\left(kWh_{std} - kWh_{ee}\right)\right)\right.$ *No Recycling* $\Delta kWh = \left(kWh_{std} - kWh_{ee}\right) \times F_{eee}$	Same algorithm, but some deemed input values are provided.
Attic Insulation Basement Insulation Wall Insulation (gas)	$MMBtu_{annual} = \frac{\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) \times HDD \times 24 \times Area}{1{,}000{,}000 \times \eta_{heat}}$	Same algorithm, but some deemed input values are provided.
Attic Insulation Basement Insulation Wall Insulation (electric)	*Air Conditioning Savings:* $kWh_{annual} \frac{\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) \times CDH \times DUA \times Area}{1{,}000 \frac{Btu}{kBtu} \times \eta_{cool}}$ *Electric Heating Savings:* $kWh_{annual} \frac{\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) \times HDD \times 24 \times Area}{1{,}000{,}000 \times \eta_{heat}} \times 293.1$	Same algorithm, but some deemed input values are provided.
Other Insulation (electric)	Deemed annual kWh savings = 137 kWh.	
Other Insulation (gas)	Deemed annual MMBtu savings = 1.2 MMBtu.	
Air sealing (electric)	$\Delta kWh = \frac{Vol \times \Delta ACH \times 0.018 \times HDD \times \frac{24}{\eta_{heating}}}{3413}$	Same algorithm producing a deemed savings approach per 1000 ft^2 based on zip code and heating type
Air Sealing (gas)	$\Delta MMBtu = \frac{Vol \times \Delta ACH \times 0.018 \times HDD \times \frac{24}{\eta_{heating}}}{1{,}000{,}000}$	Same algorithm producing a deemed savings approach per 1000 ft^2 based on zip code and heating type
Thermostats (electric)	Deemed annual kWh savings = 282 kWh.	
Thermostats (gas)	Deemed annual MMBtu savings = 2.4 MMBtu.	
Heat pump tune-up	$kWh = tons \times 12 \frac{kBtuh}{ton} \times \left(\frac{1}{SEER} \times Hours_{cooling} + \frac{1}{HSPF} \times Hours_{heating}\right)$ $kWh = kBtuh \times \left(\frac{1}{SEER} \times Hours_{cooling} + \frac{1}{HSPF} \times Hours_{heating}\right) \times \%savi$	ΔkWhdwelling = 180 kWh ΔkWhCommonArea = 325 kWh
Aerators (electric)	Deemed annual kWh savings = 41.7 kWh.	
Aerators (gas)	Deemed annual MMBtu savings = 0.36 MMBtu.	

Showerheads (electric)	Deemed annual kWh savings = 55.6 kWh.	
Showerheads (gas)	Deemed annual MMBtu savings = 0.48 MMBtu.	
Pipe Wrap (electric)	Deemed annual kWh savings = 55.6 kWh	
Pipe Wrap (gas)	Deemed annual MMBtu savings = 0.48 MMBtu.	
Tank Wrap (electric)	$\Delta kWh = kWh_{base} \times \left(\frac{EF_{new} - EF_{base}}{EF_{new}}\right)$	Deemed savings per wrap = 31.5 kWh

These results were determined by reviewing program audit data and also reviewing the measure-specific engineering savings estimates contained in each PA's program tracking database, and their relationships to the per unit values in PA Benefit-Cost Ratio (BCR) models and to the methods described in the Technical Reference Manual (TRM). Also, a review of third party algorithms from other Technical Resource Manuals or from recent studies to get another perspective of how various jurisdictions calculate savings for similar measures was conducted. These reviews included both local sources (within Massachusetts or New England PAs), as well as outside sources like the Database for Energy Efficient Resources (DEER), the Ohio TRM, and the New York TRMs.

How the Results of the Study Impact each Identified Program's Savings: The results of this study were used to derive net energy savings by multiplying the gross reported savings by the NTG factors. The impact of this study was a decrease in the reported net savings.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): The report includes all required algorithms and calculations to interpret and verify results.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: The NTG results were adopted. The proposed savings approaches will be used in 3-year planning.

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

8. Brushless Fan Motors Impact Evaluation

Type of Study: Impact

Objective of the Study: To identify energy savings associated with BFM retrofits in residential HVAC applications, as installed through the Cool Smart program.

Programs to which the Results of the Study Apply:

- Residential Cooling and Heating Equipment (Electric)

Results of the Study and How the Study Determined those Results: This evaluation used on-site spot measurement and long-term metering of BFM retrofits to determine statistically significant savings (±18% at an estimated 90% confidence interval) for a sample of 26 pilot participants.

The summer demand coincidence factor was calculated using ISO-NE definitions of peak period. Both energy and demand savings included the cooling interactive effect. The following table summarizes the results.

Brushless Furnace Motor Fan Motor Results

Item	Evaluated Savings
Annual kWh motor savings	246 kWh
Direct motor savings kWh	219 kWh
Interactive cooling savings kWh	27 kWh
Interactive heating penalty (mmbtu)	-0.676 mmBtu
Connected kW	0.182 kW
CF – summer	0.26
CF – winter	0.25
Summer demand savings (kW)	0.047
Winter demand savings (kW)	0.038
Annual Equivalent Full Load Hr	1,493hrsmeasured

How the Results of the Study Impact each Identified Program's Savings: Please refer to the tables in Sections II.A.5 for the program listed above.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Not Applicable.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: The results of the study are adopted.

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

9. Demand Impact Model Update User Manual

Type of Study: Impact

Objective of the Study: Update the existing residential demand impact model originally created by Quantec in 2001 with an improved interface and more recent Massachusetts- or New England-specific load shape data.

Programs to which the Results of the Study Apply:

- Residential New Construction & Major Renovation (Electric and Gas)
- Low-Income Residential New Construction (Electric)
- Residential Cooling & Heating Equipment (Electric)
- Multi-Family Retrofit (Electric Only)
- Mass Save (Electric)
- Behavior/Feedback Program (Electric Only)
- ENERGY STAR® Lighting (Electric)
- ENERGY STAR® Appliances (Electric)
- Low-Income Single Family Retrofit (Electric and Gas)
- Low-Income Multi Family Retrofit (Electric Only)

Results of the Study and How the Study Determined those Results: The updated model utilizes the best available load shape data, per-unit measure energy savings, and ISO-NE definitions of peak period to allow PAs to dynamically calculate demand impacts.

How the Results of the Study Impact each Identified Program's Savings: The model can be used to assess demand impacts for any of the Residential or Low-Income programs. This model will be utilized where demand impacts are not calculated in a typical impact evaluation. The results of this study only affect demand and energy calculations, not savings. Gas programs are minimally impacted by the outcome of this study.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Not Applicable

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: The results of the study are adopted.

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

10. Massachusetts Lighting Consumer Survey Report

Type of Study: Market Assessment

Objective of the Study: The objective of the study was to understand the market for energy-efficient light bulbs, with particular emphasis on establishing a baseline at the onset of the changes in lighting standards resulting from the Energy Independence and Security Act of 2007 (EISA), which went into effect on January 1, 2012.

Programs to which the Results of the Study Apply:

- Massachusetts ENERGY STAR Lighting Program (Electric)

Recommendations Derived from the Study:

#	Recommendation
1a	The team will continue to track satisfaction with CFLs in the next two waves of the survey to be completed in mid- and late-2012. The evaluation team will continue to inquire what both satisfied and dissatisfied respondents like and do not like about CFLs in order to provide a more complete understanding of CFL satisfaction. The evaluation team will also ask respondents if they have recently shifted their opinion about CFLs and why.
1b	The PAs have little direct control over the persistent concerns about CFLs. The fact that they contain mercury, cannot dim as well as other bulb types, emit a different quality of light, and take a while to warm up represents limitations of the technology. However, at least for dimmability, warm-up time, and light quality, some bulbs suffer from these problems more than others. The PAs may want to continue to work with the program partners to support the highest quality CFLs on the market, perhaps holding additional focus groups or doing other types of consumer research to identify which bulbs those might be.
1c	At this time, the LEDs on the market meant to replace 40 Watt and 60 Watt incandescents do not save much more energy than CFLs, but they do address at least some of the concerns with them, including concerns about mercury, dimmability, and warm-up time. Of course, they also cost more than CFLs. Therefore, in trying to increase adoption of LEDs, the PAs may want to consider educational materials that highlight these advantages of LEDs, but in a manner that does not add to the denigration of CFLs.
2a	The PAs may consider increasing consumer education efforts regarding covered CFLs, as they are more difficult to distinguish from incandescents when simply looking at bulbs in the lighting aisle of the store. For example, signage at the point of purchase could note that the bulb is a CFL and that it can be used with a wider variety of fixtures.
2b	The PAs may also want to consider reclassifying this bulb from "specialty" to "covered standard". Although the covered CFL is not the most common design, it does not have any "specialty" functions, such as being dimmable or fitting into a

	candelabra base. In fact, the covered CFL may offer the best opportunity to capture those customers who reject spirals for aesthetic or "fit in fixture" reasons. From an incentive and implementation perspective, the switch in classification may just be a matter of semantics, but from an evaluation and energy-savings perspective, the covered CFL is most accurately grouped with other A-line bulbs and not with specialty bulbs, because, at least in the short-term, covered CFLs will usually replace A-line incandescents—and perhaps spiral CFLs—and not specialty incandescents.
3	Satisfaction with the dimming capabilities of CFLs has been a persistent concern among consumers and many program administrators as well. Current indications are that screw-in LEDs dim more consistently and to a greater degree than dimmable CFLs. Therefore, the PAs may consider removing dimmable CFLs from the list of products they support, and turn instead to LEDs as their preferred dimmable technology.
4	The PAs may want to consider placing a consumer education campaign that helps consumers make more informed bulb choices, rather than simply defaulting to the incandescent bulb with which they are most familiar. The best choice may not always be the most efficient one, but perhaps consumers who are considering stockpiling will learn that efficient bulb options to replace incandescents exist for nearly all of their lighting needs. Moreover, PA education on EISA standards and alternative bulb types may encourage consumers to choose efficient options over stockpiling or buying halogen bulbs.
5	The PAs may want to continue their efforts at helping consumers make the transition from thinking about Watts to thinking about lumens. Educational materials and point-of-purchase displays that show typical uses based on lumens provide one example.

How the Study Came to the Recommended Conclusions: The recommendations were based on information gathered during the data collection activities for the market assessment. This included an in-depth consumer surveys to track key indicators of the market for compact fluorescent lamps ("CFLs"), light emitting diodes ("LEDs"), and halogens as well as the impact of EISA. The survey was timed to coincide with the EISA-mandated onset of the phase-out of 100 Watt incandescent bulbs. The results provide a baseline understanding of these important indicators at the earliest stages of EISA; the evaluation team will field two additional surveys later in 2012 to track changes that may occur as EISA implementation continues.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: Program Administrators plan to incorporate recommendation on continuing consumer

education of more efficient light bulbs and supporting LED technology when applicable. Future studies will focus on analyzing the trend in CFL dissatisfaction to see if this is a persistence issues, but no changes will be made until more data is provided. Program Administrators will fully incorporate appropriate lighting strategies based on the findings from the additional survey waves planned for 2013 as more EISA standards go into effect.

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

C. Residential Pilot Studies

11. Memo: Major Renovations Pilot Evaluation

Type of Study: Process Evaluation

Objective of the Study: As follow up to the preliminary report on non-participant interviews issued in 2011, this memo briefly summarizes findings from interviews with homeowners, architects and builders involved with projects completed by the end of 2011. The memo focuses on satisfaction with the Pilot and suggestions for how the Pilot could be improved or made more user-friendly. In addition, it summarizes a discussion with a HERS rater who worked with 5 of the 11 completed projects.

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study:

#	Recommendation
1	Make requirements for participating in the Pilot clearer
2	Encourage further energy-efficiency upgrades and address smaller projects.
3	Make clear what programs a project qualifies for and if it can participate in multiple programs.
4	Speed up the administration process—minimize delays in issuing incentives.

How the Study Came to the Recommended Conclusions: Recommendations are based on findings from discussion with a HERS rater who worked with five of the eleven completed projects and in-depth interviews conducted with eight homeowners, three architects and three builders. In most cases the interviewees played more than one role on the projects they were involved in. For example, the owner may have been the architect and/or been the one who

applied to participate in the Pilot. The builder may have been hired by the applicant or submitted the application for the project to participate in the Pilot. The architect may have also been the general contractor or builder and may have submitted the application for the project to participate in the Pilot. All interviewees were asked to provide suggestions for how the Pilot could be improved or made more user-friendly.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: The Major Renovations pilot went through an update in early 2012 to make adjustments based on lessons-learned and to address the findings from interviews with homeowners, architects and builders.

One adjustment was that the pilot became a contractor-focused program rather than a homeowner-focused program. The change was made in response to homeowner comments that the pilot requirements were unclear. Homeowners were struggling to understand and manage the technical requirements of the pilot, while a contractor should have greater familiarity with the requirements.

Another adjustment was that the eligibility requirements changed to allow major renovations of any size to participate. This change ensured there would not be a gap between the Home Energy Services program and the Major Renovations pilot, where people would not qualify for either program.

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

12. Massachusetts Residential New Construction Four to Eight Story Multi-Family Pilot Interview Findings

Type of Study: Process Evaluation

Objective of the Study: Assess the strengths and areas in need of improvement of the three year pilot that was introduced to serve smaller, four to eight story buildings that do not qualify for ENERGY STAR certification but are too small for commercial programs. The report focuses on the lessons learned from the pilot about addressing the energy efficiency potential of the mid-rise multi-family new construction market.

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study:

#	Recommendation
1	Offer a performance-based program for the mid-rise multi-family new construction

	market, or possibly the entire multi-family market over three stories.
2	The pilot's verification of ventilation and infiltration rates for individual units through the High Performance Building Adder is a positive innovation. Given that quality installation of insulation and air sealing have shown to be important in single family structures, multi-family programs should continue to fund and encourage these measures.
3	Offer a long-term program. Ideally, a program would run for a longer period of time and be renewed annually, so that prospective participants know that the program will be in place when their projects complete. With a longer-term program, implementers should focus their efforts on reaching projects at the earliest stage possible.
4	Try to identify and recruit more projects with less of an energy efficiency or green building tilt. Expanding relationship-based marketing focused on the design community would enable programs to reach more projects and provide the assistance they need to incorporate higher levels of energy efficiency.
5	Consider offering assistance and support for the design team, especially as more projects with less of a green tilt are recruited.
6	Consider efforts to address market concerns and misperceptions about energy-efficient building practices. Participant interviews identified a number of concerns particular to this market, notably that more efficient systems need more sophisticated staffs and training for building operation and that it would be more difficult to obtain replacement parts.

How the Study Came to the Recommended Conclusions: Recommendations are based on findings from fourteen interviews conducted with the pilot's sponsors (three interviews), implementer (two interviews), and participants with completed projects (nine interviews representing fourteen projects). The interviews examined the pilot's goals and objectives, the process of signing up and completing verification, outreach and the timing of projects served, the measures covered, the measures installed, barriers to energy efficient multi-family new construction, and satisfaction.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: With the goal of transitioning the current Massachusetts Multi-Family New Construction Pilot to a full program, the following program design features which incorporate the above recommendations are being explored. The proposed program will continue to provide a single point of contact for the participants and provide service for all fuel sources and meter configurations. To address the issue of long development timelines, a suite of program offerings will provide a stepped enrollment mechanism for pre-bid and post-bid projects. (The bid process is the project milestone after which efforts to influence energy efficiency are no longer possible.)

The first offering will include a simple prescriptive application to service post-bid projects. The goal will be to maximize the capture of energy savings from established designs with a focus on residentially metered electric savings.

In tandem with this simple prescriptive offering, a whole building prescriptive program and an interactive savings tool are being developed for pre-bid projects. Third party verification and commissioning activities will continue to be incentivized. In total, these approaches will be capable of servicing multi-family projects from 4 stories and up. These combinations of measures, in conjunction with the transition mechanism, will allow the program to offer cost-effective incentives that will move projects to achieve higher levels of energy efficiency and pave the way to recruit and educate more first-time program participants.

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

13. 2011 Home Energy Services Packaged Measure Pilot Evaluation

Type of Study: Pilot Evaluation

Objective of the Study: The evaluation was a review to determine whether the additional customer incentives offered in an effort to achieve deeper savings at one time in the Home Energy Services program made a difference in the customer's willingness to move forward with installation of energy efficient measures, meeting the pilot's stated goal, as well as assessing the delivery of the pilot itself.

Programs to which the Results of the Study Apply:

- Mass Save (Electric)
- Weatherization (Gas)

Recommendations Derived from the Study:

#	Recommendation
1	The Cadmus Team suggests that if the PAs reissue the pilot, they consider additional package combinations, such as an all-insulation package. PAs might also consider a package option without the heating system requirement, which is the highest cost item.
2	The Cadmus Team suggests that the PAs and vendors market the pilot and continue to encourage the HES auditors to explain fully the benefits of the pilot when conducting HES audits.

How the Study Came to the Recommended Conclusions: The recommendations are based on PA program manager interviews, program vendor staff interviews, participant and nonparticipant customer surveys, and a review of pilot and historical program data.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why:

1	If the PAs decide to reissue the pilot, additional package combinations will be discussed for appropriateness and cost effectiveness.
2	The PAs will look into the best approach for handling this recommendation if the pilot is reissued.

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

14. Heat Pump Water Heaters Evaluation of Field Installed Performance

Type of Study: Technology Evaluation

Objective of the Study: The objective of this study was to quantify the in-situ performance of three types of heat pump water heaters ("HPWH"). The study was also meant to answer questions on the efficiency, reliability, and performance of the three types of HPWHs.

Programs to which the Results of the Study Apply: This is a new pilot measure that will not directly affect savings from any program during this annual report year. Going forward, this is likely to affect only electric programs.

Results of the Study: This study did not have recommendations per se, but rather quantified the results of HPWH use that can be used in the analysis of potential HPWH measures.

	Small Tank (50-60 gal)	Large Tank (80 gal)
Measure Life	10 years	10 years
Incremental Cost	$1,510	$2,610
Mean Annual kWh Saved over ERWH	1,687	2,670
Annual Energy Usage		
HPWH; Monitored (kWh)	734-4,035 [1643][1]	1,200-2,040 [1579][1]
ERWH; EF=0.91 (kWh)	1,898-5,813 [3330][1]	3,110-6,078 [4249][1]

Gas, Oil, or Propane; EF=0.56 (MMBTU)	1,289-3,105 [1950][1]	1,880-3,226 [2410][1]
Gas, Oil, or Propane; EF=0.67 (MMBTU)	957-2,664 [1577][1]	1,510-2,757 [1987][1]
Mean Winter Peak Demand Reduction over ERWH[2]	374.1 W	
Mean Summer Peak Demand Reduction over ERWH[3]	174.8 W	

[1] Minimum – Maximum [Mean]

[2] June-August, Weekdays, 1pm-5pm

[3] December – January, Weekdays, 5pm-7pm

How the Study Determined Those Results: The study came to its conclusions through evaluating the in-situ performance of three types of HPWH products. Fourteen units were monitored for over one year.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: There are not any strict recommendations to adopt from this study but the PAs will use the results from this study in future analysis of HPWH measures.

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

15. Solar Hot Water Program Pilot Evaluation

Type of Study: Pilot Evaluation

Objective of the Study: The objective was to evaluate this pilot program through billing analyses, surveys, on-site validations, and engineering reviews.

Programs to which the Results of the Study Apply:

- Residential Building Practices and Demonstration Program

Results of the Study and How the Study Determined those Results: Key findings of this evaluation include:

#	Finding
1	The SHW pilot program gross gas savings, based on engineering estimates and modeling, is predicted to be approximately 701 MMBTU/yr, with average savings

	of approximately 14.2 MMBTU/yr per program participant.
2	The SHW pilot program net gas savings, based on a billing analysis to account for takeback and other effects, is approximately 512 MMBTU/yr, with average savings of approximately 10.9 MMBtu/yr per program participant.
3	Site visits confirmed the quality of SHW installations, with the only consistent problem being the lack of a UV-resistant jacket over the foam insulation on outdoor piping. The most common non-plumbing issue observed was excessive shading of solar collectors.
4	The cost-effectiveness of SHW systems installed through this program is low, with simple post-rebate payback periods to customers of 50 years, on average. Some well loaded and well sited systems, however, achieved simple payback periods of 10 years. However, including O&M costs could extend these payback periods of a well loaded system to over 100 years and of a well sited system to over 20 years, respectively.

Data for this report were obtained through billing analyses, customer surveys, site visits, and engineering reviews of solar hot water systems installed through this program over the past several years.

How the Results of the Study Impact each Identified Program's Savings: The Solar Hot Water Pilot program is a pilot program and is not currently reporting savings. As part of this evaluation, total program natural gas savings were calculated to be approximately 701 MMBTU/year.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): The report includes all required algorithms and calculations to interpret and verify results.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: N/A

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

D. Low-Income Program Studies

16. Massachusetts 2011 Low Income Program Process Evaluation

Type of Study: Process Evaluation

Objective of the Study: The focus for this process evaluation was to report the opinions and various perspectives gathered through interviews with program stakeholders. The key objectives for the 2011 program process evaluation were as follows:

- Follow up on topics discussed during the 2010 process evaluation, such as progress in standardization goals, internal and external QA/QC processes, and participant waitlists;
- Identify and discuss areas where the program changed in 2011 and reason(s) for the changes; and
- Recommend improvements for process-related issues and suggest ways to standardize or streamline processes between agencies/PAs.

Programs to which the Results of the Study Apply:

- Low Income Single-Family Retrofit (Electric & Gas)
- Low Income Multi-Family Retrofit (Electric & Gas)

Recommendations Derived from the Study:

Low Income Single Family Program Process Evaluation Recommendations

#	Recommendation
1	If not already, all PAs should provide savings goals to their lead agencies to improve transparency between PAs and program implementers. Lead vendors should then provide all sub-agencies information about annual savings goals, especially in cases where it is a challenge to meet the PAs' savings goals. Furthermore, it may prove beneficial for all agencies to track certain savings performance indicators in a manner similar to that of how they track budgets and spending. If indicators for savings performance currently do not exist, this should be a topic for discussion in the Best Practices working group meetings.
2	The PAs should establish an approval system that does not cause significant delays the PAs ability to provide program budgets to implementers. The process should be set up in a way that PAs can provide contracts and budget information to the agencies in advance of program [start date] year, to provide services to customers in a timely and effective manner and ensure agencies can plan effectively. Multi-year contracts and budgets should be implemented, when possible, with any subsequent revisions negotiated in advance of existing contract expiration dates.
3	Through the Best Practices working group, standardize a streamlined approval process for repairs that works for the agencies and PAs.
4	Through the Best Practices working group (including the PAs), develop, document and put into practice both (a) a standardized definition of the waitlist; and (b) standardized methods for tracking and reporting this information. One suggested definition for wait list is the number of eligible low income customers who have completed all the necessary paperwork to participate and are awaiting an audit.
5	Coordinated and developed through the Best Practices working group, PAs should investigate funding a statewide energy education curriculum, including leave-behind materials and energy saving tips. This effort should aim to increase the depth of

	energy savings resulting from behavior change, and provide thorough and consistent energy conservation messages to participants.
6	An assessment of necessary or recommended trainings should be discussed through the Best Practices Group to ensure quality auditors and contractors while also maintaining cost-effectiveness.
7	Through the Best Practices working group (or sub-committee) including CRI and DHCD, discuss ways to further streamline the QA/QC process so it serves the needs of the PA-funded program while minimizing participant intrusion. The objectives of the discussion should be: a. Clearly articulate the objectives of multiple QA/QC visits to a participant's home. b. Establish the value of agencies conducting 100% post inspections versus redirecting resources to serve more homes. c. Determine where the objectives of the DHCD and CRI inspections align and identify if there are opportunities for collaboration and coordination. d. Assess how changes in federal funding levels are expected to affect DHCD inspections and what affect that has on collaboration or coordination opportunities. Findings from this discussion should be clearly documented and action items to improve QA/QC process should be adopted.

Low Income Multi-Family Retrofit Program Process Evaluation Recommendations

#	Recommendation
1	The LIMF Advisory Committee should encourage more standardization across PAs by developing standardized project screening criteria or a tool to determine savings and cost effectiveness for both gas and electric projects.
2	Identify one single representative program to remain involved with during the entire participation process with building managers. Consider looking to the Multi-Family Market Integrator used in the market rate multi-family program as a model.
3	Update program materials, including the Program Guide, and clarify the role of each PA's branded benchmarking software tool. To ensure continued participation and energy savings into the future, plan for the need to increase participation in the LIMF program by raising awareness among potential participants of their eligibility and the existence of the program. Facilitate this effort by developing marketing collateral, such as leave-behind materials, that help to clarify and differentiate the LIMF program eligibility and requirements from other potential funding sources that may commonly be offered to participants.
4	Develop data formats to track program savings and administer the program more consistently. To prepare for any future audit or evaluation efforts, all implementers should collect and store building manager contact information as part of the program tracking data, then share those details with the PAs.

How the Study Came to the Recommended Conclusions: The recommendations were developed through 77 interviews with program stakeholders.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why:

Low Income Single-Family Program Process Evaluation Recommendations Responses:

#	Recommendation	PA Response
1	If not already, all PAs should provide savings goals to their lead agencies to improve transparency between PAs and program implementers. Lead vendors should then provide all sub-agencies information about annual savings goals, especially in cases where it is a challenge to meet the PAs' savings goals. Furthermore, it may prove beneficial for all agencies to track certain savings performance indicators in a manner similar to that of how they track budgets and spending. If indicators for savings performance currently do not exist, this should be a topic for discussion in the Best Practices working group meetings.	PAs have been and will continue to provide savings goals to lead vendors to the best of their ability. Often, lead vendors not only manage the overall spend of the program between the various agencies implementing the program but also their performance as it relates to savings goals for PA's territory.
2	PAs should establish a system that does not cause significant delays to the PAs ability to provide program budgets to implementers. The process should be set up in a way that PAs can provide contracts and budget information to the agencies in advance of program [start date] year, to provide services to customers in a timely and effective manner and ensure agencies can plan effectively. Multi-year contracts and budgets should be implemented, when possible, with any subsequent revisions negotiated in advance of existing contract expiration dates.	The PAs are always willing to work with the DPU to establish a regulatory approval system that does not cause significant delays in program delivery.
3	Through the Best Practices working group, standardize a streamlined approval process for repairs that works for the agencies and PAs.	This recommendation is 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.
4	Through the Best Practices working group (including the PAs), develop, document and put into practice both (a) a standardized definition of the waitlist; and (b) standardized methods for tracking and reporting	This recommendation is being considered for adoption at this time. The PAs have not formally

	this information. One suggested definition for wait list is the number of eligible low income customers who have completed all the necessary paperwork to participate and are awaiting an audit.	adopted or rejected any recommendations that require changes to program design and operations.
5	Coordinated and developed through the Best Practices working group, PAs should investigate funding a statewide energy education curriculum, including leave-behind materials and energy saving tips. This effort should aim to increase the depth of energy savings resulting from behavior change, and provide thorough and consistent energy conservation messages to participants.	PAs are in process of reviewing current marketing collateral and energy education materials that is used by the PAs and/or agencies. Once the analysis of what is currently available is complete, the PAs will determine if the recommendation for the development and/or utilization of statewide materials should be adopted.
6	An assessment of necessary or recommended trainings should be discussed through the Best Practices Group to ensure quality auditors and contractors while also maintaining cost-effectiveness.	This recommendation is 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.
7	Through the Best Practices working group (or sub-committee) including CRI and DHCD, discuss ways to further streamline the QA/QC process so it serves the needs of the PA-funded program while minimizing participant intrusion. The objectives of the discussion should be: • Clearly articulate the objectives of multiple QA/QC visits to a participant's home. • Establish the value of agencies conducting 100% post inspections versus redirecting resources to serve more homes. • Determine where the objectives of the DHCD and CRI inspections align and identify if there	This recommendation is 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.

	are opportunities for collaboration and coordination. • Assess how changes in federal funding levels are expected to affect DHCD inspections and what affect that has on collaboration or coordination opportunities. Findings from this discussion should be clearly documented and action items to improve QA/QC process should be adopted.	

Low Income Multi-Family Retrofit Program Process Evaluation Recommendations Responses:

#	Recommendation	PA Response
1	The LIMF Advisory Committee should encourage more standardization across PAs by developing standardized project screening criteria or a tool to determine savings and cost effectiveness for both gas and electric projects.	This recommendation is 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.
2	Identify one single representative program to remain involved with during the entire participation process with building managers. Consider looking to the Multi-Family Market Integrator used in the market rate multi-family program as a model.	This recommendation is 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.
3	Update program materials, including the Program Guide, and clarify the role of each PA's branded benchmarking software tool. To ensure continued participation and energy savings into the future, plan for the need to increase participation in the LIMF program by raising awareness among potential participants of their eligibility and the existence of the program. Facilitate this effort by developing marketing collateral, such as leave-behind materials, that help to clarify and differentiate the LIMF program eligibility and requirements from other	PAs are in process of reviewing current marketing collateral and energy education materials that is used by the PAs and/or agencies. Once the analysis of what is currently available is complete, the PAs will determine if the recommendation for the development and/or

	potential funding sources that may commonly be offered to participants.	utilization of statewide materials should be adopted.
4	Develop data formats to track program savings and administer the program more consistently. To prepare for any future audit or evaluation efforts, all implementers should collect and store building manager contact information as part of the program tracking data, then share those details with the PAs.	This recommendation is 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.

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

17. Low Income Single Family Program Impact Evaluation

Type of Study: Impact Evaluation

Objective of the Study: The objective of the study was to determine gross per-unit savings generated by each Low Income program measure.

Programs to which the Results of the Study Apply:

- Low-Income Single Family Retrofit (Electric & Gas)

Results of the Study and How the Study Determined those Results: The PA-weighted Massachusetts-wide per-unit gross ex post energy savings (by measure and primary fuel type of treated homes) are summarized below.

Category	Measure	Natural Gas (Therms/year)	Electric (kWh/year)	Oil (MMBTUs/ year)
Insulation and Air Sealing	Insulation and Air Sealing (overall)	263*	1,616	28.1
	Air Sealing	105	501	9.9
	Attic Insulation	83	1,071	11.6
	Wall Insulation	115	824	11.2

Category	Measure	Natural Gas (Therms/year)	Electric (kWh/year)	Oil (MMBTUs/ year)
	Basement Ceiling Insulation	15	30	2.9
	Basement Wall Insulation	13	37	0.2
	Furnace Fan (due to weatherization)	206 (kWh)	--	224 (kWh)
	Cooling (due to weatherization)	138 (kWh)	--	153 (kWh)
Heating System	Heating System Replacement	199*	--	18.4
	Boiler Reset Controls	--	--	4.4
	Programmable Thermostat	--	--	3.1
	Furnace Fan (due to furnace replacement)	172 (kWh)	--	132 (kWh)
Appliances	Refrigerator Replacement	--	762	--
	Second Refrigerator Removal	--	1,180	--
	Freezer Replacement	--	239	--
	Window AC Replacement	--	204	--
Lighting	CFLs	--	45	--
	Torchieres	--	211	--
	Fixtures	--	140	--
Domestic Hot Water	Domestic Hot Water (overall)	5	128	0.7
	Low-Flow Showerhead	9	188	1.1

Category	Measure	Natural Gas (Therms/year)	Electric (kWh/year)	Oil (MMBTUs/ year)
	Faucet Aerator	2	40	0.2
	Pipe Wrap	4	41	0.4
Distribution	Duct Insulation	55	--	4.3
	Duct Sealing	33	--	3.3
Other	Baseload (TLC Kits)	--	25**	--

* Indicates this number is based on billing analysis. All other measure results through engineering analysis (simulation or algorithms).

** Reflects MA-wide average based on each PA's kit contents and participation.

How the Results of the Study Impact each Identified Program's Savings: Please refer to the table in Section II.B.5

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): A complete set of measure-specific engineering algorithms are provided in the appendix of the report.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: The results of the study are adopted.

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

E. Commercial and Industrial Program Studies

18. Non-Controls Lighting Evaluation for the Massachusetts Small Business Direct Install Program: Multi-Season Study

Type of Study: Impact Evaluation

Objective of the Study: 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.[8]

Through extended metering of lighting time-of-use, the study determined program realization rates for the following savings parameters:

- Annual energy savings (kWh)
- Annual energy savings during energy on-peak period (%)
- Summer and winter peak period demand reduction (kW)
- Annual heating gas and oil impact (MMBtu)

Programs to which the Results of the Study Apply:

- C&I Small Retrofit (Electric Only)

Results of the Study and How the Study Determined those Results: The impact factors for the statewide program are provided in Table 1. The table includes factors for adjusting the gross energy and peak demand savings and for estimating the gas and oil impacts of lighting fixtures measures implemented through the C&I Small Retrofit program.

Impact factors are provided separately for WMECO due to a difference in the methodology for estimating gross savings for the 2010 and 2011 programs.

The impact factors are based on post-retrofit verification, metering, and analysis performed at 126 participant sites statewide. Metering was performed at all 126 sample sites during winter 2010-2011 and at 26 sites with expected seasonal variation (e.g., schools and summer camps) during summer-fall 2011.

Impact Factors:

[8] The impact evaluation of lighting control installations was conducted in *Small Business Direct Install Program: Pre/Post Lighting Controls Study*. June 2012.

Factor	Description	Statewide	WMECO
kWh RR	Energy realization rate[i]	96%	72%
$HVAC_{ELEC}$	HVAC interaction factor, electric heat	106%	102%
Total combined energy realization rate (kWh RR x $HVAC_{ELEC}$)		102%	73%[iv]
%kWh On-Peak	Percent energy savings on-peak	69%	70%
kW RR	Connected kW realization rate[i]	99%	98%
CF_{SP}	Coincidence factor, summer peak[i,ii]	66%	60%
CF_{WP}	Coincidence factor, winter peak[i,ii]	44%	43%
$HVAC_{SP}$	HVAC demand interaction factor, summer on-peak	110%	111%
$HVAC_{WP}$	HVAC demand interaction factor, winter on-peak	100%	97%
Total combined summer kW realization rate (kW RR x CF_{SP} x $HVAC_{SP}$)		72%	65%
Total combined winter kW realization rate (kW RR x CF_{WP} x $HVAC_{WP}$)		44%	41%
$HVAC_{GAS}$	HVAC interaction factor, gas heat (MMBtu/kWh)[iii]	-0.001075	-0.000522
$HVAC_{OIL}$	HVAC interaction factor, oil heat (MMBtu/kWh)[iii]	-0.000120	-0.000252

[i] Includes lighting impacts only; does not include HVAC interaction impacts.
[ii] Statewide coincidence factors are for on-peak capacity periods; WMECO coincidence factors are for seasonal peak periods.
[iii] HVAC gas and oil impacts are negative values because the reduction in lighting operation reduces waste heat generated in the space and results in an increase the space heating load.
[iv] The combined energy realization rate for WMECO is lower than the statewide average due to a different methodology for estimating HVAC interactive impacts. If WMECO changes its methodology to match that of the other PAs, this energy realization rate is no longer valid.

How the Results of the Study Impact each Identified Program's Savings: Results of the study will be applied to update existing impact factors used in calculating small business program lighting fixture electric energy and demand savings. As applied the results will marginally decrease energy and summer demand savings and marginally increase winter demand savings.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): 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, respectively:

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.

$$Adjusted\ Gross\ kWh = Tracking\ Gross\ kWh * kWh\ RR * HVAC_{ELEC}$$

Similarly, 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.

$$Summer\ Peak\ kW = Tracking\ Gross\ kW * kW\ RR * CF_{SP} * HVAC_{SP}$$

$$Winter\ Peak\ kW = Tracking\ Gross\ kW * kW\ RR * CF_{WP} * HVAC_{WP}$$

The statewide coincidence factors are based on the ISO-NE on-peak capacity periods; the WMECO coincidence factors are based on the ISO-NE seasonal peak capacity periods. A detailed description of the formulas for applying the impact factors in Table 1 is provided in the full report (see pages 3-4).

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: Results of the study have been adopted by MA Program Administrators

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

19. 2010 Combined Heat and Power Impact Evaluation Methodology and Analysis Memo

Type of Study: Impact Evaluation

Objective of the Study: The study was intended to produce kWh realization rates, thermal realization rates, and fuel impact realization rates at both the PA and statewide level. The kWh realization rate was meant to inform evaluation departments' net savings calculations while the thermal realization rates and fuel impact realization rates were produced to inform PA implementation and engineering departments regarding the accuracy of their project screening process.

Programs to which the Results of the Study Apply:

- C&I Retrofit (Electric Only)

Results of the Study and How the Study Determined those Results:

Summary of Realization Rates Program Administrator	Weighted Mean kWh Realization Rate	Weighted Mean Thermal Realization Rate	Weighted Mean Fuel Impact Realization Rate
NGRID	*0.86 ± .08*	*1.01 ± .11*	*0.87*
NSTAR	*1.15 ± .16*	*1.03 ± .08*	*1.06*
Prgm Avg	*0.93 ± .07*	*1.01 ± .08*	*0.90*

The study determined realization rates at the PA level and statewide level. A combination of onsite equipment verification, examination of operating conditions, interviews with site personnel, and equipment metering of 15 individual projects completed during 2010 was performed to inform modeling assumptions and determine realization rates. Metering was performed over a 6 month period, with at least 1 month of summer and 1 month of winter metering required for site inclusion in the evaluation. The results were extrapolated over the remainder of the 12 months to determine evaluated savings. PAs represented in the study sample were NSTAR and National Grid.

How the Results of the Study Impact each Identified Program's Savings: How the results impact each program's savings is a function of the previous realization rates that were being incorporated into each PA's savings models. Since this is the first time CHP has been evaluated, program administrators had been assuming a 100% kWh realization rate. With the new impact results, the resulting realization rate for NSTAR will increase net savings while the resulting realization rate for National Grid will decrease net savings.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Net Savings = Gross kWh Savings x Gross Realization Rate[9] x (1 – Freeridership Rate + Spillover Rate). Further information can be found in the Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures 2011 Program Year – Report Version.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: N/A – This study has been adopted by both NSTAR and National Grid.

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

20. Impact Evaluation of 2010 Custom Process and Compressed Air Installations

Type of Study: Impact Evaluation

Objective of the Study: The study's objective was to produce both energy (kWh) and demand (kW) realization rates for program administrators' custom process and compressed air projects. A 90% confidence interval was set for energy and an 80% confidence interval was set for demand in the sample design. Realization rates were to be produced at the individual PA level and also at the statewide level.

Programs to which the Results of the Study Apply:

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

Results of the Study and How the Study Determined those Results:

[9] Realization rate determined by this study.

Overall Process Results	Annual MWh	% On-Peak MWh	On-Peak MWh	On-Peak Summer kW	On-Peak Winter kW	Summer Season Peak kW	Winter Season Peak kW
Total Tracking Savings	22,888	-	-	2,833	2,883	2,833	2,883
Total Measured Savings	17,434	-	-	2,324	2,531	2,381	2,573
Realization Rate	76.2%	-	-	82.0%	87.8%	84.0%	89.3%
Relative Precision at 90% Confidence	14.9%	-	-				
Error Bound at 90% Confidence	2,602	-	-				
Relative Precision at 80% Confidence				24.0%	20.4%	24.3%	20.6%
Error Bound at 80% Confidence				558	516	578	531
Error Ratio	0.74	-	-	1.30	1.23	1.26	1.21

Overall Compressed Air Results	Annual MWh	% On-Peak MWh	On-Peak MWh	On-Peak Summer kW	On-Peak Winter kW	Summer Season Peak kW	Winter Season Peak kW
Total Tracking Savings	6,064	-	-	756	746	756	746
Total Measured Savings	5,168	-	-	577	553	569	560
Realization Rate	85.2%	-	-	76.3%	74.1%	75.2%	75.1%
Relative Precision at 90% Confidence	24.6%	-	-				
Error Bound at 90% Confidence	1,274	-	-				
Relative Precision at 80% Confidence				28.6%	30.9%	27.8%	30.0%
Error Bound at 80% Confidence				165	171	158	168
Error Ratio	0.57	-	-	0.84	0.92	0.83	0.89

Compressed Air Results by PA	Annual MWh	% On-Peak MWh	On-Peak MWh	On-Peak Summer kW	On-Peak Winter kW	Summer Season Peak kW	Winter Season Peak kW
National Grid							
Total Tracking Savings	3,936	48.1%	1,893	485	476	485	476
Total Measured Savings	3,507	44.9%	1,575	381	395	367	402
Realization Rate	89.1%	93.4%	83.2%	78.6%	83.0%	75.6%	84.4%
Relative Precision at 90% Confidence	34.0%	-	33.8%				
Error Bound at 90% Confidence	1,191	-	532				
Relative Precision at 80% Confidence				40.3%	40.5%	39.9%	39.1%
Error Bound at 80% Confidence				154	160	146	157
Error Ratio	0.57	-	0.51	0.88	0.89	0.87	0.86
NSTAR							
Total Tracking Savings	1,170	-	-	143	144	143	144
Total Measured Savings	913	-	-	117	114	117	115
Realization Rate	78.0%	-	-	81.6%	79.2%	81.6%	79.6%
Relative Precision at 90% Confidence	45.1%	-	-				
Error Bound at 90% Confidence	412,081	-	-				
Relative Precision at 80% Confidence				34.6%	37.1%	34.7%	36.7%
Error Bound at 80% Confidence				40	42	41	42
Error Ratio	0.74	-	0.72	0.75	0.81	0.76	0.80
WMECO							
Total Tracking Savings	958	-	-	128	126	128	126
Total Measured Savings	747	-	-	78	44	85	43
Realization Rate	78.0%	-	-	61.3%	34.7%	66.8%	34.5%
Relative Precision at 90% Confidence	24.6%	-	-				
Error Bound at 90% Confidence	184	-	-				
Relative Precision at 80% Confidence				55.0%	95.9%	52.5%	98.0%
Error Bound at 80% Confidence				43	42	45	43
Error Ratio	0.32	-	-	0.80	1.42	0.75	1.43

The study determined realization rates at the PA level and statewide level. A combination of onsite equipment verification, examination of operating conditions, interviews with site personnel, and equipment metering of 28 custom process and 11 custom compressed air projects completed during 2010 was performed to inform modeling assumptions and determine realization rates. Metering was performed over a 3 month period, with the resulting data being extrapolated over the remainder of the 12 months to determine evaluated savings. PAs represented in the study sample were National Grid, NSTAR, Unitil and WMECO.

How the Results of the Study Impact each Identified Program's Savings: How the results impact each program's savings is a function of the previous realization rates that were being incorporated into each PA's savings models. For instance, if a PA had been carrying a higher realization rate than was produced in this study, the affected program's savings would decrease once the new realization rate was incorporated.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Net Savings = Gross Savings x Gross Realization Rate[10] x (1 – Freeridership Rate + Spillover Rate). Further information can be found in the Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures 2011 Program Year – Report Version.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: N/A – This study has been adopted by all PAs.

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

21. Impact Evaluation of 2010 Custom Lighting Installations

Type of Study: Impact Evaluation

Objective of the Study: The study's objective was to produce both energy (kWh) and demand (kW) realization rates for program administrators' custom lighting projects. A 90% confidence interval was set for energy and an 80% confidence interval was set for demand in the sample design. Realization rates were to be produced at the individual PA level and also at the statewide level.

Programs to which the Results of the Study Apply:

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

[10] Realization rate determined by this study.

Results of the Study and How the Study Determined those Results:

Statistic	Annual MWh	On-Peak Summer kW	On-Peak Winter kW	Summer Season Peak kW	Winter Season Peak kW
Total Tracking Savings	46,463	7,659	8,061	7,659	8,061
Total Measured Savings	45,696	7,166	7,392	7,056	7,056
Realization Rate	98.3%	93.6%	91.7%	92.1%	87.5%
Relative Precision at 90% Confidence	9.3%	9.3%	13.1%	9.7%	13.1%
Error Bound at 90% Confidence	4,259	669	966	685	923
Relative Precision at 80% Confidence	7.3%	7.3%	10.2%	7.6%	10.2%
Error Bound at 80% Confidence	3,319	521	752	534	719
Error Ratio	0.30	0.38	0.58	0.40	0.58

Statistic	Annual MWh	% On-Peak MWh	On-Peak MWh	On-Peak Summer kW	On-Peak Winter kW	Summer Season Peak kW	Winter Season Peak kW
Cape Light Compact							
Total Tracking Savings	31	-	-	-	-	-	-
Total Measured Savings	25	-	-	-	-	-	-
Realization Rate	79.5%	-	-	-	-	-	-
Relative Precision at 90% Confidence	0.0%	-	-	-	-	-	-
Error Bound at 90% Confidence	-	-	-	-	-	-	-
Relative Precision at 80% Confidence	0.0%	-	-	-	-	-	-
Error Bound at 80% Confidence	-	-	-	-	-	-	-
Error Ratio	0.00	-	-	-	-	-	-
National Grid							
Total Tracking Savings	9,109	44.3%	4,036	1,886	2,250	1,886	2,250
Total Measured Savings	8,922	47.9%	4,273	2,185	1,913	2,159	1,926
Realization Rate	97.9%	108.1%	105.9%	115.9%	85.0%	114.5%	85.6%
Relative Precision at 90% Confidence	5.9%	-	13.9%	9.5%	11.7%	10.0%	12.1%
Error Bound at 90% Confidence	529	-	595	207	225	216	232
Relative Precision at 80% Confidence	4.6%	-	10.9%	7.4%	9.2%	7.8%	9.4%
Error Bound at 80% Confidence	412	-	464	207	225	216	232
Error Ratio	0.16	-	0.33	0.25	0.33	0.26	0.34
NSTAR							
Total Tracking Savings	30,375	-	-	4,628	5,127	4,628	5,127
Total Measured Savings	30,915	-	-	3,938	4,280	3,815	3,950
Realization Rate	101.8%	-	-	85.1%	83.5%	82.4%	77.0%
Relative Precision at 90% Confidence	13.5%	-	-	14.9%	16.2%	15.3%	15.8%
Error Bound at 90% Confidence	4,182	-	-	586	694	582	622
Relative Precision at 80% Confidence	10.5%	-	-	11.6%	12.6%	11.9%	12.3%
Error Bound at 80% Confidence	3,259	-	-	457	541	454	485
Error Ratio	0.34	-	-	0.42	0.46	0.43	0.44
WMECO							
Total Tracking Savings	7,999	-	-	1,409	967	1,409	967
Total Measured Savings	7,139	-	-	1,351	1,385	1,364	1,346
Realization Rate	89.3%	-	-	95.9%	143.2%	96.8%	139.2%
Relative Precision at 90% Confidence	8.7%	-	-	19.4%	45.7%	21.7%	47.6%
Error Bound at 90% Confidence	619	-	-	262	633	296	640
Relative Precision at 80% Confidence	6.8%	-	-	15.1%	35.6%	16.9%	37.1%
Error Bound at 80% Confidence	482	-	-	204	493	231	499
Error Ratio	0.24	-	-	0.48	1.21	0.53	1.25

The study determined realization rates at the PA level and statewide level. A combination of onsite equipment verification, examination of operating conditions, interviews with site personnel, and equipment metering of 45 individual projects completed during 2010 was

performed to inform modeling assumptions and determine realization rates. Metering was performed over a 3 month period, with the resulting data being extrapolated over the remainder of the 12 months to determine evaluated savings. PAs represented in the study sample were Cape Light Compact, National Grid, NSTAR and WMECO.

How the Results of the Study Impact each Identified Program's Savings: How the results impact each program's savings is a function of the previous realization rates that were being incorporated into each PA's savings models. For instance, if a PA had been carrying a higher realization rate than was produced in this study, the affected program's savings would decrease once the new realization rate was incorporated.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Net Savings = Gross Savings x Gross Realization Rate[11] x (1 – Freeridership Rate + Spillover Rate). Further information can be found in the Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures 2011 Program Year – Report Version.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: N/A – This study has been adopted by all PAs.

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

22. Massachusetts Large Commercial & Industrial Process Evaluation

Type of Study: Process Evaluation

Objective of the Study: The study is a process evaluation of the Massachusetts Large Commercial and Industrial energy efficiency programs. The study examines key process topics identified by the EEAC, PAs and the DOER including how to improve integration and coordination, concerns about the adequacy of staffing levels, how to achieve deeper savings, whether medium-sized C&I customers are being adequately served by the programs, the adequacy or program tracking databases, and program satisfaction. This study was conducted on behalf of the PAs and the Energy Efficiency Advisory Council ("EEAC").

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study:

#	Recommendation
1	Target participants with more sophisticated audits and technical assistance.

[11] Realization rate determined by this study.

2	PAs should be more proactive in reaching out to the trade allies.
3	The PAs need to simplify paperwork and accelerate rebate processing.
4	Reach out to trade ally organizations to disseminate program information and identify contractors who would promote the programs.
5	A standard lifecycle cost tool would probably be well-received.
6	Market the reduced interest financing option to dormant participants.
7	The vendor interviews reaffirmed previous process evaluation findings that PAs need to work closely with architects and engineers who specify the new construction and major renovation projects.
8	The PAs should implement a means of combining small jobs into a bigger pool.
9	The program needs to do a better job of warning program vendors about changes in program funding.
10	In order to clearly identify projects by end-use, the PARIS categories should be adopted, and data entry constrained to the following values.
11	Measure Categories should be used to indicate how projects are treated within these end-uses, according to the list of measures in the TRM.
12	A set of core data should be collected for all projects and included in tracking systems.
13	All data that is collected on customer application forms should be captured in tracking systems so that it is available for analysis.
14	Create or populate a field with consistent business type names.
15	Define Custom vs. Prescriptive projects based on savings calculation
16	Define C&I customer size categories by rate class instead of program.
17	Enter project data or create queries that extract files in such a way that each record represents a single customer site, project and type of measure.
18	Save the queries or code used to produce extract files from one year to the next.
19	Develop a statewide security policy and practice to allow all project and customer data to be delivered at once.

20	Build the capability to link gas and electric customer projects.
21	Provide a mechanism for linking billing and tracking data.
22	Add quality control through rule-based data entry screens that prevent invalid combinations of program, end use and measure category.
23	Calculate savings through lookup tables, wherever possible.
24	Provide premise number instead of account number where available.

How the Study Came to the Recommended Conclusions: The study draws on multiple sources of information including: In-depth interviews with EEAC consultants, C&I program managers and staff, participating and nonparticipating trade allies, trade association representatives, and participating customers; Focus group discussions with participating customers; Computer-Aid Telephone Interview ("CATI") surveys with hundreds of participants including both recent (2010-2011) participants and "dormant" participants who have not participated in the C&I programs since 2008-2009; and an examination of the various PA program tracking databases.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: As this report was recently issued, the recommendations are currently under consideration.

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

23. HVAC Market Characterization and Penetration Analysis – Final Report

Type of Study: Process Evaluation

Objective of the Study: The objective of the study was to estimate the market penetration of energy-efficient equipment in the Massachusetts commercial HVAC market, gauge the level of large C&I program influence on market penetration, and characterize the market for emergency replacement.

Programs to which the Results of the Study Apply:

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

Recommendations Derived from the Study:

#	Recommendation
1	Consider raising efficiency levels for condensing gas boilers. Given the high market penetration for high-efficiency condensing gas boilers reported by both participating contractors (84%-90%) and non-participants (90%-100%), it appears that the program could benefit from raising efficiency levels.
2	Consider offering stocking incentives to distributors. One-half of respondents believe that availability is an important factor in selecting new equipment in emergency replacement situations. In order to ensure the wide availability of high-efficiency models, consider offering stocking incentives to distributors to maintain an inventory of high-efficiency equipment.

How the Study Came to the Recommended Conclusions: The evaluation included telephone interviews with commercial HVAC contractors and distributors in Massachusetts. The evaluation had a goal of completing 80 interviews, however only 51 were completed. Each respondent was asked to estimate the market penetration for their firm. This figure was then rolled up to estimate market penetration for the entire market.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: As this report was recently issued, the recommendations are currently under consideration.

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

24. Prescriptive Gas Final Program Evaluation Report

This study applies to gas energy efficiency programs only and is, therefore, not included in Cape Light Compact's Annual Report.

25. Impact Evaluation of 2010 Custom Gas Installations

This study applies to gas energy efficiency programs only and is, therefore, not included in Cape Light Compact's Annual Report.

F. Special and Cross Sector Studies

26. Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report

Type of Study: Impact and Process Evaluation

Objective of the Study:

This report provides the findings from the 2011 annual impact and process evaluation of the Massachusetts Behavioral programs. This represents the second formal report of the three-year evaluation under the Massachusetts Cross-Cutting evaluation area. This report covers two of three behavior programs or pilots implemented between 2009 and 2011: the Behavior/Feedback programs administered by National Grid and NSTAR which are both implemented by OPOWER, and the Behavior/Feedback pilot administered by WMECo, called Western Mass Saves and implemented by C3.

The study evaluates the savings impacts of the two behavior programs or pilots during the 2011 program year. The report also includes a demographic analysis of the savings for the Behavior/Feedback program administered by National Grid. The report also includes a process evaluation of the Behavior/Feedback pilot administered by WMECo, which included a customer survey and web statistics.

Additionally, the report investigates a number of research questions related to behavior programs, such as: How do savings differ by opt-in or opt-out programs? Will the savings persist with or without treatment? Do these programs lead to additional participation in other programs and what are the associated energy savings? Are there specific population characteristics that lead to greater savings?

Programs to which the Impact Results of the Study Apply:

- Behavior/Feedback (Electric & Gas)

Results of the Study and How the Study Determined those Results:

Behavior/Feedback Electric Results:

PA	Cohort or Measure Name	Program Year	Base Usage	Annualized Net Savings per HH	Net Savings %	Total Evaluated Participants
National Grid	2009	PY2	10,825 kWh	223 kWh	2.06 %	23,309
National Grid	2010	PY2	12,051 kWh	196 kWh	1.63 %	67,980
National Grid	2010 Add	PY1	15,008 kWh	240 kWh	1.60 %	23,557
National Grid	2011	PY1	9,767 kWh	134 kWh	1.37 %	94,322

Behavior/Feedback Gas Results:

PA	Cohort or Measure Name	Program Year	Base Usage	Annualized Net Savings per HH	Net Savings %	Total Evaluated Participants
National Grid	2009	PY2	137.2 MMBTUs	1.72 MMBTU	1.25 %	23,685
National Grid	2010	PY1	139.9 MMBTUs	1.69 MMBTU	1.21 %	74,138
National Grid	2011	PY1	102.7 MMBTUs	1.02 MMBTU	0.99 %	87,691
NSTAR	Wave I	PY1	55.7 MMBTUs[a]	0.53 MMBTU	0.94 %	22,840
NSTAR	Wave II	PY1	121.5 MMBTUs	1.82 MMBTU	1.50 %	22,108

Complete results of the impact evaluation can be found in Section 5 of "Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report."

Net program savings were determined by conducting billing analysis to estimate annual electric and therm savings. Average annual net savings attributable to the behavioral program were determined using a linear fixed effects regression analysis of customer billing data that included billing data from behavioral program participants (who received the Home Energy Reports), and a matched comparison group of residential customers. The billing analysis approach is described in Section 3.4 of "Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report."

In addition, net program savings were also determined by conducting a channeling analysis where net program savings determined by billing analysis were adjusted by factoring out deemed savings values counted in other programs. Therefore, the savings values cited here reflect only those program savings directly obtained by the Behavior/Feedback program, factoring out savings jointly attributable to the Behavior/Feedback program *and* other energy efficiency programs. This adjustment is described in Section 3.3 of "Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report."

How the Results of the Study Impact each Identified Program's Savings: Please see Table II.A.08 in National Grid's and Western Massachusetts Electric Company's 2011 Energy

Efficiency Annual Reports and Table II.A.9 in NSTAR Gas Company's 2011 Energy Efficiency Annual Report.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Please see the Massachusetts Technical Reference Manual for Estimating Savings from Energy Efficiency Measures 2011 Program Year – Report Version.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: Impact results for the Behavior/Feedback programs are being adopted.

Programs to which the *Process* Results of the Study Apply:

- Behavior/Feedback Pilots (Electric Only)
- Behavior/Feedback Programs (Electric & Gas)

Recommendations Derived from the Study:
The process evaluation identified recommendations in two areas: (1) program design and evaluation for opt-in programs, (2) evaluating persistence.

#	Recommendation
1	Program design and evaluation for opt-in programs: • Waitlisted or delayed treatment participants should be used whenever possible to establish a comparison group. • In the absence of a waitlist or delayed treatment, Variability in Adoption ("VIA") designs are the most appropriate for quasi-experiments. • Ensure that the "treatment effects" do not occur prior to treatment, indicating a pre-existing saving trajectory (no treatment effects seem to occur prior to treatment). • Employ surveys and other qualitative research techniques to assess what customers would have done in the absence of the program. • Evaluation must also consider the effects of feedback in keeping customers on a trajectory. • Consider adjusting the impact models to account for self-selection bias.

2	Evaluating persistence: • Persistence should be examined in two ways: (1) with program treatment, and (2) without program treatment. • All behavioral programs should be continually evaluated for persistence; however opt-in models have little data to date that document persistence beyond one year. • Evaluating/measuring participants' and non-participants' attitudes and intentions using a tested conceptual model can provide confidence in interpreting statistical results.

How the Study Came to the Recommended Conclusions: The study developed the recommendations by researching and citing best practices for evaluating quasi-experimental design and persistence in behavior programs.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: The Company will adopt the recommendations from the study because they will help maintain evaluation best practices.

A copy of the complete study can be found in Appendix C, Study 26.

27. Massachusetts Umbrella Marketing Evaluation Report

Type of Study: Process Evaluation

Objective of the Study: The objective of this study was to establish baseline campaign awareness in advance of the 2012 marketing campaign. The report also builds on an interim evaluation of the 2010 Massachusetts Umbrella Mass Save Statewide Marketing Campaign, which focused on documenting the campaign's organizational structure and initial strategy.

Programs to which the Results of the Study Apply:

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

- C&I Retrofit (Electric and Gas)

Recommendations Derived from the Study: There are no recommendations from this report as it was designed to establish baseline campaign awareness.

How the Study Came to the Recommended Conclusions: Not Applicable

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: Not Applicable

A copy of the complete study can be found in Appendix C, Study 27.

28. Additional Non-Energy Impacts for Low Income Programs

Type of Study: Impact

Objective of the Study: This study includes additional investigation that clarifies and expands the research performed in the Residential and Low-Income Non-Energy Impacts Evaluation. The additional information focused on refrigerator recycling, lighting quality, price hedging, and economic development.

Programs to which the Results of the Study Apply:

- Low-Income Single Family Retrofit (Electric and Gas)
- Low-Income Multi Family Retrofit (Electric and Gas)

Results of the Study and How the Study Determined those Results: The results have a positive impact on the benefits attributable to low income programs. The results were arrived at through a process of meeting and building consensus among Program Administrators, LEAN, and the EEAC.

Lighting Quality

Item	NEI
Increased Lighting Quality	$56/participant

Refrigerator Recycling

Item	NEI
Avoided Landfill Space	$1.06
Plastics & Glass Recycling	$1.25

Item	NEI
Incineration Insulating Foam	$170.22

Price Hedging

Item	NEI
Hedge against volatile prices	$0.76/MMBTU of gas
	$0.005/kWh

Economic Development

Massachusetts – Gas Estimate					
Increase in GSP (Billion $) (1)	Savings (Tbtu) (2)	Savings (therms) (3)	Economic output per therm (4)	11% for low income (5)	Inflated from 2008 to 2011$ (6)
28	664	6,640,000,000	$4.22	$0.46	$0.486
(1) Energy Efficiency: Engine of Economic Growth; ENE; October 2009; page 49.					
(2) Energy Efficiency in Massachusetts: Engine of Economic Growth; ENE; October 2009; page 2.					
(3) Tbtu times 10,000,000					
(4) Calculated as Increase in GSP/Savings (therms)					
(5) Multiply economic output per therm by 11%; assumes 11% inures to the benefit of low-income (the low-income fraction of population).					
(6) Uses an inflation rate of 1.85% from BCR models.					

Massachusetts – Electric Estimate				
Increase in GSP (Billion $) (1)	Savings (GWh) (2)	Savings (kWh) (3)	Economic output per therm (4)	11% for low income (5) (6)
70	217,300	217,300,000,000	$0.32	$0.04
(1) Energy Efficiency: Engine of Economic Growth; ENE; October 2009; page 47.				
(2) Energy Efficiency in Massachusetts: Engine of Economic Growth; ENE; October 2009; page 2.				
(3) GWh times 1,000,000				
(4) Calculated as Increase in GSP/Savings (kWh)				
(5) Multiply economic output per therm by 11%; assumes 11% inures to the benefit of low-income (the low-income fraction of population).				
(6) Using an inflation rate of 1.85% from BCR models does not change the estimate of $0.04/kWh from 2008 to 2011$.				

How the Results of the Study Impact each Identified Program's Savings: This additional research will result in an increase in benefits in the Low-Income Programs.

Formulas Necessary to Understand the Impact of the Study on the PA's Program(s): Not Applicable.

If the Results of the Study Are Not Adopted by the PA, Fully Explain Why: The results of the study are adopted.

A copy of the complete study can be found in Appendix C, Study 28.

29. 2011 Commercial and Industrial Natural Gas Programs Free-ridership and Spillover Study

This study applies to gas energy efficiency programs only and is, therefore, not included in Cape Light Compact's Annual Report.

30. Community Based Partnership Interim Process Evaluation

Type of Study: Process

Objective of the Study: The overall objective of this evaluation is to assess the effectiveness of each community-based partnership that falls within the scope of the evaluation and determine its potential for replication and/or full-scale implementation.

The Community-Based Partnerships 2011 Evaluation Final Report provides an overview of each effort's structure and performance against the goals, presents findings from the research activities conducted with a goal of providing feedback and identifying areas for program improvement. The report also presents comparative analysis of community-based efforts under evaluation with the goal of developing best practices for design and implementation of such efforts.

Programs to which the Results of the Study Apply:

- Renew Boston (Electric and Gas)
- New Bedford Community Mobilization Initiative (Electric and Gas)

Recommendations Derived from the Study:

#	**Finding**
1	Determine the goals of each community-based effort (and how it complements the overall portfolio) upfront.
2	Be strategic with the selection of communities.
3	Understand the targeted population and barriers that might prevent the achievement of goals. Clearly document how the community-based initiative seeks to intervene prior to launch.
4	Establish metrics before launching the effort, and track metrics consistently across community-based initiatives.
5	Consider most efficient and cost-effective delivery structure that would align with the effort's goals.

6	Require that all costs and resources required for support be clearly documented and tracked.
7	For future evaluation efforts explicitly evaluate participation trends; marketing efforts and conversion rates; and the full costs of these partnerships, including resources expended by the PAs, implementers and community groups.

How the Study Came to the Recommended Conclusions: The findings presented in the study were developed through analysis of program materials and tracking databases, in-depth interviews with the PA staff, in-depth interviews with program stakeholders and community groups, historical participation analysis (for one effort), and participant interviews. As part of the research, the evaluation team has also conducted a literature review of community-based programs implemented across the United States, and developed both partnership-specific logic models and an overarching theory of change for community-based partnerships.

Explain Whether or Not the PA Decided to Adopt Recommendations from the Study, and Why: These findings are targeted at future efforts, and will be considered by the PAs and interested stakeholders as additional efforts are launched.

A copy of the complete study can be found in Appendix C, Study 30.

G. Future Studies

Table III.B summarizes the studies expected to be included in next year's Annual Report.

Table III.B		
Evaluation Studies in Next Annual Report		
Studies	Docket and Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (Y / N)
Residential Studies		
RNC Net Impact Study	Study is planned but not yet submitted for approval	Yes
RNC Incremental Cost Study	Study is planned but not yet submitted for approval	Yes
RNC Baseline Study/Code Compliance Assessment*	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Home Energy Services: Contractor Charettes in Support of Lost Opportunity Metric*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Net-to-Gross study on Residential Cooling & Heating Equipment (Cool Smart)*	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	Yes
Home Energy Services: Impact Evaluation*	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Residential Lighting Consumer Survey Phase II	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	Yes
Residential Lighting Shelf Stocking Survey	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	Yes
Residential Lighting Supplier Interviews	Study is planned but not yet submitted for approval	Yes
Residential Lighting Onsite Saturation Study*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Lighting Sensitivity Analysis (EISA Baseline Study) 3YP Version*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Consumer Electronics Potential Study	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Consumer Electronics Saturation Study*	Study is planned but not yet submitted for approval	Yes

Table III.B		
Evaluation Studies in Next Annual Report (cont'd)		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
Residential Pilot Studies		
Process and Impact Evaluation of the WI FI Thermostat Pilot*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Electronically Commutated Motor (ECM) Circulator Pump Pilot Program*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Impact Evaluation of the 2011-2012 Boiler Reset Control Pilot Program*	Study is planned but not yet submitted for approval	Yes
2012 Lighting Controls Pilot	Study is planned but not yet submitted for approval	Yes
Commercial & Industrial Studies		
Small C&I Billing Analysis	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Small C&I Lighting Controls Impact Study*	Study is pending approval of the 2010 AR, D.P.U. 11-63 through D.P.U. 11-73 and D.P.U. 11-126	Yes
Large C&I - Prescriptive Measure Impact Evaluation (VSDs)	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Large C&I - Potential Study to assess the mid-sized C&I customers	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
Large C&I - 2011 CHP Impact Evaluation	Study is planned but not yet submitted for approval	Yes
Large C&I - Custom Electric Impact Evaluation (Refrigeration, Motor, Other)	Study is planned but not yet submitted for approval	Yes
Large C&I - Upstream Lighting Impact & Process Evaluation	Study is planned but not yet submitted for approval	Yes
Large C&I - C&I Customer Profile	Study is planned but not yet submitted for approval	Yes
Large C&I - Existing Building Market Characterization	Study is planned but not yet submitted for approval	Yes
Large C&I - Lighting Controls Study	Study is planned but not yet submitted for approval	Yes
Large C&I - Whole System Approach Assessment	Study is planned but not yet submitted for approval	Yes
Large C&I - New Construction Market Characterization	Study is planned but not yet submitted for approval	Yes
Large C&I - New Construction Baseline Code Compliance Study*	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Large C&I - Prescriptive Measure Impact Evaluation (Lighting)*	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes

Table III.B		
Evaluation Studies in Next Annual Report (cont'd)		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
Special & Cross-Cutting Studies		
Non-Energy Impacts 2011 - C&I*	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Education Program Process (Literature Review)*	Study is planned but not yet submitted for approval	Yes
Residential Smart Energy Monitoring Pilot Impact Evaluation (CLC)	Study is pending approval of the 2011 MTM, D.P.U. 10-140 through D.P.U. 10-150	Yes
Community-Based Inititative: Northampton/Pittsfield	Study is planned but not yet submitted for approval	Yes
Umbrella Marketing Post-Campaign Study	Study is planned but not yet submitted for approval	Yes
Job Creation Study*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes
* The PAs anticipate filing these studies with the 2013-15 Three Year Plan.		

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). The purpose of this section is to address these statutory budget requirements.

For each sector, Tables IV.A through IV.C summarize and compare planned and actual PP&A costs, outsourced activities, and budget allocation, respectively.

B. Minimization of Administrative Costs

The most significant factor in the Compact's approach to minimizing administrative costs in 2011 was the statewide collaborative process, which was 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, resulted in economies of scale that reduced the cost for each Program Administrator. For example, the joint release of many RFPs led to minimization of administrative costs in that the costs for preparation and release of the RFPs were shared by the PAs. The Program Administrators also minimized 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 was necessary and appropriate for the Compact to maintain a skilled and dedicated administrative staff in order to ensure successful delivery of programs, compliance with the GCA, timely responses to the directives of the Council, Department, and DOER; and documentation and achievement of substantial savings. The Program Administrators sought 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 2010-2012 Three-Year Energy Efficiency Plan.

Another factor in the Compact's efforts to control administrative costs is its grassroots service to the community through its volunteer Town or County appointed Governing Board Members. These Board Members bring their expertise to community civic and business outreach events, provide guidance to staff on policies and new innovative initiatives through their role on the Energy Efficiency Committee, and support the multiple Town Energy Committees to inform and encourage participation in energy efficiency programs – all through volunteer service at no cost to ratepayers.

While the economies of scale and other steps taken by the Compact to minimize costs in 2011 were effective, and administrative costs incurred by the Compact are transparent and are presented in the Compact's narrative and supporting tables (see Appendix B), 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 Program Administrators' energy efficiency 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 GCA, 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 Compact sought to minimize costs at all available opportunities, and not just from one point in time to another.

Table IV.A provides a summary of the percent change in actual Program Planning and Administration Costs relative to plan, at the program, sector, and portfolio levels.

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	Change in % - Plan to Actual
Residential						
Residential New Construction & Major Renovation	$ 5,213	2.2%	$ 8,733	2.9%	$ 3,520	0.7%
Residential Cooling & Heating Equipment	$ 25,592	2.9%	$ 27,523	3.8%	$ 1,931	0.9%
Multi-Family Retrofit	$ 12,556	2.4%	$ 9,439	4.1%	$ (3,116)	1.7%
MassSAVE	$ 261,273	3.5%	$ 324,491	5.4%	$ 63,218	1.8%
Behavior/Feedback Program	$ -		$ -		$ -	0.0%
ENERGY STAR Lighting	$ 57,071	2.8%	$ 44,994	3.2%	$ (12,078)	0.4%
ENERGY STAR Appliances	$ 10,320	2.9%	$ 14,409	3.0%	$ 4,089	0.2%
Residential Education Program	$ -	0.0%	$ -	0.0%	$ -	0.0%
Workforce Development	$ -	0.0%	$ -		$ -	0.0%
Heat Loan Program	$ -	0.0%	$ -	0.0%	$ -	0.0%
R&D and Demonstration	$ -		$ -		$ -	0.0%
Deep Energy Retrofit	$ -	0.0%	$ 2,655	5.5%	$ 2,655	5.5%
Power Monitor Pilot	$ -	0.0%	$ 19,360	5.7%	$ 19,360	5.7%
Residential New Constr & Maj Reno - SW Pilot	$ -	0.0%	$ 151	0.9%	$ 151	0.9%
Residential New Constr MF (4-8 story) SW Pilot	$ -		$ -		$ -	0.0%
Residential New Constr Lighting Design SW Pilot	$ -	0.0%	$ 309	5.6%	$ 309	5.6%
Residential New Constr V3 EStar Homes SW Pilot	$ -		$ -		$ -	0.0%
Heat Pump Water Heater Pilot	$ -	0.0%	$ -	0.0%	$ -	0.0%
Residential Technical Development	$ -	0.0%	$ -		$ -	0.0%
Hot Roofs	$ -	0.0%	$ -		$ -	0.0%
Home Automation	$ -	0.0%	$ -		$ -	0.0%
Community Based Pilot	$ -		$ -		$ -	0.0%
Statewide Marketing & Education	$ -	0.0%	$ -	0.0%	$ -	0.0%
EEAC Consultants	$ -		$ -		$ -	0.0%
DOER Assessment	$ 28,505	100.0%	$ 105,813	100.0%	$ 77,308	0.0%
Sponsorships & Subscriptions	$ 13,090	100.0%	$ 24,298	100.0%	$ 11,208	0.0%
Residential Total	$ 413,619	3.3%	$ 582,175	5.8%	$ 168,555	2.5%

Table IV.A
Program Planning and Administration Costs (cont'd)

Customer Sector / Program	Planned		Actual		Change from Planned to Actual	
	Value ($)	% of Total Program Costs	Value ($)	% of Total Program Costs	Value	Change in % - Plan to Actual
Low-Income						
Low-Income Residential New Construction	$ 777	2.3%	$ 82	3.6%	$ (696)	1.3%
Low-Income 1 to 4 Family Retrofit	$ 57,378	2.8%	$ 183,642	8.1%	$ 126,264	5.3%
Low-Income MuiltiFamily Retrofit	$ 25,420	3.4%	$ 6,666	3.9%	$ (18,754)	0.5%
Statewide Marketing & Education	$ -		$ -		$ -	0.0%
Low-Income Energy Affordability Network Funding	$ -	0.0%	$ -	0.0%	$ -	0.0%
DOER Assessment	$ 4,774	100.0%	$ 16,141	100.0%	$ 11,367	0.0%
Low-Income Total	$ 88,350	3.1%	$ 206,531	8.3%	$ 118,181	5.2%
Commercial & Industrial						
C&I New Construction and Major Renovation	$ 35,471	2.8%	$ 27,496	3.3%	$ (7,975)	0.5%
C&I New Construction and Major Renovation - Gvmt	$ -		$ -		$ -	0.0%
C&I Large Retrofit	$ 26,022	2.8%	$ 33,290	5.9%	$ 7,268	3.2%
Large C&I Retrofit - Government	$ -		$ -		$ -	0.0%
C&I Small Retrofit	$ 206,907	2.8%	$ 138,447	4.7%	$ (68,460)	1.9%
C&I Small Retrofit - Government	$ -		$ -		$ -	0.0%
Community Based Pilot	$ -		$ -		$ -	0.0%
Statewide Marketing & Education	$ -		$ -		$ -	0.0%
EEAC Consultants	$ -		$ -		$ -	0.0%
DOER Assessment	$ 15,331	100.0%	$ 57,390	100.0%	$ 42,059	0.0%
Sponsorships & Subscriptions	$ 10,910	100.0%	$ 23,076	100.0%	$ 12,166	0.0%
Commercial & Industrial Total	$ 294,641	3.1%	$ 279,698	6.3%	$ (14,942)	3.3%
Grand Total	$ 796,610	3.2%	$ 1,068,404	6.3%	$ 271,794	3.1%

None of the sectors experienced variances of 10% or greater as compared to planned Program Planning and Administration costs.

C. Competitive Procurement

Table IV.B provides a summary of the percent change in actual cost allocations to In-House and Outsourced Activities (including Competitively Procured and Non-Competitively Procured Activities) relative to plan, at the sector and portfolio levels.

Table IV.B
Outsourced and Competitively Procured Services

Customer Sector	In-House Activities		Outsourced Activities						Total Activities
			Competitiely Procured		Non-Competitiely Procured		Total Outsourced Activities		
	($)	% of Total Activities	($)	% of Total Outsourced	($)	% of Total Outsourced	($)	% of Total Activities	($)
Residential									
Planned	$ 316,905	10%	$ 2,077,475	76%	$ 648,823	24%	$ 2,726,298	90%	$ 3,043,203
Actual	$ 741,325	32%	$ 1,324,141	84%	$ 247,433	16%	$ 1,571,575	68%	$ 2,312,900
% Planned to Actual		22%		8%		-8%		-22%	
Low-Income									
Planned	$ 82,715	9%	$ 237,075	29%	$ 575,837	71%	$ 812,912	91%	$ 895,627
Actual	$ 288,399	36%	$ 445,754	86%	$ 71,799	14%	$ 517,553	64%	$ 805,952
% Planned to Actual		27%		57%		-57%		-27%	
Commercial & Industrial									
Planned	$ 350,069	19%	$ 1,052,016	73%	$ 398,115	27%	$ 1,450,131	81%	$ 1,800,200
Actual	$ 289,009	28%	$ 440,994	61%	$ 284,987	39%	$ 725,980	72%	$ 1,014,989
% Planned to Actual		9%		-12%		12%		-9%	
Total									
Planned	$ 749,689	13%	$ 3,366,565	67%	$ 1,622,776	33%	$ 4,989,341	87%	$ 5,739,030
Actual	$ 1,318,733	32%	$ 2,210,889	79%	$ 604,219	21%	$ 2,815,108	68%	$ 4,133,841
% Planned to Actual		19%		11%		-11%		-19%	

Residential and Low Income experienced a significant variance between planned to actual by outsource category.

There was a shift from Outsourced Activities to In-House Activities across all sectors. In general, outsourced EM&V costs and vendor implementation costs (which are captured in the Sales, Technical Assistance and Training budget category) were significantly lower than planned for all sectors. Also, in-house Marketing and Sales, Technical Assistance and Training costs were significantly higher than planned.

As the Cape Light Compact did not know the exact cost of EM&V when it filed its plan, it assumed that 4% of its total budget would be spent on EM&V activities in its plan. However, the Cape Light Compact did not need to leverage all of the money set aside for EM&V due to the fact that most studies were conducted and cost-shared on a statewide basis among PAs and as a result were less costly for each PA.

When formulating its plan, the Cape Light Compact inquired about implementation costs with its vendors and used these inputs to develop its plan. However, as implementation occurred, vendors realized that they could provide services more cost-effectively than they had estimated at the time the plan was developed.

Conversely, in-house Marketing and Sales, Technical Assistance and Training costs were significantly higher than planned as internal resources were leveraged more than planned. The Cape Light Compact did not know the exact in-house costs Marketing and Sales, Technical Assistance and Training costs that would be needed when it filed its plan, and the assumptions made did not reflect the actual requirements.

In terms of the shift from non-competitive to competitive procurement, Low-Income experienced an increase in competitive procurement due to the fact that more outsourced costs were leveraged by implementation vendors that were competitively procured.

D. Low-Income Spending

Table IV.C provides a summary of the percent change in actual costs at the sector and portfolio levels, relative to plan.

Table IV.C
Customer Sector Budget Allocation

Customer Sector	Planned		Actual		Change in % from Planned to Actual	
	Total Program Costs	% of Total Program Costs	Total Program Costs	% of Total Program Costs	Total Program Costs	% of Total Program Costs
Residential	$ 12,386,208	49.7%	$ 9,998,543	59.1%	$ (2,387,665)	9.4%
Low-Income	$ 2,854,275	11.5%	$ 2,489,571	14.7%	$ (364,704)	3.3%
Commercial & Industrial	$ 9,659,199	38.8%	$ 4,420,046	26.1%	$ (5,239,153)	-12.7%
Total	$ 24,899,683	100.0%	$ 16,908,160	100.0%	$ (7,991,523)	0.0%

The statutory requirement regarding the Low-Income budget is as follows:

"Electric and gas energy efficiency program funds shall be allocated to customer classes, including the low-income residential subclass, in proportion to their contributions to those funds; provided, however, that at least 10 per cent of the amount expended for electric energy efficiency programs and at least 20 per cent of the amount expended for gas energy efficiency programs shall be spent on comprehensive low-income residential demand side management and education programs."[12]

The Low-Income budget represents greater than 10% of the amount expended for electric energy efficiency programs by the Cape Light Compact. Therefore, the Cape Light Compact met the Low-Income budget statutory requirement this year.

12 Massachusetts Session Laws. Chapter 169. An Act Relative to Green Communities. Approved by the Governor July 2, 2008. Available at: http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169. Section 19. (c).

V. PERFORMANCE INCENTIVES

The purpose of this section is to address the performance incentives that each PA proposes to collect. As a public entity and municipal aggregator, the Cape Light Compact does not collect performance incentives. As such, this section is not applicable to the Cape Light Compact.

VI. AUDITS

The purpose of this section is to address audits conducted during the past 5 program years.

In accordance with the Administrative Services Agreement between Barnstable County and the Cape Light Compact, management of the Cape Light Compact funds is done by Barnstable County. Under this service, Cape Light Compact Energy Efficiency funds are annually audited as part of the Barnstable County audit. In addition to the Department's review, the Cape Light Compact Energy Efficiency Funds have been included as part of the Barnstable County Audit since calendar year 2001, fiscal year 2002.

The Cape Light Compact is presently reviewing audit and attestation service options for an independent audit of the Energy Efficiency Program for calendar year 2011.

VII. APPENDICES

The purpose of this section is to provide detailed supporting documentation.

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