NSTAR Gas

2011 Energy Efficiency Annual Report

Table of Contents

VII. Appendices

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

B. Organization of Annual Report

The Company's 2011 Annual Report is organized as follows:

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

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

C. Summary of Program Portfolio

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

Tables[1] I.A and I.B provide summary information on program performance at the portfolio and customer sector levels, respectively.

Table I.A: Program Portfolio Summary

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	19,189,377			17,746,914		-8%
Performance Incentive	$	969,217			1,131,655		17%
Savings & Benefits							
Gas							
Lifetime	therms	60,481,471	76,878,290	27%	39,150,184	-49%	-35%
Annualized	therms	3,324,713	4,181,543	26%	2,534,797	-39%	-24%
Electric							
Annualized Energy	kWh	201,433	254,597	26%	292,723	15%	45%
Annualized Demand							
Summer	kW	18	34	90%	48	41%	168%
Winter	kW	87	94	8%	55	-42%	-37%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	11,647,843	0%	0%
Cost-Effectiveness							
TRC Benefits	$	66,117,662			55,963,669		-15%
TRC Costs	$	23,793,175			22,770,911		-4%
Net Benefits	$	42,324,487			33,192,758		-22%
BCR	n/a	2.78			2.46		-12%

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

Note: The Planned Values in Table I.A and all subsequent tables that contain Planned Values in this Annual Report (except as otherwise noted) were submitted to the Department as Attachment A to the Memorandum of Agreement on April 15, 2011 in NSTAR Gas, D.P.U. 10-141.

As shown in Table 1.A above, significant[2] variances exist at the portfolio level for lifetime and annual savings between the planned and preliminary year end and evaluated values. The C&I sector is the driving factor accounting for these variances.

Significant variances also exist at the portfolio level for electric energy and demand between the planned and preliminary year end and evaluated values. The residential sector accounts for the variances between planned and preliminary year end values. The variances between planned and evaluated values are due to changes in both the residential and low-income sectors.

Non-gas non-electric resources were positively affected by the application of the NEI evaluation study in both the residential and low-income sectors.

The C&I sector is the driving force behind the 22 percent decrease in net benefits between the planned and evaluated values.

Please reference section II.A.1 for a more detailed discussion of the cause of the variances in these sectors.

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

Table I.B: Customer Sector Summary				
Sector	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Residential				
TRC Benefits	$	22,435,048	27,203,247	21%
TRC Costs	$	12,011,564	12,408,603	3%
Net Benefits	$	10,423,484	14,794,644	42%
BCR	n/a	1.87	2.19	17%
Low-Income				
TRC Benefits	$	7,976,970	10,995,573	38%
TRC Costs	$	5,264,554	4,963,652	-6%
Net Benefits	$	2,712,416	6,031,921	122%
BCR	n/a	1.52	2.22	46%
C&I				
TRC Benefits	$	35,705,644	17,764,849	-50%
TRC Costs	$	6,517,057	5,398,657	-17%
Net Benefits	$	29,188,587	12,366,192	-58%
BCR	n/a	5.48	3.29	-40%
TOTAL				
TRC Benefits	$	66,117,662	55,963,669	-15%
TRC Costs	$	23,793,175	22,770,911	-4%
Net Benefits	$	42,324,487	33,192,758	-22%
BCR	n/a	2.78	2.46	-12%

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

- Within the Residential sector, the Residential New Construction and Major Renovation, Residential Heating and Water Heating and Behavior/Feedback programs contributed to the variance between planned and evaluated values. Please refer to 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 Multi Family Retrofit program caused the variance between planned and evaluated values. Please refer to 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 and C&I Retrofit programs contributed to the variance between planned and evaluated values. Please refer to section II.C.2 for a more detailed discussion of the cause of the variances by program within this sector.

II. PROGRAM PERFORMANCE

NSTAR Gas Performance Highlights

NSTAR Gas-specific highlights for 2011, by sector, are briefly described below:

Residential and Low-Income – In 2011, the second year of the Three-Year Energy Efficiency Plan, NSTAR Gas built upon its successful first year of program implementation under the plan despite facing many challenges and aggressive goals. The Company expanded and redesigned programs and initiatives (as described below) in 2011 in an attempt to increase participation in both the residential and low-income sectors with the desired effect of increasing overall savings.

Historically, the platform the Company has developed for acquiring increased savings cost-effectively has been based upon the following principles: (1) integrating gas and electric programs into a portfolio of fuel-neutral programs, to the extent practicable; (2) concentrating on seamless delivery from the customer's perspective; (3) focusing on deeper penetration of energy efficiency with the introduction of innovative and targeted approaches and options; (4) assisting in the development of an expanded, trained workforce capable of providing consistent program messaging and services, while maintaining high quality; (5) collaborating with community organizations that have long-standing relationships with homeowners, tenants and small businesses in economically marginalized communities, and developing community-based outreach initiatives that implement a neighborhood approach to energy efficiency services. These principles were evident in the Company's existing homes, multi-family, low-income and new construction initiatives as they successfully addressed the energy efficiency needs of its customers.

Commercial and Industrial – Even with the aggressive goals established for 2011, NSTAR Gas Company's wide variety of well-established programs and its innovative new implementation strategies allowed its C&I customers to achieve permanent energy savings and the Company to the reach many of the challenging goals set for its New Construction and Major Renovation and Direct Install programs. Savings goals were surpassed on the portfolio level with particularly high therm acquisition in the Direct Install program largely due to the vendors' growing comfort level with identifying gas measures after the integration of this program with the electric program in 2010. While on a portfolio level the gas programs remained under budget and exceeded participation goals, the overwhelming participation in the Direct Install program required this program budget to be exceeded by a marginal amount.

All of the Company's gas programs benefited immensely from the integration of gas and electric programs. 2011 marked the first full year that program staff was tasked with focusing on both gas and electric savings opportunities. As the year progressed, staff became more comfortable in the identification of gas opportunities and with working with other Program Administrators to coordinate gas leads.

Several marketing strategies, outlined below, were developed and expanded in 2011. These strategies, listed below, contributed to the Company's success in achieving therm savings and will assist the Company in acquiring additional energy savings in years to come.

- **MOUs and Roadmaps**: The Company continued to expand its MOU and Roadmap[3] strategy for its largest customers, successfully gaining new long-term commitments from seven major corporations. In addition to the MOUs and Roadmaps signed in years prior, the seven new agreements are anticipated to contribute a great deal of energy savings in the years to come. Throughout 2011, savings from MOU customers alone contributed over 30 percent toward the Company's total energy savings.

- **Market Segmentation Model**: The Company worked to aggregate customer information (including usage, demand, and industry classification) into a new database which will allow the Company to better segment customers into niche markets and develop new comprehensive market strategies to best suit their energy efficiency needs.

- **Targeted Segment Initiatives:**

    - **Small Business**: An outbound telemarketing campaign was conducted with a sample of 5,000 small business customers. This resulted in 173 leads and 82 direct install audits conducted. According to the Company's direct install vendors, the quality of leads was vastly improved through this initiative compared to those generated by past services.

    - **Commercial Real Estate**: Significant research took place in 2011 in an attempt to effectively target this hard to penetrate sub-segment of customers. In addition, the Company fostered partnerships with the Green Ribbon Commission and several major commercial real estate firms which will serve to improve the Company's marketing strategy for this segment in years to come.

[3] An increasingly important tool available to account executives managing the largest C&I customers is the Memorandum of Understanding ("MOU"). An MOU offers a way to document a mutual commitment between the customer and PA to work together to achieve mutually stated goals, through specific actions that are tailored to the customer's facilities over a multi-year planning horizon. As such, an MOU can set the stage for achieving deeper and more comprehensive energy efficiency savings, and is more likely to succeed than a "one measure" or "one year" approach. Typically, MOUs include participation by upper management, the establishment of specific, very aggressive energy efficiency saving targets, and measurement and verification strategies to document savings throughout the target facilities.

- **Government**: The Company continues to work closely with the DOER's Green Communities Division in assisting municipal customers with the process of implementing cost-effective energy efficiency measures. Additionally, 2011 was a particularly unique year as the Company facilitated millions of dollars in ARRA funding by leveraging relationships with both the DOER and the Massachusetts Clean Energy Council.

A. Residential Sector Programs

1. Summary

During 2011 the Company implemented the following residential programs and residential pilots:

Residential Programs

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

Residential Pilots

- Deep Energy Retrofit
- Community Based

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

Sections II.A.2 and II.A.3 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	$	10,580,856			10,016,581		-5%
Performance Incentive	$	309,658			361,341		17%
Savings & Benefits							
Gas							
Lifetime	therms	18,879,146	17,442,112	-8%	16,442,227	-6%	-13%
Annualized	therms	1,287,303	1,301,697	1%	1,338,353	3%	4%
Electric							
Annualized Energy	kWh	201,433	254,597	26%	163,551	-36%	-19%
Annualized Demand							
Summer	kW	18	34	90%	36	6%	100%
Winter	kW	87	94	8%	28	-70%	-68%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	7,485,517	0%	0%
Cost-Effectiveness							
TRC Benefits	$	22,435,048			27,203,247		21%
TRC Costs	$	12,011,564			12,408,603		3%
Net Benefits	$	10,423,484			14,794,644		42%
BCR	n/a	1.87			2.19		17%

As shown in Table II.A.1 above, significant variances exist at the Residential sector level between planned and evaluated values in the Savings and Benefits and the Cost-Effectiveness performance categories. The reasons for such variances are:

- The variances in the electric energy and demand values between the planned and preliminary year-end and evaluated values are due to differences in the number of measures installed and estimated savings in the Residential New Construction and Major Renovations program.
- The reason residential benefits and net benefits are 21 and 42 percent more than planned is due to the *Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts* ("NEIs"), which updated the non-energy impacts for the residential programs. The NEI study had a large impact on overall residential sector benefits based on the previously filed study in NSTAR Gas, D.P.U. 11-107, and is not included in this docket. These NEIs were applied to the residential programs in an attempt to quantify the benefits to customers not currently being captured in the total resource costs test. The application of these NEIs increased the total evaluated benefits 27 percent.

A more detailed program-level discussion can be found in Section II.A.2.

Table II.A.3: Residential Program Summary				
Program / Performance Category	**Units**	**Planned Value**	**Evaluated Results**	
			Value	% Change from Planned
Residential New Construction & Major Renovation				
TRC Benefits	$	2,459,818	3,981,788	62%
TRC Costs	$	1,823,434	2,030,307	11%
Net Benefits	$	636,385	1,951,482	207%
BCR	n/a	1.35	1.96	45%
Residential Heating and Water Heating				
TRC Benefits	$	8,136,383	11,263,384	38%
TRC Costs	$	2,312,811	2,819,170	22%
Net Benefits	$	5,823,573	8,444,214	45%
BCR	n/a	3.52	4.00	14%
MassSAVE				
TRC Benefits	$	0	0	0%
TRC Costs	$	1,296,323	1,232,907	-5%
Net Benefits	$			
BCR	n/a			
Weatherization Program				
TRC Benefits	$	8,995,229	8,983,451	0%
TRC Costs	$	4,376,233	4,489,212	3%
Net Benefits	$	4,618,996	4,494,239	-3%
BCR	n/a	2.06	2.00	-3%
Multi-Family Retrofit				
TRC Benefits	$	2,488,588	2,295,122	-8%
TRC Costs	$	1,340,889	1,271,831	-5%
Net Benefits	$	1,147,699	1,023,292	-11%
BCR	n/a	1.86	1.80	-3%
Behavior/Feedback				
TRC Benefits	$	355,029	679,502	91%
TRC Costs	$	354,624	324,539	-8%
Net Benefits	$	405	354,963	87544%
BCR	n/a	1.00	2.09	109%
Deep Energy Retrofit				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	96,514	27,628	-71%
Net Benefits	$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Hard-to-Measure Initiatives				
TRC Costs	$	410,737	213,009	-48%
TOTAL				
TRC Benefits	$	22,435,048	27,203,247	21%
TRC Costs	$	12,011,564	12,408,603	3%
Net Benefits	$	10,423,484	14,794,644	42%
BCR	n/a	1.87	2.19	17%

Residential Sector Performance Highlights

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

- 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 Heating and Water Heating - In 2011, the PAs collectively achieved over 100 percent of their savings goals within budget due to attractive customer incentives combined with federal tax incentives. The program provided outreach to 300 supply houses and 700 contractors throughout Massachusetts and New England. The PAs continued to successfully utilize extensive contractor outreach via supply houses and big box retailers, which contributed to increased participation levels in this program. PAs sponsored and participated in 22 training events in 2011 and sponsored their 11th Annual GasNetworks Fall Conference and Trade Show on September 22, 2011. Attendees included over 400 HVAC contractors from across the Commonwealth along with 23 exhibitors. The day-long conference featured a myriad of expert trainers and speakers and focused on high efficiency natural gas HVAC equipment and installation practices. The program continued its integration efforts with the Residential Cooling and Heating Equipment ("Cool Smart") program and incorporated breakout sessions to include such topics as electronically commutated motors, brushless fan motor technology, hydronic heating, on-demand water heating, condensing and modulating boilers, near boiler piping, system sizing, renewables and codes and standards updates. In 2011, program outreach

resulted in 1,789 visits and the distribution of 102,825 residential and 21,600 commercial rebates from December 2010 through December 2011.

After embarking on an extensive competitive bidding process, the PAs secured a new rebate processing vendor in 2011. During the transition to the new vendor, the PAs continued to experience steady demand. The transition did present some challenges, which included an increase in year-end claims, the carryover of unprocessed rebate applications from the previous vendor, the design and launch of the 2012 rebate form, and the integration of data systems. Each PA has successfully transitioned to the new vendor.

Mass Save/Weatherization - 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 addition, HEAT Loan offerings were extended to include many gas customers in municipal electric territories to provide qualified customers with zero percent interest loans up to $25,000 with terms up to seven years.

- 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.

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

2. Residential Programs

a. Residential New Construction and Major Renovation

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

Targeted Customers: The target market for this program included homebuilders, contractors, architects/designers, trade allies, Home Energy Rating System ("HERS") raters, homebuyers, realtors, developers, low-income and affordable housing developers, code officials, and consumers in the market for new homes or major renovations.

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

Targeted End-Uses:

- Heating

- Air Duct
- Hot Water
- Envelope

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

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

Docket/Exhibit where the Program is Discussed and Approved: The program was discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 135-144 (bates numbering 00136-00145). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.A.4[4] provides information on the performance of the Residential New Construction and Major Renovation program.

[4] For each program and pilot program, the Company has defined "participant", and updated the "units" column in the program or pilot program table to be consistent with that definition.

Table II.A.4: Residential New Construction & Major Renovation							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	1,785,536			1,452,739		-19%
Performance Incentive	$	21,402			47,788		123%
Participants	unique accts	599			470		-22%
Program Cost / Participant	$	2,981			3,091		4%
Savings & Benefits							
Gas							
Lifetime	therms	1,901,825	2,631,270	38%	2,444,192	-7%	29%
Annualized	therms	76,073	105,251	38%	105,251	0%	38%
Average Measure Life	yrs	25.0	25.0	0%	23.2	-7%	-7%
Electric							
Annualized Energy	kWh	201,433	254,597	26%	163,551	-36%	-19%
Annualized Demand							
Summer	kW	18	34	90%	36	6%	100%
Winter	kW	87	94	8%	28	-70%	-68%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	950,623	0%	0%
Cost-Effectiveness							
TRC Benefits	$	2,459,818			3,981,788		62%
TRC Costs	$	1,823,434			2,030,307		11%
Net Benefits	$	636,385			1,951,482		207%
BCR	n/a	1.35			1.96		45%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses - The variance between the planned and evaluated number of participants is the result of fewer units participating in the program than projected due to the new construction market being slower than expected.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – The increase in lifetime and annual savings between planned and preliminary year-end and evaluated values is due to a new program design element implemented in 2011. In 2010, the program design was based on a Home Energy Rating System (HERS) score. A new program design element was established for the 2011 program year which required each qualifying home to obtain a minimum percent savings over the baseline home. The projections for the 2011 program savings were based on 2010 savings and thus the average therm savings per home were under projected.

There were several variances in the electric energy and demand savings however because electric savings are not a focus of this gas program most of the large variances were caused by a small number of electric measures that are not a significant portion of the program savings. There was an increase in energy savings from planned to preliminary year-end results due to more refrigerators, dishwashers, and lighting units being installed than planned. However, the evaluated results show a decline in the energy savings due to the *Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle*. This evaluation studied average homes being built in Massachusetts and looked at average installation rates of several efficient electric measures in a baseline home. The results of this study caused an increase to the free-ridership to dishwashers, refrigerators, and lighting units which caused a decrease in energy savings. For further information, please refer to Appendix C, Study 3. The increase in summer demand between the planned numbers and preliminary year end and evaluated numbers are the result of more central air conditioning units being installed than planned. The decrease in winter demand between the preliminary year end numbers and evaluated results are due to the new demand impact model. For further information, please refer to Appendix C, Study 9.

Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

Cost-Effectiveness – The variance in TRC benefits from planned values to evaluated values of 62 percent is due to the application of the NEI evaluation study. This study included new benefits that were not previously included in any of the gas residential programs. This also resulted in higher than projected net benefits and BCR for the program.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 1 - *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.

Study 2 - *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.

Study 3 - *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.

Study 9 - *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.

The Residential New Construction program is cost effective with a BCR of 1.96.

b. Residential Heating and Water Heating

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

Targeted Customers: The program targeted residential home owners with natural gas heating/hot water heating equipment (both new construction and existing homes), home designers/architects, engineers,

plumbing and HVAC contractors and technicians, high efficiency heating equipment and related parts/accessory suppliers, manufacturers, and distributors, and new home building and remodeling contractors.

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

Targeted End-Uses: Space and Water Heating fueled by natural gas.

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

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 108-116 (bates numbering 00109-00117). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

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

Table II.A.5: Residential Heating and Water Heating							
Performance Category	**Units**	**Planned Value**	**Preliminary Year-End Results**		**Evaluated Results**		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	2,196,311			2,831,898		29%
Performance Incentive	$	114,512			171,266		50%
Participants	# of measures	6,466			5,037		-22%
Program Cost / Participant	$	340			562		66%
Savings & Benefits							
Gas							
Lifetime	therms	7,027,722	7,170,795	2%	6,159,625	-14%	-12%
Annualized	therms	429,290	404,234	-6%	335,228	-17%	-22%
Average Measure Life	yrs	16.4	17.7	8%	18.4	4%	12%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	4,021,066	0%	0%
Cost-Effectiveness							
TRC Benefits	$	8,136,383			11,263,384		38%
TRC Costs	$	2,312,811			2,819,170		22%
Net Benefits	$	5,823,573			8,444,214		45%
BCR	n/a	3.52			4.00		14%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The increase in program costs from planned to evaluated is due to strong consumer demand for both high efficiency heating and water heating products. This resulted in a shift in forecasted production of equipment type and efficiency levels as a result of consumers purchasing more of the super high efficiency models than originally forecasted. This increase in demand for high efficiency products also resulted in a higher than forecasted cost per participant.

During the course of the year, the Company transitioned to a new program vendor. Due to data tracking issues as a result of a change in vendor, program participation data was not available for a month at the end of the year, causing the variance in planned and evaluated participation. Those additional participants not accounted for in 2011 will be included in 2012 numbers.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive

variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits - The decrease in annual gas savings between the planned and evaluated values is due to adjusted net-to-gross numbers that were developed from the *Estimated Net-To-Gross (NTG) Factors for the Massachusetts Program Administrators (PAs)* study and *HEHE Process and Impact Evaluation* study both filed in the 2010 Annual Report, and through thorough review and discussions with EEAC consultants. Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

Cost-Effectiveness – The variance in TRC Benefits from planned to evaluated values of 38 percent is due to the application of the NEI evaluation study. This study included new benefits that were not previously included in gas residential programs. Due to the increase in TRC Benefits, Net Benefits also saw an increase.

There were no EM&V studies included in the Company's 2011 Annual Report that apply to this program.

The program's performance 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 Company's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in NSTAR Gas, D.P.U. 11-107.

The Residential Heating and Water Heating program is cost effective with a BCR of 4.00.

c. Residential Mass Save/Weatherization

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 upgrades.

Targeted Customers: The HES target market is all non-low-income residential customers living in single-family houses or one- to four-unit buildings that are not part of a larger site where an association exists (such as a 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 the number of insulation and blower door air sealing jobs completed for Weatherization. A participant in Mass Save is defined as the number of audits completed.

Targeted End-Uses:

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

Delivery Mechanism: The Mass Save and gas Weatherization programs were fully integrated in 2011 and were implemented by each PA's competitively procured lead vendor. 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 program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009 and the Company's 2011 RCS Budget Petition, filed November 1, 2010. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 117-128 (bates numbering 00118-00129) and NSTAR Gas, D.P.U 10-RCS-11, respectively. The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126 and on December 29, 2010 in NSTAR Gas, 10-RCS-11, respectively.

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009 and the Company's 2011 RCS Budget Petition, filed November 1, 2010. See NSTAR Electric, D.P.U. 09-120, Exhibit NSTAR-1, pages 146-157 (bates numbering 00152-00163) and NSTAR Electric, D.P.U 10-RCS-04, respectively. The program was approved by the Department on January 28, 2010 in NSTAR Electric, D.P.U. 09-120 and on December 29, 2010 in NSTAR Electric, 10-RCS-04, respectively.

Table II.A.6 provides information on the performance of the residential Mass Save program and Table II.A.7 provides information on the performance of the Weatherization program.

Table II.A.6: MassSAVE							
Performance Category	**Units**	**Planned Value**	**Preliminary Year-End Results**		**Evaluated Results**		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	1,296,324			1,232,907		-5%
Performance Incentive	$	0			0		0%
Participants	# of audits	3,735			3,278		-12%
Program Cost / Participant	$	347			376		8%
Savings & Benefits							
Gas							
Lifetime	therms	0	0	0%	0	0%	0%
Annualized	therms	0	0	0%	0	0%	0%
Average Measure Life	yrs	n/a	n/a	n/a	n/a	n/a	n/a
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	0	0%	0%
Cost-Effectiveness							
TRC Benefits	$	0			0		0%
TRC Costs	$	1,296,323			1,232,907		-5%
Net Benefits	$						
BCR	n/a						

There were no significant variances between planned and evaluated values for the Mass Save program.

Table II.A.7: Weatherization Program							
Performance Category	**Units**	**Planned Value**	**Preliminary Year-End Results**		**Evaluated Results**		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	3,355,815			2,705,676		-19%
Performance Incentive	$	144,343			107,757		-25%
Participants	# of air sealing/ insulation jobs	2,275			1,779		-22%
Program Cost / Participant	$	1,475			1,521		3%
Savings & Benefits							
Gas							
Lifetime	therms	7,521,157	5,196,430	-31%	5,846,193	13%	-22%
Annualized	therms	358,270	243,406	-32%	280,819	15%	-22%
Average Measure Life	yrs	21.0	21.3	2%	20.8	-2%	-1%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	1,965,260	0%	0%
Cost-Effectiveness							
TRC Benefits	$	8,995,229			8,983,451		0%
TRC Costs	$	4,376,233			4,489,212		3%
Net Benefits	$	4,618,996			4,494,239		-3%
BCR	n/a	2.06			2.00		-3%

The reasons for the significant variances between planned, preliminary year-end and evaluated values in the Weatherization program are as follows:

Expenses – The variance in the number of participants is due to program design changes that occurred after the planning estimates were developed. In mid 2011 the Residential Conservation Services Program and Gas Weatherization Program were integrated to offer customers fuel blind energy efficiency services. It took extra time to onboard additional independent installation contractors to work within the new program design. This affected the program's ability to reach the planned number of participants.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – The lower lifetime and annual savings between planned and preliminary year-end and evaluated were due to the planned savings by measure being lower than the vendor calculated savings. The vendor implemented a new

software program that more accurately calculates savings on a per house basis which caused lower calculated vendor savings. Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

The EM&V studies included in the Company's 2011 Annual Report that apply to these programs are as follows:

Study 4 - *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 Company saw a net increase in program savings for the 2011 evaluated results. This study is discussed in more detail in Section III, Study 4.

Study 13 - *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.

The Weatherization program is cost effective with a BCR of 2.00.

d. Residential 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 the number of measures installed under this program.

Targeted End-Uses:

- Lighting
- Heating, Ventilation, and Air Conditioning
- 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 throughout the project lifecycle.

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 145-160 (bates numbering 00146-00161). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.A.8 provides information on the performance of the Residential Multi-Family Retrofit program.

Table II.A.8: 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	$	1,087,013			1,236,636		14%
Performance Incentive	$	27,382			26,079		-5%
Participants	# of measures	5,460			4,894		-10%
Program Cost / Participant	$	199			253		27%
Savings & Benefits							
Gas							
Lifetime	therms	2,155,442	2,010,502	-7%	1,469,713	-27%	-32%
Annualized	therms	150,670	115,690	-23%	94,551	-18%	-37%
Average Measure Life	yrs	14.3	17.4	21%	15.5	-11%	9%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	548,568	0%	0%
Cost-Effectiveness							
TRC Benefits	$	2,488,588			2,295,122		-8%
TRC Costs	$	1,340,889			1,271,831		-5%
Net Benefits	$	1,147,699			1,023,292		-11%
BCR	n/a	1.86			1.80		-3%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The total costs per participant were higher than planned because of the actual mix of measures installed; fewer thermostats were installed and more air sealing was performed.

Savings and Benefits – The lower annual savings between planned and preliminary year-end were due to the vendor calculated savings for most of the measures being lower than planned. The evaluated lifetime and annual savings are significantly lower than the planned estimates based on a combination of the vendor calculated savings discussed previously and the free-ridership analysis that increased the free-ridership level for each measure to between 15 and 24 percent. For further information on the free-ridership and multifamily impact algorithms, please refer to Appendix C, Study 7. The longer measure life than planned is because of the actual mix of measures installed. Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 5 - *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.

Study 6 - *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.

Study 7 - *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 average 18% free-ridership number derived from this study. This study is discussed in more detail in Section III, Study 7.

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.

The Multi-Family Retrofit program is cost effective with a BCR of 1.80.

e. Behavior Feedback

Purpose/Goal: The purpose of the Behavior Feedback program was to educate and motivate participating residents to take gas heating-related energy saving actions and behaviors within their homes.

Targeted Customers: The program targeted 25,000 residential single- and multi-family customers with high energy use who were gas-only NSTAR customers.

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

Targeted End-Uses: The program targeted changes in the behavior of customers regarding their energy usage.

Delivery Mechanism: Participants receive information on their household energy consumption compared to similar households through monthly Home Energy Reports and an Energy Insider website.

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Pre-Hearing Statement – Attachment 2. The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.A.9 provides information on the performance of the Behavior Feedback program.

Table II.A.9: Behavior/Feedback Program							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	352,606			316,088		-10%
Performance Incentive	$	2,019			8,451		319%
Participants	unique accts	25,000			44,948		80%
Program Cost / Participant	$	14			7		-50%
Savings & Benefits							
Gas							
Lifetime	therms	273,000	433,116	59%	522,504	21%	91%
Annualized	therms	273,000	433,116	59%	522,504	21%	91%
Average Measure Life	yrs	1.0	1.0	0%	1.0	0%	0%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	0	0%	0%
Cost-Effectiveness							
TRC Benefits	$	355,029			679,502		91%
TRC Costs	$	354,624			324,539		-8%
Net Benefits	$	405			354,963		87544%
BCR	n/a	1.00			2.09		109%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The program was intended to target 25,000 customers who started receiving home energy reports in February 2011. The number of participants was 80% higher than planned because the vendor continued to send reports to the 25,000 Wave 1 customers who started receiving reports in September 2010. The winter heating season savings for that group of customers were included in NSTAR's 2010 Annual Report. Due to logistical problems on the vendor side and subsequent internal vendor negotiations, additional reports were sent to NSTAR customers at no additional cost to NSTAR. For this same reason the cost per participant is significantly lower than planned.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – The preliminary year-end and evaluated annual and lifetime savings are higher than planned because of the additional customers who received reports that NSTAR had not planned on targeting. The evaluated savings are 21 percent higher then the vendor estimates which are reported as preliminary year-end values. This difference is because the vendor reports the average energy usage difference between the participant group and control group while the evaluation contractor has done a more comprehensive billing analysis utilizing Linear Fixed Effects Regression (LFER) models.

Cost Effectiveness – The higher than forecasted TRC benefits, net benefits and BCR are all due to the higher than planned savings as a result of both the vendor logistical problems described above and the evaluated savings which are higher than the vendor calculated savings.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 26 - *The Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report*

This second formal report of the three-year cycle evaluates the savings impacts of the behavior/feedback programs and pilots. The report also compares savings between opt-in and opt-out behavior programs and identifies savings from participation in other residential programs. The report includes a process evaluation of an opt-in Behavior/Feedback pilot

and a demographic analysis of an opt-out program. This evaluation increases the 2011 evaluated results. The study is discussed in more detail in Section III, Study 26.

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.

The Behavior/Feedback program is cost effective with a BCR of 2.09.

3. Residential Pilot Programs

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 gas account served under this program.

Targeted End-Uses:

- Heating (deeper energy retrofit measures)
- Hot Water
- Envelope (deeper energy retrofit measures)

- End Use Behavior

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

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

How Achievement of the Pilot's Stated Goal was Measured: The overall goal of the Pilot was to attract participants into this "broader and deeper" energy-savings initiative, knowing that 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 in 2012.

Docket/Exhibit where the Program is Discussed and Approved: The pilot is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 129-134 (bates numbering 00130-00135). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.A.10 provides information on the performance of Deep Energy Retrofit pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available. Due to the fact that there were no evaluated savings to report for this program, this portion of the table was not able to be completed.

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	$	96,514			27,628		-71%
Participants	unique accts	n/a			1		n/a
Program Cost / Participant	$	n/a			27,628		n/a
Savings & Benefits							
Gas							
Lifetime	therms	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	therms	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
Electric							
Annualized Energy	kWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized Demand							
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
Non-Gas Non-Electric Resources (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	$	96,514			27,628		-71%
Net Benefits	$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

The reasons for the significant variances between planned and evaluated values are as follows:

> Expenses - In 2011, the Company had only one project which was started in the fall of 2010 and finished in May 2011. The total gas budget was 71 percent less than planned because participation was low due to costs associated with this program, measure requirements, length of time needed to complete a project and the complexity of doing this type of project.

These results fall in line with the Company's expectations for participation. Factors such as prohibitive costs and project complexity were the overriding contributors to the low participation level.

There are no EM&V studies included in the Company's 2011 Annual Report that apply to this pilot.

The pilot will no longer continue in 2012 but the program administrators are in the process of developing *A Builder's Guide*. This guide will be a critical component of the delivery of the 2013-2015 residential Deep Energy Renovation measures. The DER would be available for download (as a PDF) from the Mass Save® website for homeowners, designers, and contractors to understand exactly what is required in the Deep Energy Renovation measures. However, the Company does plan to budget funds in 2012 to honor any project commitments made in 2011.

b. Community-Based Pilots

Description of Pilot/Specific Activities Intended to Study: The term "Community-Based Pilots" encompassed a number of unique partnerships in 2011 between the Program Administrators and local communities designed to harness the power of community-based outreach to achieve broader participation in the Commonwealth's energy efficiency programs. NSTAR participated in a number of community initiatives in its service territory in 2011 including those in New Bedford, Cambridge, Dartmouth, and Needham. The Company also participated in a community mobilization initiative in New Bedford.

Why Implemented on Pilot Basis rather than as a Full Program: The community-based initiatives were offered as pilots to assess the effectiveness of each partnership and determine their potential for replication.

Targeted Customers: The Program Administrators and interested stakeholders selected communities with the greatest opportunities for success, based on an assessment of the proposal submitted. Targeted customers varied by pilot, but in general included residential customers with incomes between 60 and 120 percent of median household income in their community.

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

Targeted End-Uses: The end-uses targeted by the community based pilots included the same end-uses addressed under the Company's existing audit and weatherization programs.

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

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

How Achievement of the Pilot's Stated Goal was Measured: A multi-year evaluation of community based pilots was conducted by Opinion Dynamics Corporation to assess the effectiveness of these pilots and determine their potential for replication. This process evaluation is included with this Annual Report as Appendix C, Study 30.

Docket/Exhibit where the Program is Discussed and Approved: The pilot is discussed in detail in the Company's 2010-2012 Three-Year Electric Energy Efficiency Plan, filed October 30, 2009. See NSTAR

Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 115-118 (bates numbering 00121-00124). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.A.14 provides information on the performance of the Community Based pilot. Because of the nature of pilot programs, the table for this pilot program is incomplete with regard to savings and benefits. The Company has provided all information that is available.

Table II.A.11: Community Based Pilot

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	59,502			4,166		-93%
Participants	see Mass Save/ Weatherization	n/a			n/a		n/a
Program Cost / Participant	$	n/a			n/a		n/a
Savings & Benefits							
Gas							
Lifetime	therms	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	therms	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
Electric							
Annualized Energy	kWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized Demand							
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
Non-Gas Non-Electric Resources (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	$	59,502			4,166		-93%
Net Benefits	$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

The reason for the significant variance between planned and actual total program costs and TRC costs was that NSTAR Gas did not have representation in this pilot from towns in its service territory until after the second quarter of 2011. With only two towns participating, and not until late in the year, the program spending was less than initially projected.

As stated above, NSTAR Gas Company participated in a number of community initiatives in its service territory in 2011 including those in Cambridge, Dartmouth, and Needham. The Company also participated in a community based partnership in New Bedford. Community organizations performed outreach to local residents to increase participation levels in the Mass Save 1-4 family and multi-family programs. In addition to helping residents save money and energy, the New Bedford initiative sought to provide employment opportunities and career pathways for community residents who are trained and qualified to perform residential weatherization work.

Summary results of this pilot were not finalized in time for this report due to the number of community initiatives being carried over into the 2012 program year. However, initial results

indicate that participation levels will vary significantly based on location (urban or suburban), age and type of housing stock, consumer demographics, and overall level of the community's engagement. Initial results also indicate pre-weatherization barriers are more prevalent in urban environments, especially in inner-city housing stock thus creating additional challenges for implementing weatherization upgrades.

While the overall results and successes of these outreach activities varied, it has become evident that community engagement is an important component to enhancing the Company's ability to achieve greater program participation (e.g., Home Energy Services) and energy savings. The Company also recognizes there is no "one size that fits all" community engagement model. However, despite differences in size and scope the Company remains committed to working with various community organizations and partners for the remainder of this pilot in 2012 and beyond. As of this writing, the Company does not expect this pilot to become a stand alone program in the 2013-2015 Three-Year Plan but rather anticipates community based outreach initiatives to become an extension of its overall program level marketing and outreach strategies.

The EM&V study included in the Company's 2011 Annual Report that applies to this pilot is as follows:

Study 30 – *Community-Based Partnerships 2011 Evaluation Final Report*

The evaluation of community-based partnerships was intended to assess the effectiveness of such partnerships and determine the potential for replication and/or full-scale implementation of this type of pilot. The report builds upon an interim report issued in 2011 and presents the findings of the evaluation research conducted to date. This evaluation had no impact on the evaluated results. The study is discussed in more detail in Section III, Study 30.

B. Low-Income Sector Programs

1. Summary

During 2011 the Company implemented the following low-income programs[5]:

- Low-Income Single-Family Retrofit
- Low-Income Multi-Family Retrofit

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

[5] The Company did not offer any pilot programs in the low-income sector during 2011.

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

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	$	5,116,662			4,795,522		-6%
Performance Incentive	$	148,030			168,130		14%
Savings & Benefits							
Gas							
Lifetime	therms	6,635,225	5,662,289	-15%	5,594,890	-1%	-16%
Annualized	therms	299,670	265,515	-11%	259,410	-2%	-13%
Electric							
Annualized Energy	kWh	0	0	0%	129,172	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	12	0%	0%
Winter	kW	0	0	0%	27	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	3,927,534	0%	0%
Cost-Effectiveness							
TRC Benefits	$	7,976,970			10,995,573		38%
TRC Costs	$	5,264,554			4,963,652		-6%
Net Benefits	$	2,712,416			6,031,921		122%
BCR	n/a	1.52			2.22		46%

As shown in Table II.B.1 above, significant variances exist at the low-income sector level in the Cost-Effectiveness category. The reason low-income benefits and net benefits are 38 and 122 percent more than planned is due to the *Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts* ("NEIs"), which updated the non-energy impacts for the low-income programs. The NEI study had a large impact on overall low-income sector benefits based on the previously filed study in NSTAR Gas, D.P.U. 11-107, and is not included in this docket. There was also supplemental research on non-energy impacts for low-income programs which includes additional low income benefits that clarifies and expands the prior research performed in the *Additional Non-Energy Impacts for Low Income Programs*. The additional information focused on refrigerator recycling, lighting quality, price hedging, and economic development, and the results have a positive impact on the benefits attributable to low-income programs. These NEIs were applied to both low-income programs in an attempt to quantify the benefits to customers not currently being captured in the total resource costs test. The application of these NEIs increased the total evaluated benefits in the low-income sector by 36 percent. For further information on the additional NEIs, please refer to Appendix C, Study 28.

A more detailed program-level discussion can be found in Section II.B.2.a.

Table II.B.3: Low-Income Program Summary				
Program / Performance Category	Units	Planned Value	Evaluated Results	
			Value	% Change from Planned
Low-Income Single Family Retrofit				
TRC Benefits	$	5,100,937	4,892,405	-4%
TRC Costs	$	2,483,132	2,136,826	-14%
Net Benefits	$	2,617,804	2,755,579	5%
BCR	n/a	2.05	2.29	11%
Low-Income MultiFamily Retrofit				
TRC Benefits	$	2,876,034	6,103,167	112%
TRC Costs	$	2,670,802	2,761,057	3%
Net Benefits	$	205,232	3,342,110	1528%
BCR	n/a	1.08	2.21	105%
Hard-to-Measure Initiatives				
TRC Costs	$	110,620	65,769	-41%
TOTAL				
TRC Benefits	$	7,976,970	10,995,573	38%
TRC Costs	$	5,264,554	4,963,652	-6%
Net Benefits	$	2,712,416	6,031,921	122%
BCR	n/a	1.52	2.22	46%

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.

2. Low-Income Programs

a. Low-Income Single-Family Retrofit

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

Targeted Customers: This program targeted residential gas customers living in one- to four-unit dwellings who are at or below sixty percent of the state median income level and who are qualified to receive fuel assistance and/or utility-discounted rates. For two- to four- unit dwellings, fifty percent of the occupants must qualify as low-income.

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

Targeted End-Uses:

- Heating
- Hot water
- Envelope

Delivery Mechanism: PAs used a lead vendor and/or worked closely with their respective Community Action Program ("CAP") agencies on all aspects of the program design and implementation. All PAs worked in conjunction with the Low-Income Energy Affordability Network ("LEAN"). The lead vendor/CAP agencies were responsible for providing coordination of energy efficiency services to the customers, working with installation contractors to ensure that the proper initiative guidelines were enforced, ensuring that the customers met the eligibility requirements for program participation, and providing the CAP and/or PA with the required documentation of all work performed.

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 161-168 (bates numbering 00162-00169). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

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

Table II.B.4: Low-Income Single 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	$	2,378,538			2,061,949		-13%
Performance Incentive	$	104,692			74,879		-28%
Participants	# of measures	632			496		-22%
Program Cost / Participant	$	3,764			4,157		10%
Savings & Benefits							
Gas							
Lifetime	therms	4,240,800	2,569,074	-39%	2,501,675	-3%	-41%
Annualized	therms	192,600	121,129	-37%	115,024	-5%	-40%
Average Measure Life	yrs	22.0	21.2	-4%	21.7	3%	-1%
Electric							
Annualized Energy	kWh	0	0	0%	129,172	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	12	0%	0%
Winter	kW	0	0	0%	27	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	1,554,379	0%	0%
Cost-Effectiveness							
TRC Benefits	$	5,100,937			4,892,405		-4%
TRC Costs	$	2,483,132			2,136,826		-14%
Net Benefits	$	2,617,804			2,755,579		5%
BCR	n/a	2.05			2.29		11%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The participation was lower as a result of a decrease in the number of audits being performed compared to projections.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – Preliminary year-end and evaluated annual and lifetime gas savings were less than projected as a result of the lower than planned participation for this program. Also, the vendor calculated savings for insulation and weatherization measures was lower than planned.

Additional electric savings were added to the program's savings based on the *Low Income Single Family Program Impact Evaluation* which estimated furnace fan savings. The study is discussed in more detail in Section III, Study 17.

Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 16 - *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.

Study 17 - *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 savings had a net decrease for the Company due to this study. This study is discussed in more detail in Section III, Study 17.

Study 28 - *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 -107). 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 Company. 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.

The Low-Income Single-Family Retrofit program is cost effective with a BCR of 2.29.

b. 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: A participant is defined as the number of measures installed.

Targeted End-Uses:

- Heating
- 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 CAP and/or PA with the required documentation of all work performed.

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 177-190 (bates numbering 00178-00191). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

Table II.B.5 provides information on the performance of the Low-Income Multi-Family Retrofit Program.

Table II.B.5: Low-Income MultiFamily 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	$	2,627,504			2,667,805		2%
Performance Incentive	$	43,338			93,252		115%
Participants	# of measures	729			819		12%
Program Cost / Participant	$	3,604			3,257		-10%
Savings & Benefits							
Gas							
Lifetime	therms	2,394,425	3,093,215	29%	3,093,215	0%	29%
Annualized	therms	107,070	144,386	35%	144,386	0%	35%
Average Measure Life	yrs	22.4	21.4	-4%	21.4	0%	-4%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	2,373,155	0%	0%
Cost-Effectiveness							
TRC Benefits	$	2,876,034			6,103,167		112%
TRC Costs	$	2,670,802			2,761,057		3%
Net Benefits	$	205,232			3,342,110		1528%
BCR	n/a	1.08			2.21		105%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – Preliminary year-end and evaluated annual and lifetime gas savings were higher than projected because the vendor calculated savings were higher than planned.

Non-gas non-electric resources were positively affected by the application of the NEI evaluation study.

Cost-Effectiveness – The variance in TRC Benefits from planned to evaluated values of 112 percent is due the increase in savings and the application of the NEI

evaluation study. This study included new benefits that were not previously included in gas low-income programs. Due to the increase in TRC Benefits, Net Benefits and the BCR also saw an increase.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 5 - *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.

Study 16 - *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.

Study 28 - *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 11-107). 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 Company. 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.

The Low-Income Multi-Family Retrofit program is cost effective with a BCR of 2.21.

C. Commercial & Industrial Sector Programs

1. Summary

During 2011 the Company implemented the following Commercial & Industrial ("C&I") programs and C&I pilots:

C&I Programs

- C&I New Construction and Major Renovation
- C&I Retrofit
- C&I Direct Install

C&I Pilots

- Deep Energy Retrofit

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

Sections II.C.2 and II.C.3 provide detailed information on the performance of each C&I program.

Table II.C.1: C&I Sector Summary

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	3,491,859			2,934,810		-16%
Performance Incentive	$	511,529			602,184		18%
Savings & Benefits							
Gas							
Lifetime	therms	34,967,100	53,773,888	54%	17,113,066	-68%	-51%
Annualized	therms	1,737,740	2,614,332	50%	937,034	-64%	-46%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	234,792	0%	0%
Cost-Effectiveness							
TRC Benefits	$	35,705,644			17,764,849		-50%
TRC Costs	$	6,517,057			5,398,657		-17%
Net Benefits	$	29,188,587			12,366,192		-58%
BCR	n/a	5.48			3.29		-40%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Savings & Benefits – The large increase in annual and lifetime savings in the preliminary year-end results is driven mostly by an increase in large, custom building shell projects as implementers have focused on these high impact projects with longer measure lives. However, the evaluated results have been substantially reduced mainly because of impact evaluation results and free-ridership survey results for custom projects. While prescriptive measures such as condensing boilers and pre-rinse spray valves continue to show strong participation rates and drive growth in their respective programs, at the sector level this positive impact did not offset the downward pressure of evaluation results affecting the custom projects which continue to represent the majority of the Company's portfolio.

Cost-Effectiveness – The significant differences in the benefits cost effective categories is predominantly driven by the low realization rates for the custom end-use as described above. Decreases in TRC costs were not aligned with benefit decreases as these costs are a function of program's underlying measure mixes which showed substantial differences between planned and actual. A ratio analysis can explain the BCR decrease, as the TRC costs decrease less than TRC benefits.

Additional details are provided in the following sections.

Table II.C.3: C&I Program Summary				
Program / Performance Category	**Units**	**Planned Value**	**Evaluated Results**	
			Value	% Change from Planned
C&I New Construction and Major Renovation				
TRC Benefits	$	18,952,848	9,640,659	-49%
TRC Costs	$	3,265,272	2,100,390	-36%
Net Benefits	$	15,687,576	7,540,269	-52%
BCR	n/a	5.80	4.59	-21%
C&I Retrofit				
TRC Benefits	$	16,242,703	6,739,836	-59%
TRC Costs	$	2,945,226	3,030,432	3%
Net Benefits	$	13,297,477	3,709,404	-72%
BCR	n/a	5.51	2.22	-60%
C&I Direct Install				
TRC Benefits	$	510,093	1,384,354	171%
TRC Costs	$	117,689	202,044	72%
Net Benefits	$	392,404	1,182,310	201%
BCR	n/a	4.33	6.85	58%
Deep Energy Retrofit				
TRC Benefits	$	n/a	n/a	n/a
TRC Costs	$	50,000	0	-100%
Net Benefits	$	n/a	n/a	n/a
BCR	n/a	n/a	n/a	n/a
Hard-to-Measure Initiatives				
TRC Costs	$	138,870	65,791	-53%
TOTAL				
TRC Benefits	$	35,705,644	17,764,849	-50%
TRC Costs	$	6,517,057	5,398,657	-17%
Net Benefits	$	29,188,587	12,366,192	-58%
BCR	n/a	5.48	3.29	-40%

C&I Sector Performance Highlights

During 2011, the Company built upon existing C&I programs and significantly expanded initiatives to increase participation in all C&I programs. Building on the transition which took place in 2010, gas and electric integration continued to grow and run smoothly as the gas and electric Program Administrators became more comfortable identifying leads and sharing them with their counterparts in the same service territory. Innovative agreements with large C&I customers, which focus on long-term energy savings, continued to expand across the Commonwealth and were adopted by a greater number of customers.

Responding to the maturity of the Large Retrofit program, the Program Administrators began to adopt a new strategy which focused on specific niche sectors of customers and offered an expanded variety of cost-effective solutions. Many of these solutions involved deeper measures that, in addition to energy savings, provided additional customer benefits.

As higher energy costs generally motivate customers to invest in energy conservation, 2011 proved to be a challenging year given the relatively low cost of gas. Customer acquisition under these circumstances was, therefore, more costly, although the Program Administrators worked diligently to serve more customers and acquire more therms savings than in 2010.

In response to customer acquisition concerns, specifically for large, time sensitive capital gas projects unique to the New Construction & Major Renovation program, the Program Administrators agreed to support a community initiative in the cities of Northampton and Pittsfield. The purpose of this initiative is to test the hypothesis that cities building on relationships with their constituents could, with the assistance of a customer concierge service, help the Program Administrators identify more comprehensive gas energy efficiency projects. This year-long initiative, rolled out in August of 2011, was designed with specific metrics and will undergo an evaluation by the Program Administrators to determine its effectiveness in meeting its objectives.

Building on the integration of gas into the electric Small Retrofit program in 2010, the Program Administrators realized increased savings and participation in this program as vendors became more comfortable identifying and installing both electric and gas measures.

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

2. C&I Programs

a. C&I New Construction and Major Renovation

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

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

Definition of Program Participant: A program participant is defined as an individual project undertaken by a customer who has received a financial incentive for the completed implementation of one or more time-dependent gas energy efficiency measures. One customer may undertake multiple projects at different locations during the program year. Each project is, therefore, counted as an individual participant.

Targeted End-Uses: End uses targeted by the program included:

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

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

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

Docket/Exhibit where the Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 203-214 (bates numbering 00204-00215). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

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

Table II.C.4: C&I New Construction and Major Renovation							
Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	1,646,107			1,497,218		-9%
Performance Incentive	$	248,701			350,516		41%
Participants	# of projects or measures	396			377		-5%
Program Cost / Participant	$	4,157			3,971		-4%
Savings & Benefits							
Gas							
Lifetime	therms	18,684,650	27,889,476	49%	9,401,619	-66%	-50%
Annualized	therms	785,450	1,138,426	45%	389,788	-66%	-50%
Average Measure Life	yrs	23.8	24.5	3%	24.1	-2%	1%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	0	0%	0%
Cost-Effectiveness							
TRC Benefits	$	18,952,848			9,640,659		-49%
TRC Costs	$	3,265,272			2,100,390		-36%
Net Benefits	$	15,687,576			7,540,269		-52%
BCR	n/a	5.80			4.59		-21%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses - The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – Higher therm savings in the preliminary year-end case is largely driven by an increase in large custom projects, representing a 44% increase in gross savings to planned values. Complementing this is a high degree of success implementing prescriptive condensing boiler projects across all size categories, which has a substantial impact on savings. The negative delta in the evaluated case is almost entirely driven by the substantial reduction to the custom realization rate (47.3%) and increase to the free-ridership rate (57.5%), the combined net effect being an 80% reduction to gross custom savings. Because the gas program was in its infancy during the evaluation period examined, and savings review processes which are now in place had yet to be developed and adopted, the ratios of realized savings to original estimated savings are understandably low.

Cost-Effectiveness – The significant differences in the benefits cost effective categories is predominantly driven by the low realization rates for the custom end-use as described above. Reductions in TRC costs were due to the resulting differences between measure mixes and associated incremental costs.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 22 - *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.

Study 24 - *Prescriptive Gas Final Program Evaluation Report*

This study produced retrospective and prospective estimates of annual therm savings for those prescriptive gas projects in the condensing boiler, condensing furnace, infrared heating and indirect water heating measure categories. The net effect on each PA's program is dependent on the difference between the new savings estimate and the previous savings estimate incorporated into each PA's screening tool, and may therefore differ. The net effect for the Company was to decrease energy savings for this program. The study is discussed in more detail in Section III, Study 24.

Study 25 - *Impact Evaluation of 2010 Custom Gas Projects*

This study produced realization rates for annual therms for custom gas projects. 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 net effect for the Company was to decrease energy savings for this program. The study is discussed in more detail in Section III, Study 25.

Study 29 - *C&I Gas Net-to-Gross Study, 2011 Projects*

This study quantified the net impacts of the commercial and industrial natural gas programs by estimating the extent of free-ridership and spillover. As results were PA-specific, the results of this study differed for each PA. For NSTAR Gas, the study decreased savings. The study is discussed in more detail in Section III, Study 29.

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 Company's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in NSTAR Gas, D.P.U. 11-107.

The New Construction and Major Renovation program is cost effective with a BCR of 4.59.

b. C&I Retrofit

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

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

Definition of Program Participant: A program participant is defined as an individual project undertaken by a customer who has received a financial incentive for the completed implementation of one or more gas energy efficiency measures. One customer may undertake multiple projects at different locations during the program year. Each project is, therefore, counted as an individual participant.

Targeted End-Uses:

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

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

commissioning services, and the actual measure installations, including turn-key services.

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

Docket/Exhibit where Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 191-202 (bates numbering 00192-00203). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

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

Table II.C.5: C&I Retrofit

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	1,579,184			1,257,958		-20%
Performance Incentive	$	235,983			198,208		-16%
Participants	# of projects or measures	656			599		-9%
Program Cost / Participant	$	2,407			2,100		-13%
Savings & Benefits							
Gas							
Lifetime	therms	15,781,050	24,550,003	56%	6,534,499	-73%	-59%
Annualized	therms	895,930	1,331,872	49%	420,209	-68%	-53%
Average Measure Life	yrs	17.6	18.4	5%	15.6	-16%	-12%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	0	0%	0%
Cost-Effectiveness							
TRC Benefits	$	16,242,703			6,739,836		-59%
TRC Costs	$	2,945,226			3,030,432		3%
Net Benefits	$	13,297,477			3,709,404		-72%
BCR	n/a	5.51			2.22		-60%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – Differences in program costs are largely due to reduced spending on engineering studies in the sales & technical assistance budget category as more technical analysis was conducted in-house, and an average 15% reduction to the cost per project for custom retrofit as more cost effective measures within the building shell measure type were implemented.

Savings & Benefits – Higher production in the preliminary year-end case is almost entirely due to a focus on building shell projects which yielded over 80% more gross annual therms than was originally planned. The negative delta in the evaluated case is almost entirely driven by the substantial reduction to the custom realization rate (47.3%) and increase to the free-ridership rate (57.5%), the combined net effect being an 80% reduction to gross custom savings. Because the gas program was in its infancy during the evaluation period examined, and savings review processes which are now in place had yet to be developed and adopted, the ratios of realized savings to original estimated savings are understandably low.

Cost-Effectiveness – The significant differences in the benefits cost effective categories is predominantly driven by the low realization rates for the custom end-use as described above. A ratio analysis can explain the BCR decrease, as a high drop in TRC benefits was experienced accompanied by a slight increase in TRC costs.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 22 - *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.

Study 24 - *Prescriptive Gas Final Program Evaluation Report*

This study produced retrospective and prospective estimates of annual therm savings for those prescriptive gas projects in the condensing boiler, condensing furnace, infrared heating and indirect water heating measure categories. The net effect on each PA's program is dependent on the difference between the new savings estimate and the previous savings estimate incorporated into each PA's screening tool, and may therefore differ. The net effect for the Company was to decrease energy savings for this program. The study is discussed in more detail in Section III, Study 24.

Study 25 - *Impact Evaluation of 2010 Custom Gas Projects*

This study produced realization rates for annual therms for custom gas projects. 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 net effect for the Company was to decrease energy savings for this program. The study is discussed in more detail in Section III, Study 25.

Study 29 - *C&I Gas Net-to-Gross Study, 2011 Projects*

This study quantified the net impacts of the commercial and industrial natural gas programs by estimating the extent of free-ridership and spillover. As results were PA-specific, the results of this study differed for each PA. For NSTAR Gas, the study decreased savings. The study is discussed in more detail in Section III, Study 29.

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.

The Retrofit program is cost effective with a BCR of 2.22.

c. C&I Direct Install

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

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

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

Targeted End-Uses:

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

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

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

Docket/Exhibit where Program is Discussed and Approved: The program is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas, D.P.U. 09-126, Exhibit NSTAR-1, pages 215-219 (bates numbering 00216-00220). The program was approved by the Department on January 28, 2010 in NSTAR Gas, D.P.U. 09-126.

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

Table II.C.6: C&I Direct Install

Performance Category	Units	Planned Value	Preliminary Year-End Results		Evaluated Results		
			Value	% Change from Planned	Value	% Change from Preliminary	% Change from Planned
Expenses							
Total Program Costs	$	77,698			113,843		47%
Performance Incentive	$	26,845			53,460		99%
Participants	# of measures	270			606		124%
Program Cost / Participant	$	288			188		-35%
Savings & Benefits							
Gas							
Lifetime	therms	501,400	1,334,409	166%	1,176,949	-12%	135%
Annualized	therms	56,360	144,034	156%	127,038	-12%	125%
Average Measure Life	yrs	8.9	9.3	4%	9.3	0%	4%
Electric							
Annualized Energy	kWh	0	0	0%	0	0%	0%
Annualized Demand							
Summer	kW	0	0	0%	0	0%	0%
Winter	kW	0	0	0%	0	0%	0%
Non-Gas Non-Electric Resources (Lifetime)	$	0	0	0%	234,792	0%	0%
Cost-Effectiveness							
TRC Benefits	$	510,093			1,384,354		171%
TRC Costs	$	117,689			202,044		72%
Net Benefits	$	392,404			1,182,310		201%
BCR	n/a	4.33			6.85		58%

The reasons for the significant variances between planned, preliminary year-end and evaluated values are as follows:

Expenses – The difference in program cost is almost entirely driven by increased rebate payments associated with growth in customer participation as customer outreach and sales efforts improved over the year. Cost per participant was reduced as implementers were able to do a greater percentage of more cost effective measures than planned, such as pre-rinse spray valves which produce about the same level of savings as boiler reset controls at 20 percent the cost. Additionally, synergies continue to be realized from gas and electric integration putting downward pressure on costs, and marketing / advertising spending was minimal given the schedule for PA and statewide marketing efforts.

The Company's methodology allocated performance incentives achieved at the sector level to individual programs based on benefits and net benefits. Any variance in actual performance incentive allocations is directly linked to variances in evaluated benefits and net benefits in individual programs within a sector. These variances are not attributable to a change in performance incentive allocation methodology. In order to explain program performance incentive variance, please refer to the explanation of benefits and net benefits variances above.

Savings and Benefits – Differences in savings are due to substantial increases in participation across almost all end-uses. The greatest percentage increase over planned occurred in faucet aerators, where units flowing through the program were about 19x planned. The largest therm increase over planned occurred in pre-rinse spray valves, where participation resulted in approximately 34,000 more annual net therms than planned, although the product's short measure life somewhat curbs increases in lifetime savings resulting from participation increases.

Cost-Effectiveness – The differences in the benefits cost effective categories is predominantly driven by the significant increases in participation as detailed above. Reductions in TRC costs were due to the spending decreases detailed above in addition to the resulting differences between measure mixes and associated incremental costs. A ratio analysis can explain the increase in BCR, as TRC benefits increase much more rapidly than associated TRC costs.

The EM&V studies included in the Company's 2011 Annual Report that apply to this program are as follows:

Study 29 - *C&I Gas Net-to-Gross Study, 2011 Projects*

This study quantified the net impacts of the commercial and industrial natural gas programs by estimating the extent of free-ridership and spillover. As results were PA-specific, the results of this study on the program differed for each PA. For the

Company, the study decreased savings. The study is discussed in more detail in Section III, Study 29.

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 Company's 2012 Mid-Term Modification filed with the Department on October 28, 2011 in NSTAR Gas, D.P.U. 11-107.

The Direct Install program is cost effective with a BCR of 6.85.

3. C&I Pilots

a. Deep Energy Retrofit

Description of Pilot/Specific Activities Intended to Study: The Deep Energy Retrofit pilot was implemented to investigate the potential for energy savings of at least 50 percent of total on-site energy use through deep retrofits of existing commercial buildings and to identify 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 commercial customers 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 commercial building with a target of 50% reduction in energy usage.

Targeted End-Uses: The end-uses targeted to dramatically reduce the amount of energy used in existing buildings were:

- HVAC
- Process

- Building Envelope
- End-Use Behavior

Delivery Mechanism: Project design details and assistance were provided to the Deep Energy Retrofit contractors performing the work. The projects were handled through technical contractors and/or utilizing American Recovery and Reinvestment Act funds.

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

How Achievement of the Pilot's Stated Goal was Measured: The overall goal of the Pilot was to attract participants into this "broader and deeper" energy-savings initiative, knowing that 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 in 2012.

Docket/Exhibit where the Program is Discussed and Approved: The pilot is discussed in detail in the Company's 2010-2012 Three-Year Gas Energy Efficiency Plan, filed October 30, 2009. See NSTAR Gas Company, D.P.U. 09-126, Exhibit NSTAR, pages 129-134 (bates numbering 00130-00135). The program was approved by the Department on January 28, 2010 in NSTAR Gas Company, D.P.U. 09-126.

Table II.C.7 provides information on the performance of the Deep Energy Retrofit pilot.

Table II.C.7: 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	$	50,000			0		-100%
Participants	see Retrofit	n/a			n/a		n/a
Program Cost / Participant	$	n/a			n/a		n/a
Savings & Benefits							
Gas							
Lifetime	therms	n/a	n/a	n/a	n/a	n/a	n/a
Annualized	therms	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
Electric							
Annualized Energy	kWh	n/a	n/a	n/a	n/a	n/a	n/a
Annualized Demand							
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
Non-Gas Non-Electric Resources (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	$	50,000			0		-100%
Net Benefits	$	n/a			n/a		n/a
BCR	n/a	n/a			n/a		n/a

All expenses for this program are embedded in the Company's C&I Retrofit program which is why the program specific evaluated results are showing a zero value. In 2011, all allocated funds were expended in research and implementation efforts and two projects were identified and completed that met the 50 percent energy reduction criteria of the pilot program.

Currently, the company intends to continue the program believing there to be future opportunities in the market. However, there are no intended modifications in the near term to make this its own program as the market for projects meeting the criteria is small. The Company intends to leverage existing program strategies focused on specific niche customer sectors and gas and electric integration efforts, both of which have yielded deeper savings to date, to identify potential opportunities. As such, the Company believes that planned funding is aligned with the current opportunity and testing will continue on a pilot program basis for the foreseeable future.

There are no EM&V studies included in the Company's 2011 Annual Report that apply to this pilot.

III. EVALUATION MEASUREMENT AND VERIFICATION ACTIVITIES

A. Summary

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 gas 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
- The 2011 Commercial and Industrial Natural Gas Programs Free-ridership and Spillover Study
- The Large C&I Custom Gas Measures Impact Evaluation

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 NSTAR Gas, D.P.U. 11-107. 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 2011 Commercial and Industrial Natural Gas Programs Free-ridership and Spillover Study quantified the net impacts of the commercial and industrial natural gas energy efficiency programs by estimating the extent of program free-ridership, early participant spillover, and nonparticipant spillover. The final statewide net-to-gross ratio was 78.7 percent. Between individual Program Administrators, the rate varied from 59.7 percent to 108 percent. This study is discussed in more detail in Appendix C, Study 29.

The Large C&I Custom Gas Measures Impact Evaluation determined realization rates at the PA level and statewide level. Evaluation activities included visual inspection of the installed measures, acquisition of nameplate data, spot measurements of boiler efficiencies, interviews with knowledgeable site staff, review of plans, and placement of logger equipment. Depending upon the measure under evaluation, loggers were placed to calculate a variety of custom measures. Overall, the statewide realization rate of 67.6 percent decreased the savings for custom gas measures. The specific results of the realization rate impact vary by Program Administrator such that if a Program Administrator 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. This study is discussed in more detail in Appendix C, Study 26.

Table III.A summarizes the EM&V studies that have not been included in previous Annual Reports. Please note: Studies 8, 10, 15, 18-21, and 23 apply to electric energy efficiency programs only and are, therefore, not included in the table below.

Table III.A: Evaluation Studies in Annual Report			
Studies	Location of Complete Study in Annual Report	Docket & Exhibit Approving Planned Evaluation Studies	Implemented as Approved? (yes/no)
Residential Program Studies			
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		
Massachusetts Mini Baseline Study of Homes Built at the End of the 2006 IECC Cycle	App. C, Study 3		
Home Energy Services Net-to-Gross Evaluation	App. C, Study 4		
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		
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	

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	
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		
Commercial & Industrial Program Studies			
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	All studies are implemented as planned
Large C&I - Prescriptive Gas Measures Impact Evaluation	App. C, Study 24		
Large C&I - Custom Gas Measures Impact Evaluation	App. C, Study 25		
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		
Additional Non-Energy Impacts for Low Income Programs	App. C, Study 28		
C&I Gas Net-to-Gross Study 2011 Projects	App. C, Study 29		
Community-Based Partnerships 2011 Evaluation Final Report	App. C, Study 30		

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:

kWh savings = (1 – Free-ridership + Spillover)

kW savings = (1 – 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	100%	96%	15%	15

	aerators combined				
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	$\Delta kWh = \frac{N \times (Watts_{pre} - Watts_{post}) \times Hrs}{1000} ISR$	$\Delta kWh = \frac{N \times (Watts_{post}) \times \Delta WattsDue \times Hrs}{1000} ISR$
Lighting – Linear Fluorescents	$\Delta kWh = \frac{(\#Lamps_{pre} \times Watts_{pre}) - (\#Lamps_{post} \times Watts_{post}) \times Hrs}{1000}$	Same algorithm, but deemed values are provided for baseline wattage and operational hours.
Lighting – LED Exit Signs	$\Delta kWh = \frac{N \times (Watts_{pre} - Watts_{post}) \times Hrs}{1000}$	Same algorithm but, some deemed input values are provided.
Lighting – Metal Halides	$\Delta kWh = \frac{(\#Lamps_{pre} \times Watts_{pre}) - (\#Lamps_{post} \times Watts_{post}) \times Hrs}{1000}$	Same algorithm, but deemed values are provided for baseline wattage and operational hours.
Lighting – Occupancy Sensors	$\Delta kWh = \frac{(Watts_{controlled}) \times Hrs \times svg}{1000}$	Same algorithm, but some deemed input values are provided.
Refrigerators	*Refrigerator Recycling* $\Delta kWh = \left[\left((kWh_{pre} - kWh_{ee})\right) \times \frac{12-6}{12} + \left((kWh_{ee} - kWh_{ss})\right) \times \frac{8}{12}\right] \times F_{use}$ *No Recycling* $\Delta kWh = (kWh_{ee} - kWh_{ss}) \times F_{use}$	Same algorithm, but some deemed input values are provided.
Attic Insulation Basement Insulation Wall Insulation (gas)	$MMBtu_{annual} = \frac{\left(\frac{1}{R_{post}} - \frac{1}{R_{pre}}\right) \times HDD \times Sq \times Area}{1,000,000 \times \eta_{heat}}$	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)	$\Delta kWh = \frac{Vol \times ACH \times 0.018 \times HDD \times \frac{24}{\eta_{heating}}}{SEER}$	Same algorithm producing a deemed savings approach per 1000 ft^2 based on zip code and heating type

Air Sealing (gas)	$\Delta MMBtu = \frac{\Delta ACH \times 0.018 \times HDD \times 24}{\eta_{heating} \times 1{,}000{,}000}$	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	$kWh = tons \times 12 \frac{kBtu/h}{ton} \times \left(\frac{1}{SEER} \times Hours_{cooling} + \frac{1}{HSPF} \times Hours_{heating}\right) \times \%savings$ $kWh = kBtu/h \times \left(\frac{1}{SEER} \times Hours_{cooling} + \frac{1}{HSPF} \times Hours_{heating}\right) \times \%savings$	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)	$\Delta kWh = kWh_{base} \times \left(\frac{EF_{post} - EF_{base}}{EF_{post}}\right)$	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 utilities), 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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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 Residential Retail ENERGY STAR® Lighting Evaluation

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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)	9,57-2,664 [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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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 information. One suggested definition for wait list is the	This recommendation is being considered for adoption at this time. The PAs have not formally adopted or rejected any recommendations that

	number of eligible low income customers who have completed all the necessary paperwork to participate and are awaiting an audit.	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 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.	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.

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 potential funding sources that may commonly be offered 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.
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
	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	--

Category	Measure	Natural Gas (Therms/year)	Electric (kWh/year)	Oil (MMBTUs/ year)
	Torchieres	--	211	--
	Fixtures	--	140	--
Domestic Hot Water	Domestic Hot Water (overall)	5	128	0.7
	Low-Flow Showerhead	9	188	1.1
	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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

21. Impact Evaluation of 2010 Custom Lighting Installations

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

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.
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 data 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

This study applies to electric energy efficiency programs only and is, therefore, not included in NSTAR Gas Company's Annual Report.

24. Prescriptive Gas Final Program Evaluation Report

Type of Study: Impact Evaluation

Objective of the Study: The study's objective was to produce revised annual therm savings estimates for program administrators' condensing boiler, condensing furnace, infrared heater and indirect water heater prescriptive gas projects for both prospective and retrospective savings. An 80% confidence interval was set in the sample design. Therm savings 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 (Gas Only)
- C&I Retrofit (Gas Only)

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

Recommended Condensing Boiler Savings

Size Category	Revised Capacity (MBtu)	AFUE	EFLH	Original Savings (ΔMMBtu/Unit/yr)	Evaluated (Retrospective) Savings (ΔMMBtu/Unit/yr)	Recommended Prospective Savings (ΔMMBtu/Unit/yr)
Capacity ≤ 300	209.6	88.9%	1400	22.1	29.8	29.4
300 < Capacity < 500	400	88.9%	1400	42.3	56.9	56.1
500 ≤ Capacity < 1000	735	88.9%	1400	77.1	104.6	103.0
1000 ≤ Capacity ≤ 1700	1350	88.9%	1400	142.6	192.1	189.2
1700 < Capacity	2363	88.9%	1400	249.0	336.2	331.2

Recommended Condensing Furnace Savings

Furnace Efficiency	Original Savings (ΔMMBtu/Unit/yr)	Evaluated (Retrospective) Savings (ΔMMBtu/Unit/yr)	Recommended Prospective Savings (ΔMMBtu/Unit/yr)
Furnace AFUE =>92%	21.1	5.9	13.5
Furnace AFUE =>92% w/ECM	19.6	5.5	12.5
Furnace AFUE =>94% w/ECM	23.6	6.2	14.9

Recommended Infrared Heater Savings

Measure Type	Original Savings (ΔMMBtu/Unit/yr)	Evaluated (Retrospective) Savings (ΔMMBtu/Unit/yr)	Recommended Prospective Savings (ΔMMBtu/Unit/yr)
Infrared Heater	74.4	22.3	48.3

Recommended Indirect Water Heater Savings

Measure Type	Original Savings (ΔMMBtu/Unit/yr)	Evaluated (Retrospective) Savings (ΔMMBtu/Unit/yr)	Recommended Prospective Savings (ΔMMBtu/Unit/yr)
Indirect Water Heater	30.4	20.7	20.7

The study determined therm savings estimates at the statewide level. The evaluation consisted of on-site monitoring and verification of the savings for a sample of participants for four of the top five measures installed, in terms of savings. The sample sites were monitored for approximately eight weeks in an attempt to capture seasonally sensitive variations in energy consumption between the winter and swing seasons. The first monitoring equipment was installed in early February 2012 and recovery was completed during the second week of April 2012. The on-site sample design was designed to achieve a relative precision of ± 20% at the 80% confidence interval using a two-tail test for the overall program savings.

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[6] 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.

6 Realization rate determined by this study.

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 24.

25. Impact Evaluation of 2010 Custom Gas Installations

Type of Study: Impact Evaluation

Objective of the Study: The study's objective was to produce annual therm savings realization rates for program administrators' custom gas projects. An 80% confidence interval was set 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 (Gas Only)
- C&I Retrofit (Gas Only)

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

Statistic	Annual Therms
All Program Administrators	
Total Tracking Savings	4,427,361
Total Measured Savings	2,991,776
Realization Rate	67.6%
Relative Precision at 80% Confidence	±9.0%
Error Bound at 80% Confidence	268,703
Sample Size	48
Error Ratio	0.50

PA	Annual Therms	PA	Annual Therms
Berkshire Gas		**National Grid**	
Total Tracking Savings	89,684	Total Tracking Savings	1,710,500
Total Measured Savings	34,660	Total Measured Savings	1,172,176
Realization Rate	38.6%	Realization Rate	68.5%
Relative Precision at 80% Confidence	±0.8%	Relative Precision at 80% Confidence	±17.4%
Error Bound at 80% Confidence	276	Error Bound at 80% Confidence	203,593
Sample Size	2	Sample Size	17
Error Ratio	0.02	Error Ratio	0.62
Columbia Gas		**NSTAR**	
Total Tracking Savings	1,553,740	Total Tracking Savings	938,625
Total Measured Savings	1,293,037	Total Measured Savings	444,200
Realization Rate	83.2%	Realization Rate	47.3%
Relative Precision at 80% Confidence	±12.9%	Relative Precision at 80% Confidence	±11.2%
Error Bound at 80% Confidence	167,329	Error Bound at 80% Confidence	49,693
Sample Size	13	Sample Size	13
Error Ratio	0.42	Error Ratio	0.39
New England Gas		**Unitil**	
Total Tracking Savings	23,400	Total Tracking Savings	111,412
Total Measured Savings	12,902	Total Measured Savings	34,801
Realization Rate	55.1%	Realization Rate	31.2%
Relative Precision at 80% Confidence	±0.0%	Relative Precision at 80% Confidence	±48.3%
Error Bound at 80% Confidence	-	Error Bound at 80% Confidence	16,807
Sample Size	1	Sample Size	2
Error Ratio	0.00	Error Ratio	0.86

The study determined realization rates at the PA level and statewide level. Evaluation activities included visual inspection of the installed measures, acquisition of nameplate data, spot measurements of boiler efficiencies, interviews with knowledgeable site staff, review of plans, and placement of logger equipment. Depending upon the measure under evaluation, loggers were placed to measure parameters such as supply air temperatures, return and supply water temperatures, and motor runtime profiles. The study design provided for a longer than normal two week logging period. Loggers were left in place for a minimum of a week and for as much as eight weeks. When possible, trend data was secured from the building automation system. Capturing distribution company billing data for all the affected meters at a site was a goal as well. The engineer selected from a variety of analytical techniques as appropriate for the measure including eQuest building simulation models and bin temperature models. Customer gas bills were used to calibrate bills, corroborate savings, and in some cases used as the primary means of determining savings impacts.

PAs represented in the study sample were Berkshire Gas, Columbia Gas, New England Gas, National Grid, NSTAR and Unitil. The study produced statewide results that are reliable (±9.0%) at 80% confidence. In addition, the precision levels for several PAs (National Grid: ±17.4%, Columbia Gas: ±12.9%, and NSTAR: ±11.2%) are sufficient to warrant application of the three individual PA realization results to the 2011 results according to the protocol established in the November 2010 Protocol memo, which stated

that individual realization rates may be applied for those PAs with more than ten sites and a final precision better than ±9.0%.

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[7] 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 25.

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

[7] Realization rate determined by this study.

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)
- MassSave (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
- C&I Retrofit

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
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

Type of Study: Impact Evaluation

Objective of the Study: The primary objective of the 2011 program year Free-ridership and Spillover Study was to assist the Massachusetts PAs in quantifying the net impacts of their commercial and industrial natural gas energy efficiency programs by estimating the extent of Program free-ridership, Early participant "like" and "unlike" spillover, and Nonparticipant "like" spillover.

Programs to which the Results of the Study Apply:

- C&I New Construction & Lost Opportunity (Gas Only)
- C&I Retrofit (Gas Only)
- C&I Direct Install (Gas Only)

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

PA	Program Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate[8]
Berkshire Gas	Custom	11	30	99,832	3.5%	7.2%	13.6%	13.5%	0.0%	110.1%
	Prescriptive	24	74	41,089	46.9%	13.8%	49.4%	13.8%	0.2%	102.7%
	Total	**35**	**104**	**140,921**	**16.1%**	**8.3%**	**24.0%**	**9.7%**	**0.1%**	**108.0%**
Columbia Gas	Custom	27	147	1,081,175	7.8%	7.7%	1.7%	3.6%	0.4%	94.2%
	Prescriptive	41	205	55,642	24.0%	9.8%	0.2%	0.9%	1.1%	77.2%
	Total	**68**	**352**	**1,136,817**	**8.6%**	**5.0%**	**1.6%**	**2.2%**	**0.4%**	**93.4%**
National Grid	Custom	47	254	3,361,773	27.9%	9.7%	9.6%	6.4%	1.0%	82.7%
	Prescriptive	287	1,886	960,498	19.5%	3.5%	7.4%	2.3%	0.2%	88.2%
	Total	**334**	**2,140**	**4,322,271**	**25.7%**	**3.6%**	**9.0%**	**2.4%**	**0.8%**	**84.1%**
New England Gas	Custom	0	2	95,831	NA	NA	NA	NA	3.1%	NA
	Prescriptive	12	30	22,417	23.0%	15.5%	0.0%	0.0%	0.5%	77.5%
	Total	**12**	**32**	**118,248**	**23.0%**	**15.8%**	**0.0%**	**0.0%**	**2.6%**	**79.6%**
NSTAR	Custom	23	89	2,050,931	57.5%	14.6%	11.4%	9.4%	0.8%	54.7%
	Prescriptive	88	755	425,092	16.0%	6.0%	3.9%	3.2%	0.3%	88.2%
	Total	**111**	**844**	**2,476,023**	**51.3%**	**7.3%**	**10.3%**	**4.4%**	**0.7%**	**59.7%**
Unitil	Custom	0	2	32,377	NA	NA	NA	NA	0.0%	NA
	Prescriptive	16	33	47,610	24.5%	12.7%	0.0%	0.0%	0.2%	75.7%
	Total	**16**	**35**	**79,987**	**24.5%**	**13.0%**	**0.0%**	**0.0%**	**0.2%**	**75.7%**
Statewide	Custom	108	524	6,721,919	33.1%	6.6%	8.8%	4.0%	0.8%	76.5%
	Prescriptive	468	2,983	1,552,349	19.8%	2.8%	7.4%	1.8%	0.3%	88.0%
	Total	**576**	**3,507**	**8,274,268**	**30.5%**	**2.9%**	**8.5%**	**1.7%**	**0.7%**	**78.7%**

[8] Net-to-Gross Rate is calculated as (1-Free-ridership Rate) + Participant "Like" Spillover Rate.

The methodology used for this study follows the standardized methodology developed in 2010 and 2011 for the Massachusetts PAs[9] for use in situations where end-users are able to report on program impacts via self-report methods. Telephone surveys were conducted with 2011 program participants in each of the PA's C&I natural gas programs and with design professionals and equipment vendors involved in these 2011 installations.

How the Results of the Study Impact each Identified Program's Savings:

As this study produced PA-specific results, each PA will see a different impact for the study. Each identified programs used net to gross rates of 100% for planning values in 2011, so most PAs saw a decrease in program savings due to this study however, one PA (Berkshire Gas), saw an increase as their NTG rate is greater than 100%.

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

Gross Savings * Realization Rate * Net-to-Gross Rate = Net Program Savings. This study updated the Net-to-Gross Rate for all Gas Program Administrators.

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 29.

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.

[9] "Cross-Cutting C&I Free-Ridership and Spillover Methodology Study Final Report", prepared for the Massachusetts Program Administrators by Tetra Tech, KEMA, and NMR, May 20, 2011.

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.[10] This table includes studies that apply to gas energy efficiency programs only.

Table III.B: Evaluation Studies in Next Annual Report		
Studies	Docket & Exhibit Approving Planned Evaluation Studies	Expected to be Implemented as Approved? (yes/no)
Residential Studies		
RNC Net Impact Study	Study is planned but not yet submitted for approval	Yes
RNC Incremental Cost Study		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
NTG study of the High Efficiency Heating Equipment (HEHE) program*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	Yes

10 See D.P.U. 09-116 through D.P.U. 09-120, at 132; D.P.U. 09-121 through D.P.U. 09-128, at 122.

NTG study of the High Efficiency Heating Equipment (HEHE) program*	Study is pending approval of the 2012 MTM, D.P.U. 11-106 through D.P.U. 11-116	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 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*		Yes
Impact Evaluation of the 2011-2012 Boiler Reset Control Pilot Program*	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
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 Custom Gas Impact Evaluation	Study is planned but not yet submitted for approval	Yes
Large C&I - 2011 Prescriptive Gas Impact Evaluation		Yes
Large C&I - C&I Customer Profile		Yes
Large C&I - Existing Building Market Characterization		Yes
Large C&I - Whole System Approach Assessment		Yes
Large C&I - New Construction Market Characterization		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
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		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).

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

B. Minimization of Administrative Costs

The most significant factor in the PA 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 lead 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 all Program Administrators 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.

While the economies of scale and other steps taken by the PAs to minimize costs in 2011 were effective, and administrative costs incurred by the PAs are transparent and are presented in each Program Administrator'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 Program Administrators sought to minimize costs at all available opportunities, and not just from one point in time to another.

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
Residential						
Residential New Construction & Major Renovations	142,637	8%	132,001	9%	-10,636	1%
Residential Heating and Water Heating	171,801	8%	158,990	6%	-12,811	-2%
MassSAVE	144,608	11%	83,343	7%	-61,265	-4%
Weatherization Program	284,367	8%	263,164	10%	-21,203	1%
Multifamily Retrofit	86,145	8%	79,722	6%	-6,423	-1%
Behavior/Feedback Program	31,439	9%	29,094	9%	-2,345	0%
Deep Energy Retrofit	7,972	8%	7,378	27%	-594	18%
Residential Building Practices and Demonstration Program	0	0%	0	0%	0	0%
Energy Analysis: Internet Audit Program	0	0%	0	0%	0	0%
Community Based Pilots	4,502	8%	4,166	100%	-336	92%
Workforce Development	0	0%	0	0%	0	0%
Statewide Marketing & Education	0	0%	0	0	0	0
EEAC Consultants	135,000	100%	22,703	100%	-112,297	0%
DOER Assessment	56,235	100%	83,092	100%	26,857	0%
Sponsorships & Subscriptions	0	0%	0	0%	0	0%
Residential Total	**1,064,706**	**10%**	**863,653**	**9%**	**-201,053**	**-1%**
Low-Income						
Low-Income Single Family Retrofit	185,959	8%	172,092	8%	-13,867	1%
Low-Income Multi Family Retrofit	212,686	8%	196,826	7%	-15,860	-1%
Statewide Marketing & Education	0	0%	0	0%	0	0%
Low-Income Energy Affordability Network Funding	75,000	100%	22,582	100%	-52,418	0%
DOER Assessment	20,620	100%	30,468	100%	9,848	0%
Low-Income Total	**494,265**	**10%**	**421,967**	**9%**	**-72,298**	**-1%**
Commercial & Industrial						
C&I New Construction & Major Renovation	55,536	3%	55,028	4%	-508	0%
C&I Retrofit	189,772	12%	179,255	14%	-10,517	2%
C&I Direct Install	5,318	7%	4,922	4%	-396	-3%
Workforce Development	0	0%	0	0%	0	0%
Business Energy Analyzer	0	0%	0	0%	0	0%
Deep Energy Retrofit	0	0%	0	0%	0	0%
Statewide Marketing & Education	0	0%	0	0%	0	0%
EEAC Consultants	40,000	100%	6,781	100%	-33,219	0%
DOER Assessment	16,870	100%	24,927	100%	8,057	0%
Sponsorships & Subscriptions	0	0%	0	0%	0	0%
C&I Total	**307,496**	**9%**	**270,912**	**9%**	**-36,584**	**0%**
GRAND TOTAL	**1,866,467**	**10%**	**1,556,533**	**9%**	**-309,934**	**-1%**

There are no increases greater than ten percent between planned and actual PP&A spending at the sector level.

C. Competitive Procurement

Table IV.B: Outsourced & Competitively Procured Services									
Customer Sector	In-House Activities		Outsourced Activities						TOTAL Activities
			Competitively Procured		Non-Competitively Procured		Total Outsourced Activities		
	$	% of Total Activities	$	% of Total Outsourced	$	% of Total Outsourced	$	% of Total Activities	$
Residential									
Planned	$719,158	18%	$2,927,909	87%	$453,503	13%	$3,381,412	82%	$4,100,570
Actual	$784,408	23%	$2,403,150	92%	$200,021	8%	$2,603,171	77%	$3,387,579
% Difference from Planned to Actual		6%		6%		-6%		-6%	
Low-Income									
Planned	$318,881	17%	$231,288	15%	$1,293,763	85%	$1,525,051	83%	$1,843,932
Actual	$376,131	31%	$104,928	13%	$727,928	87%	$832,856	69%	$1,208,987
% Difference from Planned to Actual		14%		-3%		3%		-14%	
Commercial & Industrial									
Planned	$214,965	21%	$694,006	84%	$128,850	16%	$822,856	79%	$1,037,821
Actual	$253,557	42%	$290,051	83%	$60,195	17%	$350,246	58%	$603,803
% Difference from Planned to Actual		21%		-2%		2%		-21%	
TOTAL									
Planned	$1,253,004	18%	$3,853,203	67%	$1,876,116	33%	$5,729,319	82%	$6,982,323
Actual	$1,414,096	27%	$2,798,129	74%	$988,144	26%	$3,786,273	73%	$5,200,369
% Difference from Planned to Actual		9%		7%		-7%		-9%	

The variances in the C&I sector was due to an under spending in marketing and implementation. The marketing variance is due to several new marketing initiatives that were started in the final quarter of 2011. Due to the forth quarter start, the marketing budget was under spent for the full year. Direct marketing to small business customers, promoting Direct Install programs, started in quarter four and demonstrated strong results. Additional efforts such as marketing partnerships with several trade organizations and associations were not established until 2012 resulting in under spending for 2011. The implementation variance is because the Company had anticipated needing a higher level of technical assistance funding in order to identify and develop opportunities in the marketplace. Through the use of several structures the Company was able to achieve these objectives at a lower cost with limited use of the technical assistance funding. However, as the portfolio of opportunities continues to broaden into more complex projects, this trend is not expected to continue. This money would have been spent in Outsourced Activities which would have increased the percentage in that category and decreased the percentage in the In-House Activities.

D. Low-Income Spending

Table IV.C: Customer Sector Budget Allocation						
Customer Sector	Planned		Actual		Change from Planned to Actual	
	Total Program Costs	% of Total Program Costs	Total Program Costs	% of Total Program Costs	Value	% Change
Residential	$10,580,856	55%	$10,016,581	56%	-$564,274	1%
Low-Income	$5,116,662	27%	$4,795,522	27%	-$321,140	0%
Commercial & Industrial	$3,491,859	18%	$2,934,810	17%	-$557,049	-2%
TOTAL	$19,189,377	100%	$17,746,914	100%	-$1,442,463	0%

V. PERFORMANCE INCENTIVES

The performance incentive mechanism includes three components: the Savings Mechanism, the Value Mechanism, and other Performance Metrics. The Savings Mechanism provides an incentive for achieving dollar benefits from energy efficiency program efforts at or above threshold levels. The Value Mechanism provides an incentive for achieving net benefits equal to or in excess of the threshold level of performance. Performance metrics establish a focus on specified program outcomes or plan development, with each metric stating the specific requirements for reaching each level of the metric. Table V summarizes the performance incentives earned by the Company by component for its successful delivery of energy efficiency programs in 2011.

Table V: Performance Incentives Summary				
Incentive Components	**Threshold**	**Design**	**Exemplary**	**Actual Incentive**
Savings Mechanism	302,187	402,916	503,645	461,879
Value Mechanism	207,418	276,557	345,696	345,696
Performance Metrics	217,309	289,745	362,181	324,080
Total Incentive (before-tax)	726,914	969,218	1,211,523	1,131,655
Total Incentive (after-tax)	441,782	589,042	736,303	687,763

All supporting documentation for each performance incentive component, including detailed information on the Company's clear and distinct role in achieving the performance metrics, is included in Appendix D, Sections 1 and 2. For the Savings component, evaluation results for all three sectors required the EM&V impact bandwidth of 25 percent of preliminary results. This concept was first introduced in Exhibit Common-29 Supplemental, filed on December 21, 2009 in NSTAR Gas, D.P.U. 09-126. On page 18 of this exhibit, the application of EM&V results to savings and benefits for purposes of the incentive calculation was discussed. With the new EM&V structure and forum in MA, and increased focus on evaluation particularly for the gas PAs, it was important for the PAs to have a bandwidth around the retrospective application of these EM&V findings. As a result, this page of the exhibit also discussed the impact of any change that resulted from the application of EM&V findings at the individual PA sector level would be limited to +/- 25 percent.

In the Department's Three-Year Plan orders, D.P.U. 121 through D.P.U. 128, on page 114, the Department accepted the structure and the performance incentive components, including the EM&V contingencies outlined by the PAs.

For NSTAR Gas, the 25 percent bandwidth described above came into play for each of the three sectors. As shown on Page 3 of Appendix D, Section 1, Performance Incentive Calculation, the residential sector had evaluated benefits which were 131 percent of preliminary benefits. The low-income sector had evaluated benefits which were 161 percent of preliminary benefits. The C&I sector had evaluated benefits of 32 percent of preliminary benefits.

For the Savings and Value components of the performance incentive, the Company calculated its earned performance incentive in accordance with the incentive mechanism included in the 2011 MOA, using the post-evaluation benefits and taking into account the 25 percent EM&V impact bandwidth. The Company achieved 115 percent of its planned benefits and 125 percent of its planned net benefits at the portfolio level, surpassing the 75 percent threshold required in order to earn both the savings and value mechanisms of the performance incentive. Using evaluated results (subject to the +/- 25 percent impact bandwidth), the Company calculated the lifetime benefits and net benefits that each program achieved. The benefits were multiplied by the savings payout rate of $0.0060939 and the net benefits were multiplied by the value payout rate of $0.0063946 per the 2011 MOA. Although performance under both the Savings and Value Mechanisms is assessed at the portfolio level, this calculation was done at the sector level, as shown in Appendix D, Section 1 to facilitate the allocation of earned performance incentives in the cost-effectiveness calculations. The incentive dollars earned from performance metrics were allocated to sectors consistent with the allocation presented in the 2011 MOA. A model illustrating the calculation of the performance incentives in accordance with this methodology is included in Appendix D, Section 1.

A summary of the Company's performance for each Performance Metric is set forth below. Additional supporting documentation related to performance metrics is included in Appendix D, Section 2.

RESIDENTIAL METRIC NUMBER AND NAME	ACHIEVEMENT LEVEL	NOTES
1. MassSAVE/Weatherization: Deeper Savings {Electric & Gas} – Statewide	Exemplary Design	219% increase in installed major measures; 5% increase in average customer savings.
2. Community Initiatives {Electric & Gas} – Statewide	Exemplary	See Supporting Documentation
LOW-INCOME METRIC NUMBER AND NAME	**ACHIEVEMENT LEVEL**	**NOTES**
1. Hard to Reach Landlords {Electric & Gas} – Statewide	Exemplary	See Supporting Documentation
2. Best Practices Program Strategies Research & Technical Review of Potential New Measures	Exemplary	See Supporting Documentation
3. Multi-family Building Inventory	Exemplary	See Supporting Documentation
COMMERCIAL & INDUSTRIAL METRIC NUMBER AND NAME	**ACHIEVEMENT LEVEL**	**NOTES**
1. Retrofit -- Depth of savings	Exemplary	X = 9; Y = 120% (at Exemplary) X*Y = 12 Achieved 16
2. New Construction -- Comprehensiveness and depth of savings	Exemplary	X = 46% (at Exemplary) Achieved 50%
3. Direct Install Electric & Gas Integration	Exemplary	X= 16%; Y = 120% (at Exemplary) Y*Z = 20% Achieved 32%
4. Combined Heat & Power	Exemplary	X = 12; Y = 120% (at Exemplary) X*Y = 15 Achieved 15
ALL SECTOR METRIC NUMBER AND NAME	**ACHIEVEMENT LEVEL**	**NOTES**
1. Other Financing Capital	Did Not Meet Threshold	$296,808
2. Cost Efficiency of Program Measures	Threshold/Design	3.32

VI. AUDITS

Please refer to the Company's 2010 Energy Efficiency Annual Report for information on audits related to the Company's energy efficiency activities during the last five years (2007-2011).

VII. APPENDICES

A. Glossary of Defined Terms – includes Types of Costs in each Budget Category and a Glossary of Terms and Abbreviations.

B. Cost-Effectiveness Supporting Tables and Documentation – includes the D.P.U. 08-50 Tables, the Screening Tool, and Technical Reference Manual.

C. Program and Pilot Program EM&V Studies – includes evaluation studies for the residential, low-income, and C&I sector programs and pilot programs.

D. Performance Incentives Supporting Documentation – includes documentation that supports the Company's determination of actual performance incentives earned though the performance metrics.

E. Other Supporting Documentation – includes additional supporting documentation with regard to competitive procurement activities in 2010.

F. Lost Base Revenue Information – includes a reference to the information on savings on which LBR is based.