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An Evaluation of the NH BetterBuildings Program

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Executive Summary

The $10 million NH BetterBuildings program was funded by the United States Department of Energy (DOE) through an American Recovery and Reinvestment Act (ARRA) grant awarded to, and administered by, the New Hampshire Office of Energy and Planning (OEP) and managed by the NH Community Development Finance Authority (CDFA). The program started in July 2010 and the last projects were completed in August 2013.

The program's objective was to achieve transformative reductions in energy use by creating more efficient residential and commercial buildings throughout the communities of Berlin, Nashua, and Plymouth, also known as beacon communities. The program sought to accomplish these goals through neighbor-to-neighbor education, technical assistance, and low-interest loans and project incentives. While originally focused on these three communities, the program did expand to include projects throughout the state.

This analysis includes 54 of the 69 (78%) commercial projects and 734 of the 808 (91%) residential projects at a total retrofit cost of $10.8 million that resulted in $1.0 million in annual savings.[1] The commercial projects were primarily beacon community-based, but did include seven projects that were the result of the response to a state-wide request for proposals (RFP). Residential projects were divided into three categories: 1) low-income (beacon community only), 2) beacon community based, and 3) utility (state-wide program).

Over a three year period of the program, the $10.8 million spent on retrofit activity generated 72 direct full-time equivalent jobs and 72 indirect and induced full-time equivalent jobs in the NH economy—for a total of 144 jobs. The project activity resulted in $7.6 million in labor income in NH and $10.3 million in economic value-added to the NH economy. The program significantly impacted the NH commercial and residential construction sector accounting for over 50% of the jobs and wages generated.

NH BetterBuilding project characteristics:[2]

- The "typical" (commercial or residential) energy efficiency project had an 8 to 11 year payback without incentives; with incentives the payback was in the range of 4 to 5 years.[3]
- The "typical" residential project cost $5,500 with an estimated annual energy savings of $650.
- The "typical" commercial customer could be described as a "main street" type business. The "typical" commercial energy efficiency project cost $40,000 and had an estimated annual savings of $3,000.
- In general, projects that took loans were associated with projects that had higher costs, slightly higher savings, slightly higher incentives, and longer paybacks.

[1] The majority of projects completed are included in this analysis; however data was not available for all projects at the time of this analysis.

[2] The "typical" project refers to projects that are representative of the median as opposed to the mean out of all projects. There is a more detailed discussion in the analysis section of the use of the median over the mean in the evaluation.

[3] Incentives included all rebates and grants from all sources including NH BetterBuildings and the utility companies.

A sensitivity analysis was performed on a "typical" commercial and residential project to determine what factors most impact project payback. The results indicate that the most important factor for reducing payback was to reduce the total cost of the project. [4] The next two factors of relatively equal importance were project incentive and energy savings. Varying the loan characteristics of loan amount, term, or interest rate had almost no impact on payback.

When incentives are included, both residential and commercial projects, whether or not they utilized loans, exhibited strong rates of return over time frames of seven years or greater (potentially as high as 60%).[5] NH BetterBuildings staff reported low consumer adoption of a financing mix consisting only of a loan product. For energy efficiency projects to be attractive to customers, it appears that it is necessary to utilize incentives so that the payback of the project is on the order of 4 to 5 years. Current energy prices would need to be three times higher in order for the majority of projects to approach that level of payback.[6]

Recommendations for future energy efficiency programs :

- There is a role for programs like NH BetterBuildings, but they should integrate with other energy efficiency programs offered in the state. Characteristics of any new program offered should include: consistency, stability, and longevity. Future programs should provide a value-add or address an un-met need (such as focus on a specific customer-type or fuel-type) that complements but does not duplicate existing programs to enhance total energy reduction services offered in New Hampshire.
- Programs should place emphasis on project cost reduction. This includes developing business processes that take advantage of economies of scale, contractor performance monitoring, stream-lined integration with existing energy efficiency programs, and centralized project information management systems.
- Incentives need to be part of the financing mix. A potential option could be an incentive based on payback that is capped at a certain amount. Payback could be determined at a project or efficiency measure scope.
- Loans (even at conventional interest rates) are an attractive financing option as they can significantly reduce the upfront expenditure for a customer even if there is a slight reduction in the rate of return of the investment.
- Programs benefit by offering both project management and technical assistance.

Based on the cost information collected from NH BetterBuildings, a good rule of thumb for estimating program costs would be $4 million to retrofit every 100 "main-street" style commercial projects (30% for loans, 70% for incentives) and $400 thousand to retrofit every 100 residential projects (30% for loans, 70% for incentives). The total estimated retrofit cost for 100 commercial projects is $4 million and for 100 residential projects is $500 thousand. The difference between retrofit cost and program cost reflects the amount customers would pay upfront for projects, indicating that overall businesses mostly borrow to pay for costs not covered by incentives while residential customers are more likely to put in some of their own money.

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[4] Payback is defined as cost divided by savings. Cost incorporates different factors depending on the analysis performed. Cost methodologies are explained further on in the report.

[5] Based on calculations of internal rate of return. Technically, this is the annualized effective compounded return rate that makes the net present value (NPV) of all positive and negative cash flows equal to zero.

[6] Assuming no escalation in project cost, in reality, the construction industry is highly energy dependent and total project cost would be expected to rise with rising fuel prices.

Introduction

This study was sponsored to provide data analysis services for the NH BetterBuildings program in the following areas:

- quantify the economic impact of energy efficiency projects completed by the NH BetterBuildings program;
- investigate the role of finance mechanisms (loans and grants) in driving project adoption for residential and commercial energy efficiency projects; and
- summarize lessons learned from the program that may be useful in the design of future statewide energy efficiency programs.

The CDFA contracted with Seacoast Economics, LLC for this project and the research team consisted of Matthew Magnusson, Dr. Cameron Wake, and Corey Johnson (see Appendix A for additional discussion of the credentials of the research team). The team performed a rapid evaluation of the total economic impact (direct, indirect, and induced) of the NH BetterBuildings project on the NH economy. The analysis included: employment, tax revenue implications, and other associated value added benefits of the energy efficiency projects and how those benefits were multiplied out through the state economy.

Sensitivity analysis was performed to identify key factors for energy efficiency projects specifically in the context of low-interest loans. The dependent variable analyzed for sensitivity was simple payback when a range of loan costs and incentives were analyzed. Cash flow and internal rates of return were also provided to illustrate the financial performance of commercial and residential projects. Additional scenarios related to loan interest rates, fuel prices, and incentive levels were also conducted.

The research team analyzed surveys and interviews conducted by NH BetterBuildings staff and a study conducted by Plymouth State University to help identify best practices for future energy efficiency programs in New Hampshire.

Background

In July 2010, an $8.5 million contract was entered into between the NH Office of Energy & Planning (grant recipient) and the NH Community Development Finance Authority (CDFA)— a quasi-state agency— for the CDFA to manage the program. The purpose of the NH BetterBuildings program was to jump start the New Hampshire Beacon Communities Project; an initiative designed to empower the communities of Berlin, Nashua, and Plymouth to achieve transformative reductions in fossil fuel use and greenhouse gases through deep energy retrofits and complementary sustainable energy solutions in the residential, commercial, municipal, and industrial sectors. The program sought to accomplish these goals through neighbor-to-neighbor education, technical assistance, and low-interest loans and project incentives.

Other partners included the cities of Berlin and Nashua, the Town of Plymouth, Public Service of New Hampshire (PSNH), Unitil, Retail Merchants Association of New Hampshire, the New Hampshire Electric Coop (NHEC), and the Southern NH Services and Tri-County Community Action Agency.

Residential project activity began in the second quarter of 2011, followed by commercial project activity in the first quarter of 2012. The original program was loan-based, but due to slow customer adoption, grants were added to incent development. During the second quarter of 2012, the OEP received Department of Energy (DOE) approval to expand the residential and commercial programs statewide.

As a result of this approval, in the spring of 2012, a state-wide competitive RFP was issued for commercial and municipal energy efficiency projects, and in the third quarter of 2012, the CDFA completed the transition of the BetterBuildings residential program in Berlin, Nashua, and Plymouth to a statewide partnership with State utilities. The utility partnership involved three utilities (PSNH, Unitil and the New Hampshire Electric Cooperative) to incorporated BetterBuilding funds into the Home Performance with Energy Star (HPwES) program, a nationwide home efficiency program administered by the DOE and the Environmental Protection Agency (EPA).

At the end of the second quarter of 2013, the NH BetterBuildings program had completed 69 commercial projects and 808 residential energy efficiency projects. The program completed remaining low-income energy efficiency projects by mid-August 2013. In order to promote continued improvements in energy efficiency, program administrators are currently working to implement a revolving loan fund that will operate after the grant period.

Not all projects completed by NH BetterBuildings are included in this analysis, as the analysis was performed on project data available as of June 2013. The analysis included 54 of the 69 (78%) commercial projects and 734 of the 808 (91%) residential projects. The majority of commercial projects were beacon community-based, but there were seven projects outside of those communities that were brought in as part of a state-wide RFP process. The residential projects were divided into three main categories: 1) low-income – 100% grant, through Community Action Agencies to help more low-income, 2) beacon community-based general customers, and 3) utility.

Table 1: Categories of projects analyzed

Category	Description
Commercial	Commercial projects in the beacon communities or brought in through a state-wide RFP process.
Residential: Low-income	Low-income program with work performed by Southern NH Services and Tri-County Community Action Agency. 100% grant funded EE measures; there was no cost to home owner. Program required all cost-effective weatherization measures be installed.
Residential: Community-based	Open to all residential customers in the beacon communities. Financing mix included: low-interest loans through banks, incentives from NH BetterBuildings, and utility incentives. BetterBuildings provided rebates/incentives between $250 and $1,000 to homeowner. Rebate amount dependent on energy savings.
Residential: Utility	Statewide initiative managed by PSNH, Unitil, and NHEC. BetterBuildings funds were used to expand the existing HPwES program to provide rebates to homeowners of 50% up to $4,000. Participants could also apply for on-bill financing up to $20,000 at 0% interest.

The fact that the residential projects were divided into three different categories and managed in different ways provides some basis for benchmark comparison in regards to cost and energy savings.

NH BetterBuildings Organizational Structure

The NH BetterBuildings program was funded by the United States Department of Energy (DOE) through an American Recovery and Reinvestment Act (ARRA) grant awarded to, and administered by, the New Hampshire Office of Energy and Planning (OEP). OEP contracted with the Community Development Finance Authority (CDFA) to implement the project. The program's organizational structure consisted of a Program Director and Assistant Program Director at CDFA headquarters in Concord, plus three community offices. The Program Director was responsible for overseeing the work at the Community Offices, program development and close program coordination with the OEP. The Assistant Program Director reported to the Program Director.

The CDFA established a field office in each community which was staffed by a Community Manager and Technical Advisor. The Community Manager was assigned to a specific community and was responsible for local program management outreach, and coordination. The Technical Advisor served as an advisor and advocate for home and business owners during the efficiency retrofit process and were more focused at the project implementation level. The Technical Advisor also served as a direct liaison for contractors and auditors.

Field offices worked with the local municipalities, property owners, financial institutions and building contractors. Each Community Manager reported to the Assistant Program Director. The Assistant Program Director worked directly with each Community Manager and Technical Advisor to help manage their projects. Technical Advisors reported to their respective Community Manager, although the two positions provided mutual support for each other.

Program Analysis

The analysis included 54 of the 69 commercial projects and 734 of the 808 residential projects at a total retrofit cost of $10.8 million that resulted in $1.0 million in annual savings. An overview of the project types is discussed in the introduction.

Data verification and correction was performed for all commercial projects, and community-based residential projects. No data verification was performed for low-income and utility residential projects due to time constraints of the study. Twelve projects had wood fuel savings but they were excluded from this analysis as they were a small contributor to dollar savings relative to the other fuel categories. Specific types of energy efficiency or other fossil-fuel based energy reduction measures were not considered in this analysis. Savings are based on stated energy savings from audits as recorded by NH BetterBuildings staff.

The study assumed constant energy prices. Table 8 lists the assumed energy prices for calculating annual energy savings in dollars. The same energy price was applied to both commercial and residential projects. Inflation is not directly included in any of the financial models developed for the study. Payback is the project retrofit cost (does not include audit costs) divided by annual energy savings. The actual retrofit cost used varies slightly across some analysis but assumptions are stated for each analysis.

Table 2: Summary project information

Category	Number of Projects	Total Retrofit Cost	Estimated Total Annual Savings
Commercial (Primarily community-based)	54	$ 5,969,000	$ 461,000
Residential	734	$ 4,804,000	$ 574,400
-Low-income	143	$ 942,100	$ 131,800
-Community-based	197	$ 1,545,000	$ 140,000
-Utility	394	$ 2,317,000	$ 301,900
Total	788	$ 10,774,100	$ 1,035,400

Mean values are used in some of the analysis presented in this report; however, the data had a few significant outlier projects that significantly skewed mean values. In addition, some projects appeared to have inaccurate values and there was insufficient time or data to correct those values. This is especially apparent for calculating payback values. Instead median costs, along with a range of values were used.[7] Median values are believed to provide the most accurate picture of a "typical" residential and "main-

[7] Median and mean are two measures of central tendency, or the "average" value. Means are effective at describing central tendency when the range of values follow a normal distribution. The mean is the sum of values in a collection divided by the total number of observations in that collection. The median is employed when a few outlier values significantly alter that central tendency. The median is the numerical value that separates the lower half of a collection from the upper half. It is calculated by rank ordering all values and selecting the value in the middle.

street" commercial project in this program and help avoid potential problems caused by outlier projects and incorrect data.[8]

Median cost per commercial project was $39,000 with a median annual energy savings of $3,000. Median cost per residential project was $5,400 with a median annual energy savings of $660. At current energy prices, the median payback for commercial projects completed disregarding incentives was 10.5 years; the median payback for commercial projects completed including incentives was 5.0 years. The median payback for residential projects completed disregarding incentives was 8.1 years; the median payback for residential projects completed with incentives and excluding low-income was 3.8 years.

Table 3: Project cost by project category

Category	Mean Cost	Median Cost	Minimum Cost	Maximum Cost
Commercial (Primarily community-based)	$110,500	$ 39,000	$ 4,200	$ 836,497
Residential	$ 6 ,500	$ 5,400	$ 290	$ 32,100
-Low-Income	$ 6,600	$ 5,900	$ 450	$ 19,200
-Community-based	$ 7,800	$ 4,900	$ 500	$ 32,100
-Utility	$ 5,880	$ 5,400	$ 290	$ 24,000

Table 4: Project savings by project category

Category	Mean Savings	Median Savings	Minimum Savings	Maximum Savings
Commercial (Primarily community-based)	$ 8,500	$ 3,000	$ 480	$ 112,800
Residential	$780	$ 660	$40	$ 4,300
-Low-Income	$ 920	$ 840	$ 50	$ 2,500
-Community-based	$ 730	$ 530	$ 140	$ 4,300
-Utility	$ 790	$ 660	$ 40	$ 4,100

[8] The term "main-street" for commercial projects, indicates they appeared to be smaller businesses, including professional services and smaller retail, as opposed to large manufacturing or corporate customers. A specific analysis of commercial customer type was not performed in this analysis.

Table 5: Payback without incentives by project category

Category	Un-weighted Mean	Median
Commercial (Primarily community-based)	27.0	10.5
Residential	13.3	8.1
-Low-Income	9.1	7.5
-Community-based	14.1	9.9
-Utility	14.5	7.5

Table 6: Payback with incentives by project category[9]

Category	Un-weighted Mean	Median
Commercial (Primarily community-based)	17	5.0
Residential	8.4	3.8
-Low-Income	-	-
-Community-based	7.8	3.2
-Utility	8.7	3.9

Out of the residential programs, the low-income and utility programs had identical median paybacks without incentives for projects at 7.5 years, but the community-based residential programs had a higher median payback of 9.9 years. However, the median cost for community-based projects was lower than low-income or the utility projects. This could indicate that certain types of measures that were installed in the low-income or utility programs that may have not been installed in the community-based programs.

Annual energy savings from the portfolio of projects analyzed was 1.4 million kWh of electricity, 203,000 therms of natural gas, 113,500 gallons of heating oil, 34,000 gallons of propane, and 3,400 gallons of kerosene.

Table 7: Total annual energy savings by project category

Category	Electricity (kWh)	Natural Gas (Therms)	Heating Oil (Gallons)	Propane (Gallons)	Kerosene (Gallons)
Commercial (Primarily community-based)	1,014,200	133,500	15,500	21,100	-
Residential	399,600	69,300	98,000	12,900	3,400
- Low-income	178,900	27,300	15,200	1,500	1,600
- Community-based	47,200	32,000	22,300	1,600	700
-Utility	173,400	10,000	60,400	9,700	1,100
Total	1,413,800	202,900	113,500	34,000	3,400

[9] Low-income was excluded from calculating median paybacks with incentives, as there was no cost to low-income participants.

Table 8: Energy cost assumptions

Energy Type	Unit	Cost per unit
Natural Gas	Therm	$1.29
Propane	Gallon	3.31
Oil	Gallon	3.72
Electric	kWh	$0.159
Kerosene	Gallon	$4.19

As a result of the work performed in the NH BetterBuildings program, at current energy prices, NH businesses are saving $161,300 on electricity (35% of the total cost savings experienced by the commercial sector for completed NH BetterBuildings projects), $172,200 on natural gas (37% of total commercial cost savings), $57,700 on propane on heating oil (13% of total commercial cost savings) and $69,800 on propane (15% of total commercial cost savings) annually. Residences are saving $63,500 on electricity (11% of total residential cost savings), $89,500 on natural gas (16% of total residential cost savings from completed NH BetterBuildings projects), $364,600 on heating oil (63% of total residential cost savings), $42,700 on propane (7% of total residential cost savings), and $14,200 on kerosene (2% of total residential cost savings) annually. The savings from the reduction in heating oil in the residential sector stands out as an area of noteworthy savings for this program.

Table 9: Total annual energy cost savings by project category

Category	Electricity	Natural Gas	Heating Oil	Propane	Kerosene
Commercial (Primarily community-based)	$ 161,300	$ 172,200	$ 57,700	$ 69,800	-
Residential	$ 63,500	$ 89,400	$ 364,600	$ 42,700	$ 14,200
-Low-income	$ 28,400	$ 35,200	$ 56,500	$ 5,000	$ 6,700
-Community-based	$ 7,500	$ 41,300	$ 83,000	$ 5,300	$ 2,900
-Utility	$ 27,600	$ 12,900	$ 224,700	$ 32,100	$ 4,600
Total	$ 224,800	$ 261,700	$ 422,200	$ 112,500	$ 14,200

Within the residential project types, the program offered through the utility companies throughout the state accounted for the highest number of projects and total energy savings. The utility residential program accounted for just over 50% of the total number of residential projects, and approximately 50% of the total savings in energy costs. The established utility programs have the infrastructure and capacity to deliver significant energy efficiency project results. This was also seen in the NH Greenhouse Gas Emissions reduction fund, where in the first year of the program's existence (2009-2010), the electric utilities through the RECORE program was the single largest contributor of energy reductions and contributed over 90% of the electricity reductions.[10] This highlights the productivity of an established energy efficiency program and supports the concept of managing for consistency and longevity of energy efficiency programs in the state.

[10]" NH Greenhouse Gas Emissions Reduction Fund Year 1 (July 2009-June 2010) Evaluation," Carbons Solutions New England, 2011, Available online at http://www.puc.nh.gov/Sustainable%20Energy/GHGERF/Evaulations/GHGERF_Year1_Report_11Feb2009.pdf

For commercial customers, the median loan amount per project was $20,000, and the average incentive (grants and rebates from all sources) was $17,100. For residential customers, the median loan amount was $3,600, and the median incentive was $2,800.

Table 10: Total and median loans and incentives for projects analyzed

Category	Total Loans`	Total Incentives (Grants & rebates from all sources)	Median Loan	Median Incentive[11]
Commercial (Primarily community-based)	$ 2,336,300	$ 2,612,000	$ 20,000	$ 17,100
Residential	$ 1,494,500	$ 2,517,700	$ 3,600	$ 2,800
-Low-income	$ -	$ 942,100	$ -	$ 5,900
-Community-based	$ 797,800	$ 636,900	$ 6,900	$ 2,300
-Utility	$ 696,700	$ 938,700	$ 3,200	$ 2,500

Table 11 shows project financing characteristics for commercial and residential projects (excluding low-income) segmented by those that included loans in their financial mix and those that did not include loans. Table 12 segments the utility and community-based residential programs on those that utilized loans and those that did not utilize loans. For both the commercial and residential projects, in general, loans were associated with projects that had higher costs, slightly higher savings, slightly higher incentives, and longer median paybacks.

Table 11: Commercial and residential projects by loan utilization

Category	Type	Number of Projects	Median Cost	Median Savings	Median Loan	Median Incentive	Median Payback	Median Payback w/ Incentive
Commercial (Primarily community-based)	No loan	19	$ 17,400	$ 2,900	-	$ 9,600	9.3	4.6
	Loan	35	$ 49,900	$ 3,100	$ 20,000	$ 19,400	12.4	6.2
Residential[12]	No loan	346	$ 4,300	$ 600	-	$ 2,300	7.0	2.7
	Loan	245	$ 6,900	$ 650	$ 3,600	$ 2,700	10.0	6.0

Sixty-five percent of the commercial projects and 42 percent of the residential projects utilized loans in financing projects. The community-based and utility programs provided data for comparison of cost, savings, loan, and incentive comparison. The community-based residential programs that did not use loans tended to be lower cost but also resulted in lower energy savings than the utility programs that did not use loans. The community-based residential programs that did utilize loans were substantially higher in cost than the utility programs that did utilize loans and while the savings with the community-based tended to be slightly higher, they still overall tended to have lower payback periods than the utility programs.

[11] Residential median incentive excludes low-income

[12] Residential excludes low-income

Table 12: Community-based and utility residential programs by loan utilization

Category	Type	Number of Projects	Median Cost	Median Savings	Median Loan	Median Incentive	Median Payback	Median Payback w/ Incentive
Community-based	No loan	93	2,700	300	-	2,200	8.7	1.6
	Loan	104	10,000	690	6,900	2,900	12.9	9.0
Utility	No loan	253	5,000	670	-	2,900	6.5	3.3
	Loan	141	6,300	600	3,200	2,700	9.3	4.9

Economic Modeling

The IMPLAN model—a widely used economic evaluation tool (discussed in detail in Appendix B)—was used to determine total economic impact on the NH economy from the analyzed energy efficiency projects. IMPLAN 3.0 (2010 NH state data) was used to model direct, indirect, and induced economic impacts. The purpose of the modeling was to help understand the economic impacts energy efficiency programs, as represented by the NH BetterBuildings program, can have on the NH economy.

The total retrofit cost of projects analyzed was $10.8 million. This generated 72 direct jobs and 72 indirect and inducted jobs in the NH economy—for a total of 144 jobs. The project activity resulted in $7.6 million in labor income in NH and $10.3 million in economic value-added to the NH economy.

Table 13: Total economic impact of NH BetterBuildings on the NH economy

Impact Type	Employment	Labor Income	Value Added
Direct Effect	72	$4,364,000	$4,825,000
Indirect Effect	23	$1,173,000	$1,732,000
Induced Effect	49	$2,057,000	$3,696,000
Total Effect	144	$7,595,000	$10,254,000

The IMPLAN model predicted 6.7 FTE direct jobs per million spent. This figure produced by IMPLAN is supported by an analysis of Davis-Bacon wages from NH BetterBuildings projects which showed approximately 3.3 FTE jobs per million spent on commercial projects and 7.5 FTE jobs per million spent on residential projects. This is also similar to values reported from the America Recover and Reinvestment Act funding from the Department of Energy, which recorded 4.0 FTE jobs per million spent which likely does not include all direct wages generated by a project.[13]

Over 50% of the employment impact (78 jobs), over 60% of the labor income impact ($4.7 million in income) and over 50% of the economic value-added ($5.5 million) is experienced in the construction sector. Restaurants and other food and drink service establishments were the next most impacted in terms of employment at 6 jobs.

[13] Through June 2012, ARRA funded $23.8 billion Dept of Energy projects that resulted in 95,751 FTE jobs. http://www.recovery.gov/Transparency/RecipientReportedData/Pages/JobSummary.aspx

Table 14: Top ten industries impacted by NH BetterBuildings

Implan Sector	Description	Employment	Labor Income	Value Added
39	Maintenance and repair construction of nonresidential structures	49	$2,246,000	$2,835,000
40	Maintenance and repair construction of residential structures	29	$2,425,000	$2,688,000
413	Food services and drinking places	6	$126,000	$192,000
369	Architectural, engineering, and related services	4	$251,000	$255,000
324	Retail Stores - Food and beverage	3	$84,000	$121,000
360	Real estate establishments	3	$51,000	$369,000
397	Private hospitals	3	$189,000	$207,000
329	Retail Stores - General merchandise	3	$73,883	$115,000
394	Offices of physicians, dentists, and other health practitioners	3	$236,000	$244,000
319	Wholesale trade businesses	2	$202,000	$359,000

The projects also generate state and local tax activity accounting for almost a half-million in taxes.

Table 15: Total State and Local Tax

Employer Paid Taxes	Indirect Business Tax	Property Tax	Corporations	Total
$8,700	$321,800	$70,700	$76,400	$477,600

Table 16 summarizes the inputs used in the IMPLAN model. The model includes the sales in the construction sector to implement the projects, the annual energy savings in the commercial and residential sectors, and the reduction in payments to energy providers that result from the energy efficiency savings.

Table 16: IMPLAN model inputs

Implan Category	Input Value	Represents
39 Maintenance and repair construction of non-residential structures	$ 5,969,000	Commercial energy efficiency work
40 Maintenance and repair construction of residential structures	$ 4,804,000	Residential energy efficiency work
1003 Households 15-25k	$ 131,800	Low-income residential energy savings
1006 Households 50-75k	$ 442,600	All other residential energy savings
6001 Proprietor Income	$ 461,000	Commercial energy savings
31 Electric power generation, transmission, and distribution	$ (224,800)	Reduction in payments to utilities due to electricity savings
32 Natural gas distribution	$ (261,700)	Reduction in payments to utilities due to natural gas savings
331 Retail Nonstores - Direct and electronic sales	$ (568,900)	Reduction in payments to fuel oil dealers due to fuel savings

Sensitivity Analysis

A sensitivity analysis was performed using simple payback to determine program design features that would have the most impact on project performance. A program model was developed in Microsoft Excel to determine the change in simple payback as individual factors were varied. Table 17 lists the model assumptions used for commercial and residential projects and were meant to represent the "average" cost, performance, and financing mix for these two categories of projects. Sensitivity was measured on payback taking into account incentives (grants and rebates).

Table 17: Model assumptions for sensitivity analysis

	Commercial	Residential
Project Cost	$ 50,000	$ 6,900
Loan	$ 20,000	$ 3,600
Incentive	$ 26,000	$ 2,700
Customer contribution	$ 4,000	$ 600
Annual energy savings	$ 4,000	$ 650
Loan term	60	60
Loan interest	1.0%	0%

The commercial model at the assumed values was most sensitive to project cost, followed by incentive and project energy savings. It was least sensitive to loan amount, loan term, and loan interest rate. For example, a 5% decrease in project cost resulted in a 10% decrease in simple payback maintaining account incentives and loan costs constant.

Table 18: Commercial sensitivity analysis

Measure	Value Used in Analysis	Value Change	Payback	Payback w/ Incentive	Sensitivity
Base			12.6	6.1	
Cost	$ 47,500	-5%	12.0	5.5	-10%
Loan	$ 19,000	-5%	12.6	6.1	-0.1%
Incentive	$ 27,300	+5%	12.6	5.8	-5%
Savings	$ 4,200	+5%	12.0	5.8	-5%
Term	57	-5%	12.6	6.1	-0.1%
Interest rate	0.95%	-5%	12.6	6.1	-0.1%

The residential model at the assumed values behaved in a similar manner to the commercial model and was most sensitive to cost, followed by incentive and project energy savings. It was least sensitive to loan amount, loan term, and loan interest rate. For example, a 5% increase in energy savings resulted in a 5% decrease in simple payback when taking into account incentives and loan costs.

Table 19: Residential sensitivity analysis

Measure	Value Used in Analysis	Value Change	Payback	Payback w/ Incentive	Sensitivity
Base			10.6	6.5	
Cost	$ 6,555	-5%	10.0	6.0	-8%
Loan	$ 3,420	-5%	10.6	6.5	0%
Incentive	$ 2,835	+5%	10.6	6.3	-3%
Savings	$ 683	+5%	10.1	6.2	-5%
Term	57	-5%	10.6	6.5	0%
Interest Rate	Not Analyzed				

Future programs should place emphasis on project cost reduction. This would include business processes that take advantage of economies of scale, contractor performance monitoring, and stream-lined project management processes.

Energy efficiency customers appear "willing to move" with 4-5 year payback. At these levels, it shows that they are more sensitive to total cost than estimated energy savings. This suggests it would be useful in marketing efforts to emphasize payback period with incentives versus the energy savings on their own.

Cash flow & Internal Rate of Return

The sensitivity model was adapted to show cash flow over a 12 year period. A 12 year period was chosen as a conservative expected lifetime for an energy efficiency project. A sensitivity analysis was not performed on factors affecting cash flow or internal rate of return, but the purpose of this analysis was to provide financial projections based on real-world data from the NH BetterBuildings projects. This type of financial analysis—based on actual data—could be helpful in helping to educate both commercial and residential customers on energy efficiency as an investment option.

Table 20 summarizes the inputs used for the cash flow analysis for "typical" projects that did not utilize loans. Table 17 from the previous section summarizes the inputs used to represent projects that did utilize loans and is the same inputs used for the sensitivity analysis. It is based on customer cash outflows net of incentives and energy savings.

Table 20: Inputs for "typical" projects that did not utilize loans cash flow analysis

Input	Residential	Commercial
Project Cost	$ 4,300	$ 17,400
Loan	$ 0	$ 0
Incentive	$ 2,300	$ 9,600
Annual Savings	$ 600	$ 2,900

Both residential and commercial projects, whether or not they utilized loans, show attractive rates of return over a longer term investment period (seven years or greater). The rate of return for the "typical" loan project was less than the "typical" project that did not utilize loans due to the longer payback period. For example, a "typical" commercial project that utilizes loans with a 12 year expectation of energy savings shows a 28% internal rate of return while the "average" commercial project without loans had a 59% internal rate of return. It is interesting to note that for both "typical" commercial and residential projects that utilized loans, the annual loan payment was approximately the same as the annual energy cost savings.

Table 21: Cash flow, cumulative cash flow, and internal rate of return by "average" project category by loan utilization[14]

Project Type	Measure	Year											
		1	2	3	4	5	6	7	8	9	10	11	12
Residential w/o loan	Annual cash flow	-$1,400	$600	$600	$600	$600	$600	$600	$600	$600	$600	$600	$600
	Cumulative cash flow	-$1,400	-$800	-$200	$400	$1,000	$1,600	$2,200	$2,800	$3,400	$4,000	$4,600	$5,200
	Internal Rate of Return		-57%	-10%	14%	26%	32%	36%	38%	40%	41%	42%	42%
Residential w/ loan	Annual cash flow	-$670	-$70	-$70	-$70	-$70	$650	$650	$650	$650	$650	$650	$650
	Cumulative cash flow	-$670	-$740	-$810	-$880	-$950	-$300	$350	$1,000	$1,650	$2,300	$2,950	$3,600
	Internal Rate of Return						-9%	7%	14%	19%	22%	24%	25%
Commercial w/o loan	Annual cash flow	-$4,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900	$2,900
	Cumulative cash flow	$-4,900	-$2,000	$900	$3,800	$6,700	$9,600	$12,500	$15,400	$18,300	$21,200	$18,300	$21,200
	Internal Rate of Return		-41%	12%	35%	46%	52%	55%	57%	58%	58%	59%	59%
Commercial w/ loan	Annual cash flow	-$4,100	-$100	-$100	-$100	-$100	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000	$4,000
	Cumulative cash flow	-$4,100	-$4,200	-$4,300	-$4,400	$-4,500	$500	$3,500	$7,500	$11,500	$15,500	$19,500	$23,500
	Internal Rate of Return						-2%	11%	19%	23%	25%	27%	28%

Incentives are an important part of the financial mix for energy efficiency projects. For example, the "typical" commercial project that took a loan would have an internal rate of return of -2% to the business owner in year 12 if no incentives had been offered.

[14] Cash flow includes loan payments (if applicable), incentives, energy savings and customer out-of-pocket payments.

Additional Scenarios

Some additional scenarios were run to help program planners understand factors and characteristics to be aware in program development.

6% Loan Scenario

To help understand the importance of low to no interest loans in the project financial mix, a loan that was closer to actual market rates was applied to the "typical" commercial and residential customer used in the sensitivity analysis. Under a 6% interest rate scenario, under both the commercial and residential projects, the payback period increases by about half to three quarters of a year. It has minimal impact on the sensitivity of the overall model, with project cost still being the most significant factor in determining payback. This indicates that while no to low interest may have marketing appeal; it does not significantly alter the financial performance of the project.

Table 22: Model assumptions for sensitivity analysis

	Commercial	Residential
Project Cost	$ 50,000	$ 6,900
Loan	$ 20,000	$ 3,600
Incentive	$ 26,000	$ 2,700
Savings	$ 4,000	$ 650
Term	60	60
Interest	6.0%	6.0%

Table 23: Commercial sensitivity analysis at 6% interest rate

Measure	Value Used in Analysis	Value Change	Payback w/ Incentive	Sensitivity
Base			6.8	
Cost	$ 47,500	-5%	6.1	-11%
Incentive	$ 27,300	+5%	6.4	-6%
Savings	$ 4,200	+5%	6.5	-5%
Term	57	-5%	6.8	-0.6%
Interest rate	5.7%	-5%	6.8	-0.6%

Table 24: Residential sensitivity analysis at 6% interest rate

Measure	Value Used in Analysis	Value Change	Payback w/ Incentive	Sensitivity
Base			7.3	
Cost	$ 6,555	-5%	6.7	-8%
Incentive	$ 2,835	+5%	7.1	-3%
Savings	$ 683	+5%	7.0	-5%
Term	57	-5%	7.3	-0.6%
Interest rate	5.7%	-5%	7.3	-0.6%

Level of Incentive

Another scenario analyzed was the incentive required to get to a 3, 4, or 5 year payback for the "typical" commercial and residential project used in analysis (project assumptions listed in tables 17 and 20). For example, the typical commercial $50,000 loan project would require a $34,000 incentive to have a four year payback and the typical $6,900 residential project with a loan would require a $4,950 year incentive to have a three year payback.

Table 25: Incentives required for a 3, 5 and 5 year payback on "typical" projects

Project Type	Project Cost	Payback (years)		
		3	4	5
Commercial Loan	$50,000	$38,200	$34,300	$30,400
Residential Loan	$6,900	$4,950	$4,300	$3,650
Commercial w/o loan	$17,400	$8,700	$5,800	$2,900
Residential w/o loan	$4,300	$2,500	$1,900	$1,300

Program Cost Estimates

While the projects in this program spanned a wide range, considering the "typical" project—based on median values—can be useful for program cost budgeting. For example, a program that was expected to fund 100 residential retrofits with loans would be expected to need to have a budget of between $365,000 and $495,000 available for incentives (based values obtained from Table 25). For this same example, utilizing information from Table 10 where median loan for residential customers was $3,600, the program would also require a budget of approximately $360,000 for funds to be awarded as loans.

Table 26: Modeled program costs for 100 commercial or 100 residential projects

	Projects		Fund Requirements		
Project Type	Loan	No Loan	Loan	Incentive	Total
Commercial ("Main-street")	65	35	$ 1,300,000	$ 2,432,500	$ 3,732,500
Residential	40	60	$ 144,000	$ 286,000	$ 430,000

Equation 1: Program Cost Formula

$$Program\ Cost = Projects_{no\ loan} \times\ Incentive_{no\ loan} + Projects_{no\ loan} \times (Incentive_{loan} + Loaned\ Amount)$$

For example, the program cost for 100 homes (assuming 60 that do not take loans and 40 that do take loans with 4 year payback incentive):

$$\$430{,}000 = 60\ \times\ \$1{,}900\ +\ 40\ \times\ (\$4{,}300 + \$3{,}600)$$

Based on the mix of commercial projects that took loans (65%) in NH BetterBuildings and assuming a four year payback is required, the approximate program cost per 100 "main-street" commercial buildings is estimated to be around $4 million for loans (~30%) and incentives(~70%). Based on the mix of residential projects that took loans (40%) in NH BetterBuildings and assuming a four year payback is required, the approximate program cost per 100 residential projects is estimated to be around $400 thousand for loans (~30%) and incentives (~70%).

Fuel prices

While retrofit costs can be managed and planned for, fuel prices, are considerably more volatile. The NH BetterBuildings program has shown that fuel prices at their current levels do not provide enough incentive to move energy efficiency projects forward due to the customer expectation of short payback periods (i.e., less than 5 years)

Table 27 shows the energy prices required in current dollars to move projects forward without incentives. For example, heating oil would need to be closer to $12 a gallon for projects to move forward without incentives, based on the typical energy efficiency improvements of projects that were analyzed.[15]

Table 27: Energy cost at different paybacks based on 12.5 year baseline project payback

			Project Payback		
Energy Type	**Unit**	**Cost per unit**	**3**	**4**	**5**
Natural Gas	Therm	$1.29	$5.38	$4.03	$3.23
Propane	Gallon	3.31	$13.79	$10.34	$8.28
Oil	Gallon	3.72	$15.50	$11.63	$9.30
Electric	kWh	$0.16	$0.66	$0.50	$0.40
Kerosene	Gallon	$4.19	$17.46	$13.09	$10.48

To help provide context, the current average New Hampshire home that heats with oil uses 660 gallons per year. At current energy prices, that is $2,455 annual cost. To make energy efficiency attractive, costs would need to rise to where the average annual cost rises between $6,000 and $10,000. This is a limited analysis, but shows that even within the context of current volatile energy prices, it is highly unlikely that a program without incentives will result in a high level of adoption. In reality, other factors would come into play with rising energy prices which could include consumer acceptance of longer payback periods.

[15] This is a very simplified example, and is just meant to illustrate the need for incentives to move projects forward. The construction energy is very energy-dependent and if energy prices were to rise, so would retrofit costs. This example assumes that project costs would be constant across different fuel prices. This means that energy prices would even need to be higher to get a 4 year payback, provided that with an increase in energy prices, retrofit costs were able to rise at a slower rate (e.g. a doubling of energy cost, does not double retrofit costs).

Lessons Learned from the BetterBuildings Program

As part of the evaluation process for NH BetterBuildings, the BetterBuildings team conducted a web-based survey that was emailed to commercial and residential customers in Berlin and Plymouth who had participated in energy efficiency programs. In addition, with assistance from Plymouth State University, in-person interviews were held with four energy efficiency contractors and technical coordinators who worked on the projects. The goal of the survey and interview evaluation was to assess what worked, what didn't work, and solicit recommendations for improvement to help inform future potential energy efficiency programs in the state. It also allowed for a comprehensive look at the program by requesting feedback from both customers (demand side) and contractors/technical advisors (supply side). While overall this was a useful evaluation mechanism, BetterBuildings management indicated that the majority of feedback from stakeholders was obtained during the course of the program via informal conversation or email communication with staff members.

The interviews and surveys focused on customers and contractors who worked with either the original BetterBuildings residential program or the commercial buildings program in either Berlin or Plymouth. Feedback from the survey work is not representative of customers who participated in the second iteration of the residential program, which was a partnership between BetterBuildings and the Home Performance with Energy Star (HPwES) program run by the state's utilities.

Overall, survey respondents and interviewees indicated that the BetterBuildings program was largely effective at accomplishing its goals and customers expressed a high-level of satisfaction with the results. However, there were several common themes that pointed to potential areas for improvement.

One central theme of comments from the contractor and technical coordinator perspective was that these types of programs would benefit both customers and contractors if there were better coordination across related programs in the state. Typically there was overlap between BetterBuildings and utility energy efficiency programs for all project types, and on the commercial side, several other funding sources also came into play. Although overlap is not inherently negative, it is important to clearly communicate to customers how to maximize funding across the different programs where overlap does exist.

Another key theme was the need for program marketing and to have it in place before the actual program was fully up and running. While comments varied on the most effective marketing channels (e.g. one interviewee stated newspapers while another suggested social media but not newspapers), interviewees stressed the importance of leveraging local partnerships to increase exposure to the target market and communicate options available to customers. A challenge with programs that are grant-funded are they typically have a limited duration which can make it difficult to develop a long-term sustainable memory for these constituents.

At the customer level, contractor selection and quality consistency appeared to be a major area of concern. Several interviewees indicated that customers were exposed to too many contractor options and that customers would benefit from a more streamlined approach to contractor selection by program management. Similar suggestions were made regarding the consolidation of funding sources, where all of the different financing programs would be applied for above the customer level.

While contractors should be able to openly and fairly compete for business, given they are representatives of the program, they also should be accountable regarding competent and professional service. Often multiple contractors worked on any one project, and customers frequently had mixed experiences with the quality of service provided by the contractors. A beneficial practice would be for program management to conduct contractor performance evaluations and intervene with those contractors that demonstrate continued sub-standard performance. Another approach could be to develop a near real-time contractor evaluation that is completed by the customer and reviewed by program managers as projects are underway to take corrective action as necessary.

Finally, many customers did not understand the technical details of audit reports. A suggested practice could be to have a standardized audit template that provides the critical, decision relevant information (e.g. savings, cost) in an easy to understand format, and save the more comprehensive audit reports as an appendix for those customers who are interested in the details.

A number of the concerns regarding contractors, audit reports and multiple funding sources for the residential program were addressed when BetterBuildings executed partnership contracts with three utilities that run the HPwES program in New Hampshire. Formally integrating with HPwES allowed BetterBuildings to merge with an existing program structure that provides a standardized, easy to read audit report and robust contractor oversight with the option for the customer to choose their own contractor, or if they prefer, to have a qualified contractor assigned by the program. The partnership also created a single entry point and program explanation for customers who were previously confused by the separate BetterBuildings and HPwES programs.

Survey Results

Web-based surveys were distributed to customers in Plymouth and Berlin at the conclusion of the program. Surveys were not issued to Nashua customers. Seventy-three surveys were distributed in Plymouth, with a response rate of 42%. In Berlin, one hundred and fifty-nine surveys were distributed, and the response rate was 19%. Although both surveys were issued to residential and commercial customers, residential customers represented the majority of survey respondents, as indicated in the Table 28.

Table 28: Survey respondents by type and community

	Plymouth		Berlin	
Residential	17	55%	22	71%
Commercial	10	32%	6	19%
Both	1	3%	3	10%
Other/Neither	3	10%	0	0%

Customers participated in the BetterBuildings program for a variety of reasons, although fuel costs seemed to be the primary driver. The majority of Berlin respondents (37%) participated in the program to reduce fuel costs, while fewer respondents aimed to take advantage of grant funds (28%), improve comfort (20%), and reduce emissions (12%).

Survey results indicate that word-of-mouth marketing may have been the most effective tool to attract customers of the various marketing methods that were used. In Plymouth, nearly 40% of participants learned of the BetterBuildings program through word-of-mouth, as compared to 16% from a community organization or event, 13% from signs outside of homes, 10% from newspapers, and 7% each from fliers or online.

Survey respondents indicated that their projects were funded by a variety of sources. In Plymouth, 60% of respondents funded their share of project costs with their own funds, followed by personal BetterBuildings loans (29%), commercial BetterBuildings loans (14%), Home Performance With Energy Star (11%), and other loans (4%). In Berlin, 35% of respondents funded their share of project costs with personal loans, followed by their own funds (32%), commercial loans (13%), Home Performance with Energy Star (10%), and funding from the Tri-County Community Action Program (10%).

Another theme highlighted in the survey results was confusion surrounding the audit report. While respondents were generally satisfied with the audit process, several individuals expressed dissatisfaction with the lack of clarity of the audit report and the practicality of audit recommendations. Despite elements of dissatisfaction in this area, survey results indicate that receiving the audit report itself was critical to the eventual success of a project, as very few projects stalled after this stage. In Plymouth, for example, over 90% of survey respondents went forward with implementing energy improvements after receiving an audit report. In Berlin, over 80% of survey respondents indicated that their projects proceeded to completion, although it was unclear what percentage of Berlin projects did or did not receive audit reports.

Overall, respondents were largely pleased with the outcomes of their projects. Respondents most commonly identified lower energy costs, increased comfort, and improved lighting as benefits of participation. In Berlin, 90% of survey respondents were either “extremely satisfied” or “very satisfied” with the program, and 100% of respondents were either “extremely likely” or “very likely” to recommend implementing energy efficiency or renewable energy to others. In Plymouth, 87% of respondents indicated that they were “satisfied” or “very satisfied” with the program.

Survey respondents provided largely favorable comments about their overall satisfaction with the program. However, several respondents indicated certain issues with the program, including slow communication between program management and customers, inconsistent quality and reliability of contractors, and overestimated energy savings from implemented projects.

In-Person Interviews

The Plymouth BetterBuildings office partnered with Plymouth State University to conduct formal in-person interviews with four stakeholders: two contractors, and two technical advisors. Examples of questions asked included:

- Were there any characteristics of the program's structure that were particularly effective in helping meet its objectives? Were there any characteristics that hindered the program?
- Do gaps exist that could be met by existing (or new) programs?
- What other barriers exist among the target market to investing in energy efficiency? How might future program services be designed to overcome those additional barriers?

Interviewees indicated that certain elements of the program's structure contributed to its ability to meet objectives. In particular, several individuals stated it was useful to separate the program manager and technical advisor role.

One interviewee stated that it is critical to have both positions in place early on in the program's implementation, especially so that the technical advisor can assist in the development of the program and provide input on the needs of the energy efficiency field. In one instance, waiting to hire a technical advisor until midway through the program's development resulted in an overall lack of technical understanding and slowed down the program's implementation.

Table 29: Comments on current program & recommendations for future programs

Category	Comments
Program Design	- Separating the roles of program manager and technical advisor was beneficial to the program - Program could have improved flexibility by accounting for differences in demographics and energy needs of local communities - Program duration was too short; it would benefit by being consistent, stable, and of longer duration - Program would have benefited by assessing available contractor workforce prior to program implementation - Program front-loaded audits which generated work that exceeded contractor capacity; the program would have benefited from a more even distribution of audits throughout project duration to better match contractor capacity - Current process was too paper-based; a centralized, web-based project submission process would have facilitated the sharing of project information, including required documentation, contact information, project status, etc. - Program presented too many choices in terms of contractors; a better practice may be to have the program manage contractor selection in the absence of customer preference.
Start-Up	- Key personnel need to be hired early on to aid in program development - Marketing efforts should have begun six to eight months prior to program implementation
Marketing & Communication	- The name “BetterBuildings” confused participants; the program would have benefited from having a name that communicated its purpose clearly - Word-of-mouth was most likely the most effective marketing channel in the program. - Local partnerships help to increase exposure to target market
Project Financing	- Consolidating funding sources may help to decrease customer confusion with funding options - Important to communicate what is and isn’t eligible for funding (e.g. health & safety measures) - Incentives help to boost customer participation, such as promotions to encourage early commitment

Program structure and administration should also be tailored to the individual community in which the projects are taking place. In the instance of the BetterBuildings program, there were reportedly major differences between each community involved, including demographics, expectations, predominant energy types (e.g. heating oil vs. natural gas), incumbent energy efficiency programs, and methods of outreach. Interviewees advised on conducting market research prior to implementation in order to tailor the program to the unique characteristics of its particular region.

One suggested component of this market research that should be undertaken was gauging the availability of contractor workforce. Programs need to ensure that there is a sufficient skilled labor to accommodate the influx of project components that occur at each stage of the program. For example, a significant number of energy audits were completed towards the beginning of the program, while contractors were in higher demand at a later point to implement the actual projects. Ensuring that there will be adequate labor capacity, communicating the anticipated increase in demand to applicable auditors and contractors, and pacing the conduction of audits all will help to ensure a timely progression of projects.

Another issue commonly cited in the interviews was the need for a centralized data submission process to help facilitate the documentation of required information for each project. Reportedly, too much information was required to be documented, and it was not stored in an easily manageable or accessible way. Information was largely shared via paper forms. Several interviewees recommended that future programs implement an online submission process so that information doesn't get lost between auditors, contractors, and program administration. One piece of data that was especially onerous to track was Davis Bacon wage information. The ability to submit this data online would have substantially improved the ability to track and manage required documentation.

Likewise, interviewees recommended that project coordination could be improved with a central database where various stakeholders could view the status of a project, post updates, documents, etc. It would have also been helpful to publish a central contact list of program managers, customers, and contractors to help facilitate communication across projects and cities.

Well-planned project marketing was commonly cited as a key to overall program success. However, interviewees said there were several characteristics of BetterBuildings' marketing strategy that detracted from effective communication and outreach. It appears that the name of the program itself was confusing to customers. Several interviewees suggested that the name "BetterBuildings" misled consumers and did not adequately communicate the objectives of the program. One interviewee indicated that the name led some customers to believe that the program builds energy efficient homes rather than provides funding options for energy efficiency upgrades.

As for the content of marketing materials distributed to communities, interviewees referenced several components that contributed to strong messaging. Notably, it was helpful to include success stories as part of the marketing strategy. Since energy efficiency may not necessarily be a familiar topic for much of the target market, it is helpful to illustrate the potential benefits with actual projects, especially if they are local. As part of these messages, it is also important to emphasize that all homes—both old and new—may benefit from energy efficiency upgrades. Often, owners of newer homes think that there is little they can do to reduce their energy bills, while owners of older homes may feel that their homes are simply too old to improve.

Income eligibility should also be a central component of marketing messages whether or not there is an income cap. In fact, a survey respondent cited BetterBuildings' lack of income requirements as a positive attribute of the program. Clarifying eligibility and illustrating successful customer experiences can strengthen the marketing and attract more customers.

With regard to the timing of marketing initiatives, several interviewees said that communication efforts should start well before the program actually commences. Specifically, six to eight months of exposure in the community beforehand was helpful in the instance of Berlin residential projects.

Just as program management should adjust the program's characteristics to suit the target market, marketing initiatives should be specifically tailored to reach the desired customer base. For example, certain types of media may not be as effective at reaching certain audiences. One interviewee suggested that increased televised media or use of social media might be effective at attracting more participants, while print media was recommended only as a way to further explain the program.

Separately, a study titled “GIS Analysis of Plymouth Better Buildings Disbursement and Projects” by Plymouth State University stated that “If in fact word of mouth is a key contributor to energy efficiency spending, although seemingly counter-intuitive, it may make sense to push advertising for the program in the regions where success has already been realized.” The same analysis found little correlation between project enrollment and customer demographics (race, gender, income, mortgage status, etc.).

Interviewees also stated that an effective practice was to partner with local programs that already know the target market well. For instance, all three BetterBuildings communities partnered with the NH Retail Merchants Association to help gain better exposure with potential commercial customers.

As was the case with BetterBuildings, providing funding to contractors to aid in marketing efforts can help expand the breadth of program outreach. On one hand, local contractors likely have well-established relationships in a community; however one interviewee reported that it was difficult for contractors to reach out to customers and that program administration should be more involved with connecting customers with applicable contractors.

Providing clear communication on funding options is critical to customer retention. One interviewee indicated that having multiple sources of funding served as a source of confusion for customers. It is important to communicate which elements of a project will and will not be funded under the program’s policies. Notably, one interviewee suggested that certain health & safety measures, including lead or asbestos removal, were not always covered by rebates. Such a lack of funding, if not made clear in the beginning, has the potential to thwart a project’s progress.

Providing extra promotions, in addition to standard funding, can help to attract customers and secure retention. As an example, one promotion in the Plymouth BetterBuildings program was an extra $1,000 if a customer made the decision to participate by a certain deadline. This promotion was cited as a helpful way to boost program participation.

Conclusion

The NH BetterBuildings program was an effective energy efficiency program supporting $10.4 million in energy efficiency activity with $1.0 million in energy savings annually.[16] The program was particularly strong in creating reductions in thermal load, especially a reduction in heating oil use for residential customers. Over 60% of the total cost savings from projects implemented for NH residences was in heating oil reduction.

The program contributed to the NH economy, supporting 144 jobs, $7.6 million in labor income in NH and $10.3 million in economic value-added to the NH economy. The highest employment impact from this program was in the commercial and residential construction sector.

Future programs should place emphasis on project cost reduction. This would include business processes that take advantage of economies of scale, contractor performance monitoring, and stream-lined project management processes. Future programs should also strive for stability, consistency, and longevity. While grant-based programs are effective short-term tools to drive energy efficiency projects, a longer-term program would increase the overall efficiency and reduce the cost of energy efficiency projects in the state.

A key question posed for this analysis was what is the right mix for loans and grants in an energy efficiency project? Based on the project characteristics observed, it appears that a “typical” energy efficiency project has a 7 to 11 year payback with no incentives. NH BetterBuildings staff reported slow uptake of just a loan product, and it appears that in order for energy efficiency projects to be attractive to customers that it is necessary for incentives (or reduction in project cost) to bring the payback of the project to 4-5 years.

Loans are an attractive financing option as they significantly reduce the upfront expenditure of a customer without significantly impacting the payback or return on investment of a project. Based on the projects that utilized loans versus those that did not, it appears that the overall cost of the project is a key factor in whether or not a loan is utilized. Specifically, loans appear to be more prevalent in higher cost projects than lower cost projects.

Additional areas of research would include taking more detailed look at the characteristics of the projects and the types of measures that were installed to better understand the financial attributes of different project types. Given that many customers do not believe the estimated savings (as uncovered in the surveys performed by NH BetterBuildings), research that compares actual energy reductions to predicted and also illustrates how energy savings risk impacts return on investment would be a valuable contributor to the customer education process.

[16] Based on projects analyzed, as discussed in report this is not the full portfolio of projects, but represents a majority.

Appendix A – Study Authors

Matthew Magnusson is owner of Seacoast Economics, LLC. Seacoast Economics, LLC— formed in 2012— provides project-based energy and economic analysis consulting services. These projects often involve collaboration with outside experts who assist with an aspect of the project.

Matthew is a graduate of the University of New Hampshire's Whittemore School of Business and Economics with a Masters of Business Administration and currently is earning his Ph.D. in Natural Resources and Environmental Studies at the University. In his previous role as a Project Director II at Carbon Solutions New England, he guided reporting system development, procedures, and compliance for energy-efficiency grants awarded from the NH Greenhouse Gas Emissions Reduction Fund. He was responsible for the collection and analysis of project data, and for authorship of annual reports to the NH Public Utility Commission Sustainable Energy Division.

Relevant recent research while employed as a Research Scientist at the University of New Hampshire includes economic modeling for a study sponsored by NRDC and Protect Our Winters "Climate Impacts on the Winter Tourism Economy in the United States," "New Hampshire's Green Economy and Industries: Current Employment and Future Opportunities" performed for the Rockingham Economic Development Committee (REDC), "Economic Impact of Granite Reliable Power Wind Power Project in Coos County, New Hampshire" performed for Granite Reliable Power, LLC and the economic analysis of policies proposed in "The New Hampshire Climate Action Plan" performed for the NH Climate Change Task Force.

Dr. Cameron Wake is actively involved in identifying and developing viable, collaborative solutions to address climate change in the Northeast. Over the past decade, he has focused his research at the University of New Hampshire on regional climate and environmental change primarily through the analysis of ice cores. In addition to his role as Research Associate Professor, he is Director of Carbon Solutions New England (CSNE, www.CarbonSolutionsNE.org), a public-private partnership promoting collective action to achieve a clean, secure energy future while sustaining our unique cultural and natural resources. Through his work at CSNE, he has played a leadership role in the Northeast Climate Impacts Assessment (NECIA, www.northeastclimateimpacts.org) and served on the NH Climate Change Policy Task Force. Cameron also helps lead the New Hampshire Energy and Climate Collaborative, established to track and facilitate the implementation of New Hampshire's 2009 Climate Action Plan, of which he was a contributing author.

Cameron's outreach efforts at UNH have emphasized the need for tracking and analyzing energy data in order to make informed decisions about the transition to a low-carbon economy. Cameron oversaw CSNE's analysis of energy savings associated with New Hampshire's Greenhouse Gas Emissions Reduction Fund. CSNE provided critical insight into the effectiveness of various projects funded by the program. Cameron was also involved in the development of the Small Town Carbon Calculator to help small municipalities track and analyze opportunities for energy and cost savings. Through these projects, he has collaborated with many different stakeholders to address the environmental and economic opportunities associated with reducing greenhouse emissions.

Corey Johnson is a graduate of the Paul College of Business and Economics (formerly the Whittemore School) at the University of New Hampshire. While in school, Corey worked with Carbon Solutions New England (CSNE) to help analyze energy savings associated with New Hampshire's Greenhouse Gas Emissions Reduction Fund. His work helped to inform CSNE's analysis of projects funded by the program, including their associated environmental and financial benefits to the State of New Hampshire.

Corey also developed, in partnership with CSNE and Clean Air-Cool Planet, the Small Town Carbon Calculator (STOCC). STOCC is an Excel-based tool to help small towns manage energy use, greenhouse gas emissions, and related expenses. Corey received a grant from UNH's Hamel Center to implement STOCC throughout New Hampshire. His work involved collecting and analyzing utility data for municipal governments and providing actionable recommendations to local energy committees. Currently, Corey works as a Sustainability Research Analyst at Pax World Investments, a role in which he analyzes the environmental, social and governance profiles of companies considered for inclusion in Pax World's mutual funds. Corey will be returning to school in the fall to pursue a Master of Environmental Management from Yale University.

Appendix B – Economic Modeling

The technique used to estimate the economic activity in this study is called economic impact analysis. Economic impact analysis describes the current economic activity in a study area (such as a county, group of counties, state, or group of states) and it can be useful in estimating how a change—such as the loss of an existing industry or the addition of a new industry—would be expected to affect the wider local or regional economy in the study area. Impact analysis begins with evaluating the output of businesses included in the analysis. These expenditures (referred to as direct expenditures) trigger a series of additional spending flows throughout other sectors of the local economy as businesses spend on 1) payroll and benefits, and 2) supplies, equipment, and service contracts with local vendors (referred to as indirect expenditures). The purchase of goods and services from local vendors supports the hiring of workers at those firms and also provides funds to enable those firms to purchase additional goods and services from suppliers situated further down the supply chain.

The activity at companies involved in direct or indirect expenditures results in their employees earning salaries and wages. A portion of their wages will be spent on local goods and services at different industries including: health care, retail, and leisure (referred to as household spending or induced expenditures). This round of spending by employees helps support workers in those industries who then will spend portions of their incomes locally and employees triggers another round of spending, etc.

This entire chain of spending is referred to as the "ripple" or "multiplier" effect. The rounds of spending and re-spending do not continue indefinitely but typically diminish rapidly. The impacts of the initial economic activity rapidly leave or "leak" out of the local economy through the imports of goods and services produced in other regions, savings, spending in areas outside the local economy, and taxes.

IMPLAN (IMpact analysis for PLANing) is a system of software and databases produced by the Minnesota IMPLAN Group (MIG), Inc that is widely used and accepted for local and regional economic modeling. IMPLAN was originally developed in 1976 by the US Forest Service, the Federal Emergency Management Agency, and the Bureau of Land Management to allow for analysis of private and public sector decisions on local, state and regional economic impacts. MIG, Inc. was formed in 1993 to privatize the development and maintenance of IMPLAN data and software. IMPLAN is currently in its third version.

IMPLAN utilizes input-output (I-O) accounts to model how the more than 500 industries that comprise the U.S. economy interact. Input-output (I-O) analysis quantifies the relationships of how industries provide input to and use output from each other. IMPLAN data and accounts follow the accounting conventions used by the U.S. Bureau of Economic Analysis (BEA) when developing an Input-Output (I-O) model of the U.S. economy as well as formats recommended by the United Nations.

Underlying data sources for the IMPLAN model include:

- U.S. Bureau of Labor Statistics (BLS)
    - Census of Wages and Employment (CEW)
- U.S. Department of Census
    - County Business Patterns
    - Annual Survey of Manufacturers (ASM)
    - Construction Spending (Value Put in Place)
- Bureau of Economic Analysis (BEA)
    - Regional Economic Information System (REIS)
    - National Income and Product Accounts (NIPA)
    - Gross State Product (GSP) series
    - Output series

The IMPLAN program uses an ordered series of steps to build the model starting with selection of a study-area. The study-area can be at the county level (including multiple counties), the state level (including multiple states), and the national level. The IMPLAN model allows substitution of data at each stage of the process which can serve to increase the robustness of the model. The model can also have its import and export functions modified and industry groupings changed. IMPLAN also allows for the creation of aggregate models consisting of industries grouped together to streamline the modeling process.

The creation of the study-area database constructs a descriptive and prescriptive model. The descriptive model describes the transfer of money between industries and institutions. This model provides data tables on regional economic accounts that capture local economic interactions. These tables describe the local economy in terms of the flow of dollars from purchasers to producers within the study-area region. The descriptive model also produces trade flows— the movement of goods and services within a study-area and the outside world (regional imports and exports).

The prescriptive model is a set of input-output multipliers that estimate total regional activity based on a change entered into the IMPLAN model. Multiplier analysis is used to estimate the regional economic impacts resulting from a change in final demand. New industries or commodities can be introduced to the local economy, industries or commodities may be removed, and reports can be generated to show the consequences (on output, employment, and value-added) of various impacts. Impacts include: output, labor income, value added, and employment. Impacts can be in terms of direct and indirect effects (commonly known as Type I multipliers), or in terms of direct, indirect, and induced effects.

Table 30: Implan summary measures of regional economic activity

Measure	Description
Output	The value of production by industry in a calendar year. Output is measured by sales or receipts and other operating income plus the change in inventory. For retailers and wholesalers output is equal to gross margin not gross sales.
Labor Income	All forms of employment income, including employee compensation (wages and benefits) and proprietor income.
Value Added	The difference between total output and the cost of intermediate inputs. It is a measure of the contribution to Gross Domestic Product (GDP) and equals output minus intermediate inputs. Value added consists of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus.
Employment	The annual average of monthly jobs in an industry and includes both full-time and part-time workers.