ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANT (EECBG) - BETTER BUILDINGS NEIGHBORHOOD PROGRAM

FINAL INTERIM REPORT

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Executive Summary

With $10 million in funding from the U.S. Department of Energy's (DOE) Better Buildings Neighborhood Program, the NH Better Buildings program was established as an initiative that initially empowered the three "Beacon Communities" of Berlin, Nashua and Plymouth to achieve transformative energy savings and reductions in fossil fuel use and greenhouse gases through deep energy retrofits and complementary sustainable energy solutions. The program also enabled those Communities to provide leadership to other communities around the state as "beacons" of energy efficiency. The goal of the program was to reduce energy use by a minimum of 15% through energy efficiency upgrades in residential and commercial buildings in the communities. The program expanded statewide in April 2012 by issuing a competitive solicitation for additional commercial projects non-profit, and municipal energy efficiency projects from any community in the state, and a partnership with the state's utility-run, ratepayer-funded residential Home Performance with ENERGY STAR® (HPwES) program.

The NH Better Buildings program was 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 funded with American Reinvestment and Recovery Act (ARRA) funds were completed in August 2013. The program will continue after the American Recovery and Reinvestment Act program period as a Revolving Loan Fund, enabling low-interest financing for deep energy retrofits into the future.

During the initial three-year period, the $10.8 million (private and public funds) spent directly on retrofits 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 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.[1]

Beacon Communities - Outreach and Technical Assistance

The three Beacon Communities were selected from more than 30 applicants based on their mix of geography, economic status, building types, and other demographics. The NH Better Buildings program established a local office in each of these forward-thinking towns to coordinate outreach and walk businesses and homeowners through the energy efficiency improvement process. Each office employed a community manager who generated support for the program by hosting outreach events and making presentations at local meetings, maintaining lists of qualified energy professionals, and assisting in identifying financial opportunities for efficiency upgrades. In addition, a technical

[1] From "An Evaluation of the NH Better Buildings Program", by Seacoast Economics, LLC, September 2013

advisor was on hand to address specific energy efficiency questions, facilitate energy assessments (energy audits) and timely completion of projects, and help owners interpret energy evaluation findings and recommendations from energy professionals.

When the program expanded statewide, the established utility efficiency programs provided residential outreach and technical assistance. Commercial outreach and technical assistance was provided by CDFA staff. Although this model was successful in the Beacon Communities, a challenge for the continuation of NH Better Buildings will be how to provide this hands-on outreach, management and personal assistance in a cost effective manner.

Consistency Means Quality

The program created jobs for New Hampshire small businesses and continued to build workforce capacity for energy efficiency improvements. Working through local community colleges, NH Better Buildings provided BPI curriculum and training to help develop more qualified workers and foster employment. In addition to classroom training sessions, NH Better Buildings and Lakes Region Community College offered a mentoring opportunity for workers who had completed classroom trainings but needed more experience in the field before working on their own. In total, over 40 workers were trained through these classes and mentorships.

By collecting before and after data from energy professionals and local utilities, NH Better Buildings determined best practices to implement in later phases of the program. Energy professionals were required to use the same software to ensure that the measured savings from an energy upgrade in a home in Nashua would be the same for a similar home in Berlin or Plymouth. This approach not only helped maintain quality performance of energy efficiency upgrades across the program, but also ensured consistency among savings data for comparison purposes. The program used Targeted Retrofit Energy Analysis Tool (TREAT) software for residential properties, which captured and analyzed energy efficiency data. For commercial properties, a set of evaluation guidelines helped to provide consistent information while recognizing that a variety of approaches to analysis can work well, depending on the building type, size, and use.

Financing and Grant Options to Spur Participation

Better Buildings' funds were used to leverage private investment from banks and credit unions throughout the state to create attractive financing terms that encouraged program participation. For residential and small commercial projects (up to $20,000) in Berlin, Nashua and Plymouth, the program bought down interest rates to allow for an attractive 1% interest rate loan product with terms up to ten years. NH Better Buildings also provided a 50% loan loss reserve to help reduce risk for banks and credit unions.

Funding was also used to address existing barriers in the private market such as building owner concerns about upfront costs and bank concerns about loan defaults. For medium and large commercial projects, the program created a co-lending loan product with financial institutions. Better Buildings' funds provided one-half the capital at 0% interest while the bank provided the other half of the capital at an interest rate negotiated with the borrower, usually 5-7%, which resulted in a lower-than-market blended rate for the borrower.

To stimulate demand, increase customer return on investment, and further off-set up-front implementation costs, NH Better Buildings provided additional incentives in the form of grants and rebates. All NH Better Buildings commercial projects were offered a grant of 25% of the total project cost up to $150,000. Residential customers were offered rebates. Residential customers residing in a Beacon Community were offered a rebate of $250 to $1,000 depending on the total projected energy savings. These customers could combine the NH Better Buildings rebate with HPwES rebates provided by utilities. HPwES rebates equaled 50% of total project cost up to $4,000. Statewide residential customers were only eligible for the HPwES rebates. During the collaboration between NH Better Buildings and HPwES, each entity funded one-half of the rebates.

A Cooperative Approach for Low-Income Manufactured Homes

NH Better Buildings partnered with the New Hampshire Community Loan Fund, the Tri-County Community Action Program, New Hampshire Electric Co-op, and Lakes Region Community College to implement a series of projects in Whip-O-Will Hill Village, a resident-owned community of manufactured homes in Plymouth. Through cooperation with the community's Board of Directors, a door-to-door education campaign was implemented to increase homeowner interest in energy efficiency. Homes qualifying for low-income programs were served by Tri-County Community Action Program and the New Hampshire Community Loan Fund. Other homes in the community were served by the New Hampshire Electric Co-op's HPwES program and NH Better Buildings. Contractors were also trained specifically on implementing energy efficiency projects in mobile home units, conducting energy upgrades in three mobile homes as a hands-on learning experience.

Program Expansion and Innovative Developments

In April 2012, NH Better Buildings opened an application period for additional commercial, non-profit, and municipal energy efficiency projects from any community in the state. The program sought to implement several additional energy efficiency projects, as funding allowed. Ten projects were selected, based on scoring criteria that included

prioritizing project applications that had either already completed an energy evaluation or were looking for substantial implementation loans.

The program also developed a formal collaboration with the HPwES program run by the state's regulated utilities. This collaboration provided an integrated approach for residential projects, allowing residential customers to work both with HPwES and NH Better Buildings. Key elements of this program included on-bill financing and program implementation through an existing utility contractor network. Through the Better Buildings partnership with three utility companies that run the state's HPwES program, the utilities were able to expand their loan offerings when using Better Buildings' funds as capital. The maximum residential loan was increased to $20,000 with a maximum term of ten years. Customers taking loans from through this collaboration were also allowed to finance "deep dive" measures that are not typically available through the utility programs.

The Future Sustainability of NH Better Buildings

Throughout the grant period, the NH Better Buildings Program was focused on overcoming key market barriers including demand for energy efficiency services, bank participation and understanding of the energy efficiency marketplace, availability of funding for energy efficiency, and the public's understanding of audit and upgrade processes. The program was successful in transforming the market by increasing demand, providing funding, and increasing the public's understanding of energy efficiency – leading to the completion of over 1,200 energy audits and 1,000 energy upgrades of 15% energy savings or more.

In general, NH Better Building project characteristics were:

- 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.
- 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.

The key lessons learned from the initial phase of NH Better Buildings program are listed below. These lessons will assist in further defining the target customer and financing options implemented with the revolving loan fund.

- The program should be well integrated with other energy efficiency programs offered in the state. Program characteristics should include: consistency, stability, and longevity.
- The program 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.
- Significant customer education is an important part of any program. Explanations of energy audits, energy efficiency measures, paybacks, and financing options are key elements to getting customers to make efficiency investments.
- Incentives may still 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.

Final Technical Report

Institutional Design and Business Model

NH Better Buildings took a collaborative approach with regard to Institutional Design and Business Model that enabled the Program to leverage funds and take advantageous of efficiency programs already established in the state. Two best practices to highlight are financing programs with local banks and credit unions, and contracts with utility run efficiency programs.

1. **Financing Programs**

   The design element most unique to NH was the effort to work closely with a suite of local banks and credit unions to develop attractive financing programs. This approach complemented the community-centered focus of the NH Better Buildings program. In total, ten local banks and credit unions made 152 loans through their partnership with NH Better Buildings. Customers were able to work with banks in their communities, and in some cases contractors formed lasting connections with these banks, a development that creates positive opportunities for future project financing in the state.

   - **Residential and Small Commercial Financing Programs**

   Similar to other Better Buildings programs, NH created a residential loan product using Interest Rate Buy-downs (IRB) and Loan Loss Reserves (LLR). A LLR of 50% offered banks a very low-risk entry into the market of energy efficiency loans. The LLR was also a way to ensure a sustainable expenditure of funds such that the LLR will return to the program's revolving loan fund as the original loans are paid off. An IRB to 1% created a low interest product that was attractive to consumers during an economic downturn. This loan product was also available to small commercial projects financing $20,000 or less. Under this program, local banks and credit unions made 134 loans through their partnership with NH Better Buildings.

   - **Commercial Financing Programs (Participatory Lending)**

   In addition to a LLR/IRB model, NH developed a participatory lending product with local banks for commercial loans over $20,000. This scenario had Better Buildings providing one-half of the loan capital at 0% interest and the bank providing the other half at their fair-market rate. The participatory lending arrangement allowed NH Better Buildings to expand the amount of capital available for loans. It also ensured that underwriting and loan administration was done by experts at the banks. Better Buildings' capital lent out is returned to the revolving fund as the loans are repaid. Better Buildings' funds took second place in the event of a default, which offered the banks new loans at a lower risk. It also

allowed these banks a way to strengthen ties with existing business clients and attract new ones. Administratively, the bank handled all underwriting and loan servicing while Better Buildings provided project oversight and inspections. The commercial building owners received the benefit of large loan amounts available at lower than market rates. Under this program, local banks and credit unions made 18 loans through their partnership with NH Better Buildings. In the future, a participatory model could create similar benefits to all groups, and support a small interest rate on the federal funds that could be used to run lending programs.

2. Utility Partnerships

As the NH Better Buildings program evolved, partnership with the residential Home Performance with ENERGY STAR® (HPwES) programs run by the State's utility companies became an integral part of the program design. The HPwES programs had been operating in the state for several years before Better Buildings started. The HPwES programs offer significant rebates toward energy efficiency retrofit project costs and some utilities have a complementing on-bill financing program. Contracts and partnership with these existing programs made sense for Better Buildings on a variety of levels.

A single program, and process, made the most sense for residential customers, who were more likely to move forward with a project if they did not have multiple programs and processes to figure out. Marketing and messaging around the state also made more sense with a combined program. Customers also benefitted from the combined program by being able to take advantage of the rebates offered by HPwES, which were greater than rebates originally offered by Better Buildings before the partnership.

Combining programs also made sense for Better Buildings. The utility programs had an existing queue of projects. They also had a well-developed procedure for audits and implementation, and a robust database for collecting information about projects.

Participating contractors appreciated that the combined programs meant they did not have to fill out multiple sets of paperwork or submit invoices to more than one program office. They also found it simpler to explain program options and process to potential customers. They were able to continue using the auditing software and project database that they had become used to with the utility programs over the preceding years.

The utility companies benefitted from the partnership because the additional funds from Better Buildings allowed them to expand their program. Though three utilities had existing on-bill financing programs, they did not have enough capital to meet demand and were starting to develop wait lists for loans.

A unique element to the combined program is that the Better Buildings funds were also used to expand the existing HPwES offerings, by allowing "Deep Dive" measures to be included in homeowner's retrofit projects. These were energy efficiency measures that were not eligible for rebates under the current cost-effectiveness test for HPwES. With the Better Buildings funds available for loan capital, customers were able to add "Deep Dive" elements to their loans and complete them as one project within the HPwES program.

Combining efforts and utilizing each program's strengths lead to consistent marketing/messaging, more efficient processes for contractors, one-stop shopping for customers, and a streamlined approach to financing (on-bill). In total, 193 loans were written with a total value of $1,276,163.

Program Design and Customer Experience

NH Better Buildings developed best practices for customer experiences in several ways.

1. **Community Offices in Berlin, Nashua and Plymouth**

   The heart of the customer experience for NH Better Buildings was the community office. The program opened offices in three NH communities: Nashua, Plymouth and Berlin. These were the "Beacon" communities and the effort was intended to drive as much energy efficiency work as possible within each of these communities, and then roll the program out to additional communities. Each community office was staffed by one Community Manager and one Technical Advisor. These staff members served as the main points of contacts for customers, contractors and others in the community.

   Located on Main Street in each community, customers could come in to the office for information, contractors could come for meetings, and the location was a home base for staff to partner with other local organizations such as local non-profits, businesses, and community groups.

   The community staff focused on grassroots outreach, customer service and partnerships. Even when NH Better Buildings executed contracts with the HPwES program and expanded beyond the original three communities, the community offices still served as main hubs for driving residential projects. For commercial projects, the community staff played a vital role in helping building owners understand and navigate the myriad of available programs in the state.

2. **Streamlining for Contractors Leads to a Better Experience for Customers**

   Contractors were some of the most important partners for NH Better Buildings. They had the most direct contact with every customer, and the way in which they presented the program, sold jobs and implemented projects had a tremendous

impact on the program's success or failure. Early on, NH Better Buildings learned that streamlining the administrative process for contractors would positively impact the overall customer experience.

At the beginning of the program, NH Better Buildings asked contractors to learn and use new energy auditing software, and fill out a rather extensive set of paperwork for each of their Better Buildings jobs. Some of this work was necessary due to DOE reporting and program requirements and other items were put into place based on initial program preference. While contractors were willing to meet these Better Buildings requirements in order to get jobs, the process had a negative impact on their business model and thus a potentially negative impact on the program overall. Contractors were spending more time than usual on audits because they were new users of the selected audit software. This learning curve provided no benefit to the client and frustrated contractors. In addition, filling out redundant information on paperwork in the field was leading to errors and increasing administrative time. With the initial program design, contractors also had to explain multiple efficiency programs and incentives to their customers (i.e. utility rebates, Better Buildings' rebates, state commercial efficiency programs, and financing).

The partnership with the HPwES program solved many of these issues, as contractors were able to use the existing audit software and processes established by the utility program and drop the additional requirements and paperwork for Better Buildings. For some of the contractors, one negative impact of the utility partnership is that while the original Better Buildings program let them name their own prices for work, the utility program had a defined pricing agreement for all the measures eligible for rebates.

3. Customers: Choice versus Convenience

One element the NH Better Buildings program was able to explore in an interesting way was customer preference regarding how to choose contractors. NH Better Buildings developed a qualified list of contractors and customers were able to get quotes and choose to work with any contractor on the list. While many customers and contractors appreciated this model, it did not work as well for others.

Customer feedback indicated that a significant number of people felt they did not have the time or knowledge to find and evaluate quotes from multiple contractors; therefore, "choice" actually became a barrier to getting interested homeowners to move forward with audits and retrofits. Customers would receive the qualified list, but be too busy and delay projects because they did not know who to choose. Some even asked for a contractor to be assigned to them.

Partnering with HPwES removed this barrier. Customers who wanted to choose their own contractor from the utility qualified list could do so when they signed

up for the program. If they did not have a particular preference, the utility would assign a contractor based on the customer's location and contractors' current workloads.

4. **Coordination between Efficiency Programs and Ease of Financing**

NH Better Buildings' collaboration with the utilities HPwES programs was very successful from a client perspective. Because the maximum loan amount increased, deep dive retrofits were implemented, resulting in significant energy savings. The average loan size increased indicating a consumer desire to implement deep dive measures and the need for financing to off-set the out-of-pocket expenditure needed to implement such measures. Clients appreciated the ease of on-bill financing from both an application and payment perspective.

The administrative mechanics of collaboration were challenging in that the combining of programs with different reporting criteria lead to increased time requirements for utility staff. The utilities are also interested in future models that move from on-bill financing and instead partner with private banks to execute and manage the loan process and payments.

The program was less successful in making transformative change with banks. Although the program developed partnership with banks, it is still unclear whether the industry is willing to enter the marketplace without loan loss reserve and co-lending agreements. A new pilot program being tested by the utilities is evidence that banks are in fact now more willing to enter the efficiency marketplace. Please refer to the "Program Sustainability Plans" section for further details regarding this pilot program.

Driving Demand

1. **Cooperative Marketing with Contractors**

Contractors were an important partner for NH Better Buildings in driving demand. In Nashua especially, contractors seemed to bring in the majority of projects. Two contractors in particular used the availability of the Better Buildings program as a business development tool and did extensive outreach to bring their customers to the Better Buildings program. In addition to business development, the program offered two incentives that encouraged contractors to drive demand for Better Buildings.

In each of the three beacon communities we offered a contractor incentive. If a contractor referred a project to Better Buildings and the customer moved to

completion, the program provided a $300 incentive to the contractor. Forty of these incentives for residential and commercial projects were available in each community on a "first finished – first served" basis.

NH Better Buildings also offered a co-marketing incentive, where if a contractor wanted to do a marketing campaign, NH Better Buildings would pay a portion of the marketing cost. The program's logos and contact information had to be included in the marketing materials. Program staff participated with contractors in several mailings, flyers and home shows, and even a set of YouTube videos highlighting retrofit projects.

2. **Partnerships Build on Existing Community Networks**

NH Better Buildings worked to leverage existing networks and relationships within the communities where it operated. A good example comes from the town of Plymouth. Building on the success of work done by Plymouth State University, the Plymouth Area Renewable Energy Initiative and a Select Board appointed Local Energy Commission, as well as many other individuals in the community, NH Better Buildings formed the Plymouth Energy Reduction Council (PERC). This group provided a place where all voices could be heard in the common, community-wide effort to reduce energy use. PERC met monthly from August 2010 to August 2011 and participated significantly in the initial design of how NH Better Buildings would work in Plymouth.

3. **Community Events**

NH Better Buildings also participated in community events as a way to drive program demand. One of the most successful examples comes from Berlin where participation in the weekly farmers market and a monthly series of "Lunch and Learn" events were significant drivers for program participation. As a small and relatively isolated city in NH's north country, downtown Berlin is the major center of social and civic life for the area. The weekly farmers market had high attendance and was located just down the street from the Berlin Better Buildings community office. Community staff set up a booth at the market every week and got to know residents and the other participating businesses through these events.

The Berlin office also created a series of very well attended "Lunch and Learn" sessions. A different topic related to energy efficiency, renewable energy and green building was presented each month. Regular attendance at the events created a well-educated core of citizens who not only participated in the Better Buildings program, completing energy audits and energy efficiency retrofits projects themselves, but were able to spread the word to their family and friends.

Workforce Development

1. **Scholarships and Trainings**

   A number of training opportunities for the energy efficiency workforce exist in New Hampshire, and Better Buildings was able to offer training scholarships as well as work with the Community College System to develop new trainings. Scholarships allowed Better Buildings' Qualified Contractors to enhance their skills and offer training opportunities to new hires. When Better Buildings decided to use the TREAT energy auditing software for the program, the program worked with the Lakes Region Community College (LRCC) to offer in-depth, hands-on, training classes for contractors to learn how to use the software. Because use of the software was a program requirement, NH Better Buildings paid for course development and covered class fees for Qualified Contractors.

   Additional contractor trainings that the program sponsored included a mentoring program for contractors needing additional field hours to qualify for the approved list, BPI certified Building Analyst and Building Installer classes, Introduction to How Buildings Work, and an installation workshop focused on manufactured homes. NH Better Buildings also provided scholarships to several other BPI, infrared and heating system classes offered by the Community College System.

   NH Better Buildings also helped to sponsor the development of a new training to educate realtors about energy efficiency. The curriculum received approval from the NH Real Estate Board to be used for continuing education credits. The course is still being offered by co-developers Sustainable Energy Resource Group and LRCC.

2. **Unique Partnership at Whip-O-Will Manufactured Housing Park**

   Plymouth Better Buildings, Lakes Region Community College (LRCC), NH Electric Co-op and NH Community Loan Fund partnered for a unique training at the Whip-O-Will Manufactured Housing Park in Plymouth. The NH Community Loan Fund was awarded federal dollars to perform energy efficiency upgrades in low-income manufactured homes. They were able to reach a number of the homes in Whip-O-Will through their program, but other homes in the park did not meet the income qualifications. These manufactured homes also needed efficiency upgrades, and their residents were in financial difficulty, even though they were just above the qualification for low-income.

   At the same time there was a recognition in the state that manufactured housing has unique aspects when it comes to installing efficiency measures, and many contractors are not trained to treat these homes differently from other jobs. LRCC put together a hands-on training class that taught contractors the unique challenges of manufactured housing and specifically how to complete work on manufactured homes. The training was done on-site at Whip-o-Will.

Homes chosen for the training needed weatherization but had not qualified for the low-income program. These owners were able to receive free services by having their manufactured homes serve as demonstrations for the training. Better Buildings and NH Electric Coop jointly covered material and project costs, and sponsored the training.

This event showed how multiple organizations and programs can work together to achieve multiple community and workforce development goals.

3. **Mentoring**

NH Better Buildings required relevant previous work experience for a contractor to be listed on the program's Qualified Contractor list. A few applicants had passed their BPI exams but did not have work experience. In order to create a path for qualification, NH Better Buildings worked with Lakes Region Community College to modify an existing mentoring opportunity that they offered. Contractors were able to participate on several energy audits with an experienced mentor in order to gain more practice and ensure they were going about the work correctly. NH Better Buildings only sponsored two contractors in this process, but both found the experience to be helpful.

Financing and incentives

1. **Demand Exists for Higher Loan Amounts – Utility Loan Experience**

An interesting result of the partnership with utility on-bill financing was that the loan amounts were on average much higher than anticipated. When program staff developed the budget for the utility partnership with Public Service of New Hampshire (PSNH), staff used the average loan amount from their previous program experience of $2,500.

However, the Better Buildings partnership allowed the utilities to offer larger loans than they had been able to through their existing HPwES program and to let customers take out loans for deep-dive measures that had previously not been allowed. At the end of the program the average on-bill loan for PSNH was $6,612.

This experience reveals that when loan funds are available and customers are able to undertake more extensive measures as part of their project, there is consumer demand for higher spending. The rebates available through the utility HPwES program did not increase with the partnership, only the loan amounts and allowable measures increased. So the higher average was entirely loan funds that consumers have to repay. In other words, "their" money went into retrofit projects rather than "free" money (rebates) from the program. Given the right

conditions, consumers are willing to invest at higher levels than originally anticipated.

2. **Co-lending**

The co-lending/participatory lending model (described previously) was very popular with bank partners. On commercial projects banks still want to see "bricks and mortar" collateral. They are not yet ready to use energy savings as collateral. Neither the banks nor the customers are quite ready to use the estimated savings as collateral for a loan.

The participatory lending, or co-lending, program offered a solution to collateral concerns. With the federal dollars in a subordinated position, the risk to the bank was halved. Many of the banks also got a personal guarantee from the borrower. Others backed their half with a Small Business Administration (SBA) guarantee.

3. **In NH Market, Rebates and Grants Still Needed**

NH Better Buildings found that in New Hampshire's market, rebates and grants are still needed to move projects forward. On the residential side, utility HPwES programs offer significant rebates of 50% of the total project cost up to $4,000, and it did not make sense to run a competing program with lesser rebates.

For commercial projects, the program initially offered only a low-interest loan without a grant. Uptake was very, very slow. Once a grant (rebate) was added to the offering (25% of total project cost up to $150,000), clients proceeded with projects much more quickly. Grants were offered in part due to time pressures to spend all ARRA funds within the grant period. It is unclear whether a lower rebate or no-rebate program could have eventually flourished. It would have taken more time to develop in the marketplace than the original grant period offered. Anecdotally, business owners did seem to indicate that they wanted rebates, or at least wanted the fairly short term paybacks that rebates make possible, or they would not move forward.

Data and Evaluation

1. **Collection of Good Data is Difficult**

NH Better Buildings learned that collection of accurate, useful data is a difficult and time consuming process. One of the biggest keys to success is that contractors need to be willing and easily able to submit required information (data). Streamlining forms with other programs was one way NH Better Buildings tried to help in this arena. The requirement to use TREAT software provided good modeled savings data per household, but it was a more time intensive effort for many contractors, and not all of them found it to be worthwhile. Program-wide

fuel use data also proved difficult to collect, especially since many in NH use delivered fuels for heating and supplement with wood. Metered fuel utilities often have significant privacy rules and administrative difficulties in sharing large groups of customer data.

2. Undertaking Data Analysis

NH Better Buildings has undertaken an economic and financial impact analysis using data collected from the program's projects. That report, created by Seacoast Economics, LLC focused on three main objectives; quantify the economic impact of energy efficiency projects completed by the NH Better Buildings program, investigate the role of finance mechanisms 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. A copy of the Seacoast Economics report can be reviewed through this link:

Accomplishments

SOPO Task 1: Develop and Enhance Financial Mechanisms

NH Better Buildings identified four different financial mechanisms to develop during the course of the grant period. The program experienced success with all four approaches.

Utility On-Bill Financing

NH Better Buildings executed contracts with three utilities that run the state's rate-payer funded HPwES programs. Two of these utilities, Public Service of New Hampshire (PSNH) and Unitil, use on-bill financing. As part of the contract, these two utilities used Better Buildings' funds as additional capital for their on-bill lending. This innovation from their previous programs involved going to the NH Public Utilities Commission (PUC) for a change in their tariff in order to allow the utilities to expand their loan offerings when using Better Buildings' funds as capital. The maximum residential loan available increased from $7,500 to $20,000 and the maximum term increased from five years to ten years. Customers taking loans from the joint program were also allowed to finance "deep dive" measures that are not typically available through the utility HPwES programs. These "deep dive" measures included installation of pellet boilers, solar thermal hot water, geothermal systems, exterior insulation and ENERGY STAR® rated windows and doors. Customers adding these items were required to implement a base efficiency project achieving a minimum 5% savings first.

The utility partnership resulted in 193 on-bill loans totaling $1,276,164. Prior to the partnership, the utility companies estimated their average on-bill loan amount was $2,500. The average loan during the partnership was $6,612.

Financing Program - Private Loans

NH Better Buildings created two private loan financing programs with local banks and credit unions. A residential and small commercial loan product offered customers a 1% interest rate and terms up to 10 years for loans under $20,000. NH Better Buildings provided partner banks with a 50% loan loss reserve (LLR) and used an interest rate buy down (IRB) to achieve the 1% rate. Local banks and credit unions wrote 134 loans through this partnership. Total loans made with the residential product were $1,197,138 leveraging $870,731 in Better Buildings' funds in the form of LLR and IRB. Specifically, $597,775 funded the LLR and $272,957 was paid in IRB. The unspent LLR funds will return to the revolving loan fund. Thus far there have been no defaults.

NH Better Buildings also developed a commercial loan product. This was achieved as a participatory lending (co-lending) agreement with local banks and credit unions. NH Better Buildings provided one-half the capital at 0% interest, the bank provided the other half at a fair market rate negotiated with the borrower. The NH Better Buildings capital was in second place in case of default. The result was a lower-than-market blended

interest rate for the borrower. Banks used their own underwriting criteria. The NH Better Buildings portion of each repayment is returned to the revolving loan fund. In total, banks made 18 loans with this product. Total loans were $2,596,652 leveraging $1,298,326 in Better Buildings' funds.

Low Income

NH Better Buildings created partnerships with local Community Action Agencies to achieve retrofits in low-income homes in Berlin, Plymouth and Nashua. Contracts with Southern New Hampshire Services (SNHS) for $491,385 retrofitted 89 units and a contract with Tri-County Community Action Program (TCCAP) for $438,365 retrofitted 74 units. Both SNHS and TCCAP also participate in the federal Weatherization Assistance Program (WAP) administered through the NH Office of Energy and Planning, and used the Better Buildings funds in concert with their existing low-income program. In addition, Better Buildings' funds were used to address low-income homes that were above the current income limit of 200% of the Federal Poverty Guideline, but still below 363%. In Plymouth, a partnership with the NH Electric Coop and a local non-profit, the Plymouth Area Renewable Energy Initiative, achieved retrofits on 8 low-income homes for a cost to Better Buildings of $35,618. All funds for low-income partnerships were grants to upgrade the homes of low-income NH citizens.

Revolving Loan Fund

NH Better Buildings is putting returned funds from loan repayments, interest, and loan loss reserves into a revolving loan fund. This fund will serve as the basis for future program efforts described in more detail in section 7 of this report.

Financing Products	Amount	Number of Loans
Loan Loss Reserves	$597,774.85	134
Co-Lending with Banks	$1,298,326.11	18
Co-Lending with Utilities	$1,276,163.91	193
Total	**$3,172,264.87**	**345**

SOPO Task 2: Design Marketing and Outreach Program

NH Better Buildings opened three community offices in the beacon communities of Berlin, Nashua and Plymouth. A Community Manager and Technical Advisor staffed each office and served as the main points of contact for customer interaction and outreach in their respective communities. The Community Development Finance Authority (CDFA) and the community offices embarked on numerous marketing efforts, both grassroots and traditional, during the course of the project.

Staff attended community events such as fairs, farmers markets, and Chamber of Commerce meetings. In Berlin, a series of monthly "Lunch and Learn" sessions provided

the foundation to create an ever growing group of interested and informed citizens. In Plymouth, door to door business visits in partnership with the NH Retail Merchants Association and NH Division of Economic Development recruited participants for the Better Buildings' commercial program. In Nashua, an incentive structure for contractors had the implementers selling the program to their customers and bringing them to us. A marketing surge in the fall of 2011 spread coordinated messaging about the program through the three communities through newspaper, radio and online advertisements.

SOPO Task 3: Implement Program

Subtask 3.1 Cultivate Participation in Energy Program

NH Better Buildings was able to exceed program goals for both Residential Units and Commercial Square Footage retrofitted. The program had goals of retrofitting 808 residential units and 685,000 square feet of commercial space. The program achieved 810 residential units, 365 residential multi-family units (29 buildings; 366,837 square feet) and 66 commercial buildings (909,979 square feet).

Critical to the success in achieving the program goals was the statewide expansion of NH Better Buildings work outside the three original beacon communities in 2012, to partnerships with three utilities throughout their service territories and an RFP for commercial projects anywhere in the state. Lessons learned about outreach and project management in the three communities enabled successful expansion of the program statewide.

Subtask 3.2 Build Workforce Capacity

NH Better Buildings worked with a list of qualified contractors and auditors throughout the program. Contractors presented bids and quotes to their customers and the customers had the ultimate decision on which contractor they chose to work with and which measures they chose to implement. A total of 43 contractors and auditors were listed on the NH Better Buildings website by the end of the program.

NH Better Buildings also partnered with the Community College System to offer training programs for contractors. Trainings that were sponsored included TREAT auditing software training, a mentoring program for contractors needing additional field hours to qualify for the qualified contractor list, BPI certified Building Analyst and Building Installer classes, Introduction to How Buildings Work, a Realtor Workshop, and an installation workshop focused on manufactured homes. NH Better Buildings also provided scholarships to several other BPI, infrared and heating system classes offered by the Community College System.

SOPO Task 4: Develop Mentorship Program and Implement Phase II

NH Better Buildings ended up expanding to a statewide program during the course of the initial grant period. Thus the idea of establishing three new NH Better Buildings' communities after the initial grant period does not have the same basis that it did when the initial grant application was written. However, lessons learned through working with Berlin, Nashua and Plymouth were captured so that they can be used during the implementation of Phase II with the Revolving Loan Fund.

NH Better Buildings produced a series of case studies that can be used for future customers and programs to illustrate different efficiency projects done in the three communities and around the state. One of the most important lessons learned, the need for closer coordination and streamlining of efficiency programs in the state, has been highlighted by Better Buildings staff in several venues, such as meetings of the State's Energy Efficiency and Sustainable Energy Board, the National ACI conference, in energy policy discussions with other stakeholders, in discussion with utility programs and in planning for use of the revolving loan fund.

Implementation of Phase II will happen through the revolving loan fund. Through this fund, the program will have the opportunity to continue co-lending relationships developed with local banks and possibly expand coordination with utility programs that want to offer financing opportunities for their customers.

SOPO Task 5: Project Management and Reporting

The NH Office of Energy and Planning and the Community Development Finance Authority developed a comprehensive billing and reporting structure to verify completion of projects and ensure that the program was on track to meet and exceed goals for unit and square footage completions. Gathering of project information for the DOE quarterly reports and the submission of those reports provided a wealth of information on projects, costs and estimated savings.

Efforts to collect data on deliverable fuels (oil, propane, wood) have been a challenge given time and staff constraints. Lacking the ability to create a mechanism for comprehensive data gathering on delivered fuels, staff chose to do in-depth post-construction interviews and fuel data collection directly with building owners for a subset of program projects. Due to staff relationships, a high percentage of oil usage, and willingness of building owners, a number of commercial program projects in Berlin were chosen for this effort. Billing data for metered fuels (electric and natural gas) was collected whenever possible and submitted to DOE.

Challenges

1. Program Design Challenges

a. Level of Demand in Specific Geographic Areas (Beacon Communities)

During the original grant award process NH Better Buildings created estimates for the number of residential and commercial buildings that could be retrofit in each of the three Beacon Communities.

BERLIN	Residential	Commercial
Original Goal	145	21 (105,000 sq ft)
Actual Retrofits	204	19 (208,758 sq ft)

NASHUA	Residential	Commercial
Original Goal	310	70 (350,000 sq ft)
Actual Retrofits	216	20 (625,321 sq ft)

PLYMOUTH	Residential	Commercial
Original Goal	353	46 (230,000 sq ft)
Actual Retrofits	36	21 (210,520 sq ft)

Estimates for the original goals were based on retrofit goals from the state's Climate Action Plan and some general knowledge about the demographics of each community. However, as the program began to unfold, significant differences between the estimated number of projects and the actual level of demand was noticed. By fall of 2011, program administrators realized that not enough projects were coming in to meet program goals by the end of the grant period, and began planning for adjustments.

The first reason projections were likely off from actual projects is that the original estimates were based more on need than they were on existing demand, or the potential for demand, in the marketplace. Looking at the Climate Action Plan goals and making some simple assumptions based on knowledge of the three communities lead to a set of goals that were based on how many buildings the state *should* retrofit, not on an analysis of the existing market and potential for expansion. For example, in Plymouth, population included student population and many residential units were rental properties, both market segments that are less likely to proceed with energy efficiency projects. Also, many early adopters had already completed projects.

The original goals for each community were quite high. However, they were not completely out of reach. The biggest concern with meeting the original goals was having the time to build demand to the level needed in order to achieve the goal.

As with every program, there was a significant ramp-up period for NH Better Buildings. In order to achieve high numbers of retrofits in a single community, marketing messages need time to sink in and disseminate. A part of NH Better Buildings included an effort to try a variety of marketing tactics in the three communities to learn what was most effective. Because part of this process was learning what works and what does not, some tactics proved more successful than others. This type of learning by experience in a community is very valuable, and the experience gained will be used during the next phase.

Additionally, word of mouth marketing, an approach found to be very effective among neighbors in a community, becomes stronger as residents complete projects and see the results. The timeline of creating initial customer interest, getting an energy audit, determining which measures to implement, construction and then, for true results, experiencing a heating season with the improvements in place, adds up to almost a full year before a customer has experienced the entire process. With the timeframe of the Better Buildings funds, the true value of many satisfied customers driving demand in the marketplace did not have time to develop.

By the end of the program, the local NH Better Buildings offices had developed a strong presence in each community. However, given the timeframe, the program needed to expand to a wider customer base in order to meet program goals by May 2013.

In the fall of 2011, NH Better Buildings program administrators realized that the number of retrofits were not on track to meet goals by the end of the program. Staff developed and evaluated a number of approaches to increase completion numbers (units and square footage). In the end a suite of efforts, including increased marketing, addition of a grant opportunity for commercial projects and a statewide expansion for both residential and commercial, lead to success and NH ended the program exceeding both residential and commercial goals. While the three original communities did not meet the retrofit goals on their own, a significant number of projects did happen in these locations. They truly did become Beacon Communities.

b. <u>Coordinating with Other Programs</u>

One of the great benefits of NH Better Buildings projects was also one of the biggest challenges. At the time the Better Buildings program operated, there were numerous energy programs operating in the state, with a variety of funding sources including Weatherization Assistance Program (WAP), Systems Benefit Charge (SBC), American Reinvestment and Recovery Act (ARRA) and Regional Greenhouse Gas Initiative (RGGI) finds. These sources funded various programs which all operated essentially independently and were not coordinated by any single entity. For instance, on the residential side, there were the utility HPwES programs (run by four different utilities), Low-income Weatherization programs,

state rebates for solar thermal, solar electric and pellet boilers, and the Northern Forest Center Model Neighborhood program operating in Berlin, as well as the NH Better Buildings program. On the commercial side, there was a program run by the NH Retail Merchants Association, utility rebate programs (run by 4 different utilities), the Pay for Performance program, and the HUD funded Greener Homes program for large multi-family as well as the NH Better Buildings program. All of the programs mentioned had slightly different rules, requirements and paperwork.

Customers often became overwhelmed trying to determine which programs they qualified for, how to process all the required paperwork, which contractors they were able to work with, etc. As a result, one of the main roles of the NH Better Buildings community staff became to streamline coordination with all of these other programs. Staff was able to fill this role well, because of a program structure that had dedicated staff in three communities. However, the time spent doing this coordination work took away from time that staff originally thought would be spent on marketing, outreach and other efforts at building demand in the communities.

NH Better Buildings' staff was able to build good relationships with the program staff from other programs and tried to structure relationships in a way that left customers and contractors dealing with as few entities as possible. However, programs were not able to be completely combined. This was most often noticeable on the commercial projects when trying to determine rebate and energy savings levels (i.e. Should rebates be subtracted from other programs when determining project costs? Which rebate gets paid first? Who gets to count energy savings?). Each program wanted to cooperate, but also had to meet its own deadlines and goals in terms of spending funds and generating energy savings.

A lesson learned through this process is that new programs or funding sources need to take the time to fully understand other programs operating in the marketplace and to develop from the start in a way that builds on and coordinates with what already exists.

c. <u>Streamlining Processes and Reporting</u>

For NH Better Buildings, a relatively small program with limited funds and timeframe, development of a significant computer-based customer service and reporting database system did not seem to be the best use of time and funds. Thus NH Better Buildings relied on paper forms from customers and contractors to collect project information and used the DOE quarterly reporting spreadsheet and some internally created project spreadsheets to keep track of customers and projects. This process worked well when the program had a relatively small number of projects, but became unwieldy as the number of projects and customers grew. Given this insight, if a large number of projects are anticipated through the RLF, then a database tracking system should be employed.

Project management and tracking relied heavily on the community staff knowing their customers, contractors, and where projects were in the process. Very capable staff provided project tracking which led to strong relationships between the staff and customers. However, because the process relied so heavily on knowledge of individual people it created some difficulties if a new person had to step in on a project and get up to speed quickly, and in scaling up to higher project numbers. Additionally, because staff was so involved in projects, customers began to assume they were the go-to people for almost everything, even other programs over which staff had no control.

One advantage to partnering with the utility HPwES programs for residential projects was that they had an existing customer and project database. Their HPwES program had been operating in the state for several years and had developed a database system that stores customer information, tracks projects, and integrates with auditing software and tracks measures, energy savings and project costs. In some respects, having the utilities use their existing program and process to service NH Better Buildings' residential customers solved a lot of the process and reporting concerns.

On the other hand, integrating the utility database with Better Buildings' reporting was an extremely time intensive and manual process. While the utility database did include most of the data points requested by Better Buildings' quarterly reports, it was not set up to match precisely with the reporting spreadsheet. Every quarterly report required utilities to run a query from their database and then spend hours manually reformatting the data to match the fields of the DOE spreadsheet. NH Better Buildings' staff would then spend additional hours adding more information and trying to re-format dropdown menus and other particulars from the Better Buildings reporting spreadsheet. The high degree of manual manipulation required meant an increased chance for errors. It was possible to do this work for the one year contract period between NH Better Buildings and the utilities, but it would not have been sustainable over a longer period of time.

For future programs it would probably work best to find a way to accept data and reports being produced by existing programs, rather than trying to create brand new processes or heavily manipulate the existing ones.

2. Challenges to Sustainability

a. Market Desire for Rebates

One of the biggest challenges to sustainability is funding used for rebates (grants) that does not revolve back into the program. In NH, the need to use rebates and grants to drive customer action was high. There may be a number of factors

contributing to this customer mindset. NH Better Buildings happened during a time period where ARRA funds were being dispersed throughout the state through a wide variety of programs. The overall expectation that there should be grants or rebates available for projects was high. For commercial projects, the state had also been running RGGI funded grant programs for a few years before the start of Better Buildings. Residential customers had the HPwES Program, which during the NH Better Buildings time period offered a 50% rebate, but previously had offered an even higher 75% rebate. With the addition of the economic downturn, the market was primed to demand rebates, not just loans, and that is exactly what happened.

On the residential side, NH Better Buildings started offering a relatively modest rebate of $250 to help cover the cost of an audit and a second rebate, scaled from $250-$750 based on estimated energy savings, for implementation. NH Better Buildings also offered a 1% residential loan. However, almost all Better Buildings customers also had access to the utility programs, which offered 50% rebates for eligible measures up to $4,000 per home and some offered on-bill financing at 0%. Not surprisingly, the customers preferred the higher rebates and 0% financing. As discussed elsewhere in this report, NH Better Buildings was able to partner with these utility programs and came to an agreement where Better Buildings provided half the rebate dollars and all of the loan capital for projects done through the partnership. The arrangement allowed the program to meet its retrofit and spending goals and to loan out just under $1.3 million dollars that would return to the revolving loan fund for program sustainability. However, the loans were at 0% so there was no program income and an average of $1,288 of NH Better Buildings funds were spent on rebates per project.

For commercial projects, NH Better Buildings started out offering a low interest loan product, with no rebate. Initial commercial uptake was very slow, almost non-existent. With the program end looming and commercial dollars unspent, NH Better Buildings needed a plan to ensure that the program would meet the retrofit and spending goals by May 2013. That plan included covering the cost of the audit 50% up front and 50% if the project moved forward, and a 25% grant toward project implementation costs. The downside to this approach is that it likely over-incentivized the market. The upside was that staff was reasonably certain it would bring in enough projects to meet other goals, and it did.

As Better Buildings ends, the market in NH still seems to require grants and rebates to make projects move. The data analysis done for NH Better Buildings indicates that payback is one of the most important determinants of whether a project will move forward. Rebates and grants are still the surest way to reduce a project’s payback period. When thinking about sustainable programing for future use of the federal revolving loan funds, CDFA and OEP need to look at partnering with other steady sources of funding in the state that provide the rebate dollars the market seems to require. State and program leaders need to think about an overall

plan for whether and how it makes sense to start lessening the overall market reliance on rebate and grant programs.

b. Bank Interest in Lending

NH Better Buildings created strong relationships with a number of local banks and credit unions. Using NH Better Buildings' interest rate buy-downs (IRB) and loan loss reserves (LLR), these institutions made numerous loans and have had no defaults to date. A series of conversations with banks at the end of the program led to the following insights. For all of the residential loans, banks felt the IRB was a key component in attracting customers. Their own loan products do not include a low-interest product, and there did not seem to be much desire for creating one. Some banks felt the residential loan loss reserve was critical, because energy loans are typically unsecured. Others felt that it was not so critical because they were maintaining high underwriting standards for the loans anyway.

On the commercial side, banks still want to see "bricks and mortar" collateral. They are not yet ready to use energy savings as collateral. Both the banks, and in some case the customers, indicated a skepticism of the estimated dollar savings for the projects. They agreed there should be dollar savings, but were not certain enough to include the savings when doing underwriting.

c. Supporting a Program Income

Because rebates or grants are still necessary to drive demand, and technical assistance is necessary to ensure customers move from audit to retrofit installation, program income will be a key factor in ensuring long term sustainability. Methods such as instituting a fee for technical assistance or implementing an interest rate to generate program income have been discussed. Given program deadlines, neither method was fully tested.

Program Sustainability Plans

Several groups in NH have conducted surveys and research amongst citizens, municipal leaders and business owners. Overarching themes related to barriers, issues, and concerns in the energy efficiency marketplace often stated are:

- Program longevity – energy efficiency programs need to be sustainable and available long term. A program that starts and stops, changes eligibility requirements, and frequently modifies its benefits or runs out of funding further contributes to the uncertainty.
- Single source of information – information on energy programs is hard to find and there is no single, trustworthy source for such information
- Competing energy programs – multiple programs with varying eligibility requirements and lack of program coordination adds to market confusion and frustration. Further, sometimes multiple programs may result in combined benefits while other times consumers must determine which single program provides them the best value. This leads to lower participation rates because the effort to proceed may be high.
- Grants/rebates "needed" - continued need for rebates (at least for now) to reduce the payback period

For these reasons, the NH Better Buildings program must ensure it collaborates with other efficiency programs in the NH marketplace while controlling administrative costs and developing a method for earning income to insure the program's future sustainability.

All NH Better Buildings' funds are currently under contract with commercial and residential clients. Residential loans have a maximum 10-year term and based on the amount lent, the program expects loan repayments of approximately $220,000 annually for the next three to four years with the amount declining as smaller, shorter term, utility loans are fully paid. Because the majority of these loans were written through the NH Better Buildings and utility partnership, which offered interest-free loans, program income is minimal. Commercial loans have longer terms of 10 – 30 years and the estimated repayments are $160,000 annually.

Currently, the value of the revolving loan fund is minimal; therefore, NH Better Buildings will build the revolving fund's capital in 2014 through loan repayments and interest. Staff will use this year to further develop a loan program that has minimal administrative overhead and addresses the market concerns previously listed.

Commercial Program:

Further development of a participatory lending (co-lending) model would continue to create similar economic and energy savings benefits realized during the program's ARRA phase. Based on recognized market transformation, a minimal interest rate may

be charged on loans. The program income (interest and possibly a program fee) could be used to manage the lending program, supporting staff efforts including project oversight and inspections. The benefits of focusing on commercial projects are that these projects tend to request large loans, which in turn leads to fewer projects; however, the project management costs remain high due to Federal requirements such as the Davis Bacon Act and Buy American. These two regulations require significant staff time and reporting, which leads to increased overhead costs.

As part of the ARRA State Energy Program (ARRA-SEP), OEP and CDFA established an Enterprise Energy Fund (EEF). This revolving loan fund provides low interest loans to non-profit businesses, commercial businesses, and municipalities for energy efficiency and renewable energy projects. An observation stated in the introduction of this section highlighted a barrier that New Hampshire continues to face – having multiple programs serving the same or overlapping client base is confusing to the market, and leads to questions such as: Do the programs work together? Can a business combine incentives? So as to not perpetuate this market confusion by offering multiple programs to the same sector, NH Better Buildings may decide instead to only serve the residential sector through its revolving loan fund.

Residential Program:

To build upon NH Better Buildings' successful collaboration with the utility HPwES programs, utilizing the revolving loan fund to support a residential efficiency program is a viable option. The HPwES program is a recognizable "brand" of which residential customers are aware and familiar. The utilities have established program requirements, processes, installer networks and implementation standards including the measurement and verification of results. All of which lead to program consistency and customer satisfaction. Marketing efforts could also be combined, resulting in reduced program administrative costs.

One obstacle the utility-run HPwES program currently faces is limited funding, as the program is primarily funded through the Systems Benefit Charge (SBC) and Regional Greenhouse Gas Initiative. Consumer demand for loans is high and in the past the program has run out of funds for retrofit rebates and financing prior to the end of each program year.

The NH Better Buildings program proved that access to easy, low-cost, financing is essential for market transformation and program success. Through the NH Better Buildings' partnership with the utilities, the HPwES on-bill financing option was very well received by residential customers. Understanding the need for "easy" financing, the utilities are beginning to research other financing options, such as partnering with banks for additional capital and loan administration.

How can NH Better Buildings continue this successful partnership by leveraging the revolving loan fund with utility and private capital? One method involves a co-lending agreement between a private bank, the utility and NH Better Buildings where the bank

provides 50% of the loan at an agreed upon rate and NH Better Buildings provides the balance at a below-market rate (0% - 3%), with a resulting blended rate that is below market. If the utility chooses, they could further buy down the interest rate. A second option is to provide the revolving loan fund as a loan loss reserve to increase the bank's lending ability to HPwES customers.

Recently the NH Public Utilities Commission provided approval to two NH utilities to pilot a new private/public financing program whereby private banks provide loan capital at a negotiated interest rate and the utility then buys down the interest rate to 2%. Assuming a successful pilot, NH Better Buildings' revolving loan fund could be leveraged to fully implement and expand the pilot program. NH Better Buildings could accomplish this in one of two ways: co-lending or loan loss reserve. The co-lending option could be structured (include an interest rate) to cover administrative costs. However, given the projected annual balance in the revolving loan fund, the number of loans written under the combined program would be limited to approximately 100 per year (based on projected annual fund balance and an average loan of $2,500). If the HPwES program instead needs to expand its overall lending capacity, then using the revolving loan fund as leverage to increase private investment in energy efficiency lending may better serve the residential market.

Next Steps:

During 2014, staff will monitor the utility pilot program and demand for energy efficiency loan products. Meetings with the utilities, local banks and credit unions will be scheduled to discuss the various options defined above. The State of New Hampshire, led by OEP, is also currently undertaking development of a new State Energy Strategy as well as an investigation of an Energy Efficiency Resource Standard. Overall goals for efficiency programs may be incorporated into planning efforts. Based on information gathered and market trends, a program for the revolving loan fund will be fully defined.

Verification of Data

DOE will provide a summary of data for NH Better Buildings program in March 2013. The Dashboard summary report highlights program funding, design, financing and incentive products and results, workforce development, and upgrade and energy savings data.

In addition to the dashboard report, data collected during the NH Better Buildings program was analyzed by Seacoast Economics, LLC. This study provided data analysis in the following areas:

- Economic impact of energy efficiency projects completed by NH Better Buildings
- Role of finance mechanisms (loans, grants, and rebates) in driving project adoption for residential and commercial energy efficiency projects
- Summary of lessons learned that may be useful in the design of future energy efficiency programs

Developed Products

No specific products were developed as part of the NH Better Buildings program; however, during the program period cases studies, economic analysis and presentations were created. Including:

- NH Better Buildings Case Studies
- An Economic Evaluation of NH Better Buildings Program by Seacoast Economics, LLC
- Blended Programs: A NH Better Buildings and Home Performance Case Study – Presentation at the ACI – Better Buildings Conference in Denver

In addition, a webpage devoted to the NH Better Buildings program is accessible from the State of New Hampshire's Office of Energy and Planning website. The webpage includes links to the aforementioned materials.

Submission

In addition to the items requested above, any other addenda related to your Better Buildings Neighborhood Program award are also welcome.

DOE recommends that you submit a DRAFT of your final report to your Better Buildings Neighborhood Program account manager, project monitor, and project officer 30 days prior to final submission to ensure that the final submission will be accepted.

Electronic Submission: The Final Technical report must be submitted electronically-via the DOE Energy Link system (E-link) accessed at http://www.osti.gov/elink-2413

Electronic Format: Reports must be submitted in the Adobe Portable Document Format (PDF) and be one integrated PDF file that contains all text, tables, diagrams, photographs, schematic, graphs and charts. Materials such as prints, videos, and books that are essential to the report but cannot be submitted electronically should be sent to the Contracting Officer at the address listed in Block 12 of the Notice of Financial Assistance Award.

Submittal Form: The report must be accompanied by a completed version of DOE Form 241.3, "U.S. Department of Energy (DOE), Announcement of Scientific and Technical Information (STI)". You can complete, upload and submit the DOE F.241.3 online via E-Link.

Case studies for BetterBuildings NH

Statewide results at a glace

Residential Units	829
Commercial Buildings	69
Commercial Sq ft	1,276,816
Total Audit Cost	$664,260
Total Project Cost	$14,416,570
Total Loans Made	$5,195,453
$$ Savings	$1,155,492
Electric Savings (kwh)	2,447,158
Gas Savings	221,119
Gallons Saved (oil, propane, kersene)	178,459
Leverage	$9,378,544

Participating commerical lenders

Merrimack County Savings Bank
The Nashua Bank
Northway Bank
Guardian Angel Credit Union
Laconia Savings Bank
Northway Bank
Woodlands Credit Union
Woodsville Guaranty Savings Bank
Laconia Savings Bank
Woodlands Credit Union
Northway Bank

The BetterBuildings NH program was funded by the American Recovery and Reinvestment Act (ARRA) through the United States Department of Energy and administered by the New Hampshire Office of Energy and Planning. BetterBuildings was operated in New Hampshire by the Community Development Finance Authority. A three-year demonstration project, it operated between 2010 and 2013.

The goal of the program was to provide residential homeowners and business owners resources for conducting deep energy retrofits to their buildings, with goals of 20%-30% savings. The program operated within the boundaries of Nashua, Plymouth, and Berlin (eventually, assistance was offered statewide). City representatives, as well as local advisory boards, were active stakeholders in the effort.

BetterBuildings community managers worked with participants by helping them obtain energy audits for their home, office, or store. Staff helped analyze the audit results and suggest improvement measures. Participants then selected private-sector energy contractors, certified by BetterBuildings, to implement upgrades. Participants selected only the measures that fit their needs, building use, and budget.

A number of options were available for financing audits and construction work. BetterBuildings offered some grants money and rebates to incentivize interest. Partners, such as the Retail Merchants Association, also offered rebates to supplement financing. Working with area banks and credit unions, BetterBuildings bought down interest rates to help create commercial lending products to qualified buyers.

BetterBuildings implemented a varied marketing campaign to build brand awareness and create demand in the three communities. Efforts included radio, print, transit, and online advertising; event sponsorships; direct mail; local event sponsorships; energy work giveaways; workshops; and social media outreach.

BetterBuildings also acted as a friend to additional energy-related programs. Among these include the Berlin Model Neighborhood Project, the Plymouth Area Renewable Energy Initiative, and several workforce development efforts to train the next generation of energy professionals.

As the program progressed, BetterBuildings partnered with PSNH, Unitil, and the NH Electric Co-op to leverage the benefits of each other's efficiency programs. This resulted in greater market penetration than BetterBuildings could have achieved on its own.

At the end of the three-year demonstration project, BetterBuildings NH had exceeded its goal by facilitating the energy upgrade of more than 800 residential projects and 1,000,000 square-feet of commercial space. Best practices learned from BetterBuildings NH will inform future energy efficiency initiatives in New Hampshire going forward.

Getting the power of efficiency

Alphagraphics
97 Main Street
Nashua

project at a glance

Completion date	2/25/13
Building age	Early 1900's
Square footage	24,000 sq ft
Construction	brick masonry walls
Number of floors	3

Project cost (pre-rebate)	$30,385
BetterBuildings rebate	$4,673
BetterBuildings 1% loan	$16,712
BetterBuildings partner rebates	$10,519
Projected energy savings	15.6%
Estimated annual gas savings	1,183 therms
Estimated annual electricity savings	29,913 kWh

Open since 1989, Alphagraphics is a full service printing company in Nashua, NH. David Orpin owns the company and the 3-story, 29,000 square foot building which it shares with three other businesses. David was in the process of a lighting upgrade when he learned about BetterBuildings and got a free energy analysis for the building.

The audit estimated improved insulation, airsealing and upgrades in the heating/cooling system that would achieve significant gas and electric savings. Air sealing and insulation reduce gas space heating costs in winter and electric cooling costs during the summer. Updated rooftop heating and cooling equipment also result in gas and electric savings from reduced fuel use and improved blower efficiencies.

BetterBuildings worked directly with David through the entire process from reviewing the energy audit; discussing the scope of work; outlining potential rebates, incentives, and financing options; choosing contractors, and inspecting their work.

An insulation crew used spray foam to seal a huge number of penetrations in the attic floor due to ductwork, old repairs, and the guywires supporting the plaster floor. Ductwork located in the attic was sealed and then insulated and 14" of cellulose was blown in. On the roof two new heating and cooling units were installed.

David has noted reduced electricity use. A comparison of electric bills from October to April with the same period from the previous two years shows over 28% reduction in electricity use. While reductions in natural gas use are also expected, electricity accounts for 74% of the total energy used by Alphagraphics and 83% of the total energy cost. So reductions in electricity will have the greatest impact on David's savings.

Printing presses use lots of power, but BetterBuildings found other ways for Alphagraphics to conserve energy.

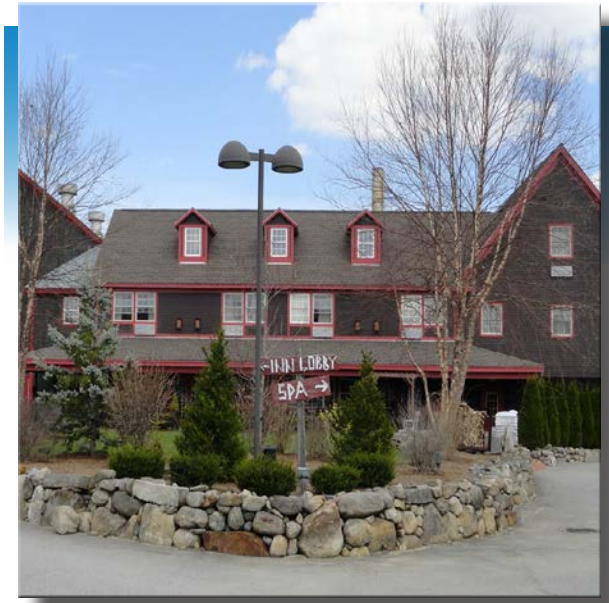
WORK DONE

- Conducted attic air sealing
- Insulated attic with blown cellulose to R-50
- Applied weather stripping to doors
- Sealed and insulated attic ductwork
- Replaced two rooftop heating/cooling units with higher efficiency units

BETTER BUILDINGS
A NH BEACON COMMUNITIES PROJECT

NEW HAMPSHIRE OEP OFFICE OF ENERGY AND PLANNING

CDFA



Taking some uncommon measures

The Common Man Inn

231 Main Street
Plymouth

Alex Ray is a progressive corporate citizen who really lives the company motto "doing well, by doing good." Alex upped the ante by undergoing energy efficiency improvement projects in three of his hospitality properties, including the Common Man Inn and Spa in Plymouth.

This former wood mill was brought back to life in 2001 to become the destination event facility that it is today. But operating a hotel, restaurant, and spa in a turn-of-the-century building still came with certain inefficiencies.

Working with BetterBuildings partners, including the NH Electric Co-op, the Retail Merchants Association, and Energy Efficiency Investments, the work scope focused on measures that were automated and would not increase the workload for employees: things like lighting, pumps and motors and ventilation, room occupancy sensors, and a top of the line efficient commercial washing machine and dryer. One of the biggest investments was a new high-efficiency pellet boiler, complete with a one ton hopper to feed it.

Even with the breadth of the project, the energy measures will save the property nearly $15,000 a year in operating costs. At that rate, it will pay for itself in just over four years. That's a return on investment that would be - otherwise - uncommon.

This wood pellet boiler has the power to heat the entire Common Man Inn and Spa, and provide a good return on investment.

project at a glance

Completion date	1/20/12
Building age	1900
Square footage	113,288 sq ft
Construction	former wood mill
Number of floors	2

Project cost (pre-rebate)	$119,736
BetterBuildings rebate	$26,558
BetterBuildings co-loan	$61,448
BetterBuildings partner rebates	$31,553
Projected energy savings	17%
Estimated annual oil savings	1,904 gallons
Estimated annual electricity savings	127,455 kWh

WORK DONE

- Installed wood pellet boiler with one ton hopper
- Installed room occupancy controls for three conference spaces
- Installed supply fan with ducted make up air for kitchen exhaust
- Installed ECM pumps
- Implemented interior lighting improvements
- Replaced 2 commercial energy efficient 30lb washing machines
- Installed spa area lighting upgrade
- Installed ventilation controls for kitchen exhaust hood

BETTER BUILDINGS
A NH BEACON COMMUNITIES PROJECT

NEW HAMPSHIRE OEP OFFICE OF ENERGY AND PLANNING

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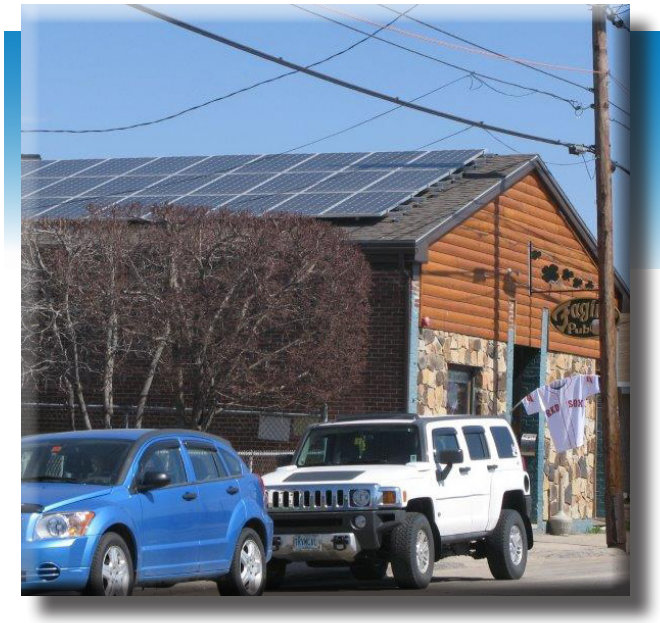

From the ashes, a better building

Fagin's Pub
777 Main Street
Berlin

project at a glance

Completion date	02/04/13
Building age	reconstructed 2010
Square footage	3,000 sq ft
Construction	brick
Number of floors	1

Project cost (pre-rebate)	$63,670
BetterBuildings rebate	$15,918
BetterBuildings co-loan	$35,070
BetterBuildings partner rebates	$15,392
Projected energy savings	20%
Estimated annual oil savings	393 gallons
Estimated annual electricity savings	14,918 kWh

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A NH BEACON COMMUNITIES PROJECT

NEW HAMPSHIRE OEP OFFICE OF ENERGY AND PLANNING

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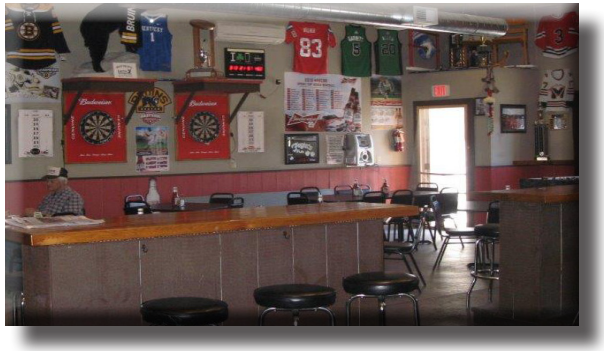
Fagin's Pub is truly the place where everybody knows your name! It's the favorite watering hole for the local fire and police departments. The building suffered extensive fire damage years ago and was rebuilt mostly by the patrons helping to keep the cost affordable. Unfortunately, money and energy efficient knowledge was in short supply. So they rebuilt on a shoe string budget, skimping on the insulation and the heating system. The original building had a second floor, but the idea to rebuild was too costly; rental space and some income was lost.

Shawn Fagin purchased the business on Jan 31, 2007 and opened his doors for a New Year's Eve Bash that same night. As any small business owner knows, "every cost item comes right out of your pocket." Business was very tight; cost, service and profit was always top of Shawn's mind.

When BetterBuildings explain to Shawn the grants available, he jumped on the idea of reducing his electric cost. He enjoying the idea of providing air conditioning to his favorite people: his patrons. Everything but the cook stove was run by electricity, so lowering his electric cost was Berlin BetterBuildings' main focus.

Insulating the building and installing LED lighting with a new furnace and duct work was standard fair. A highlight of this project was the Solar Electric Generating (PV) panels. After their first winter season, Fagin's Pub had reduced their electric bill by 50% and anticipate electricity costs in the summer will be a zero. Shawn admits before he was not very "green." But now he is now saving some real green: cash green.



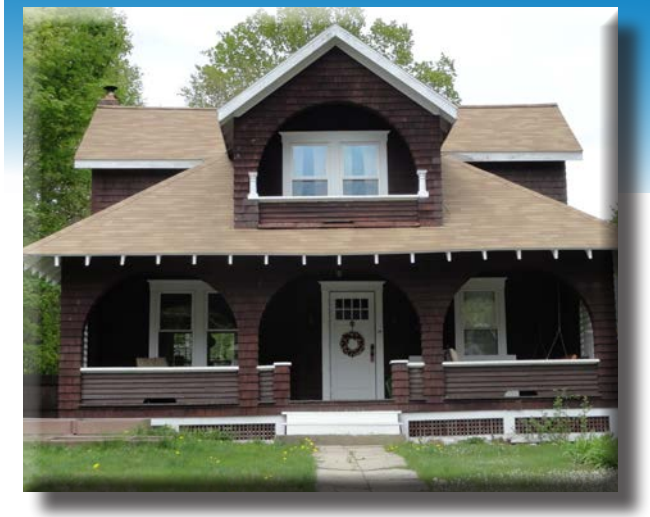
Just getting Fagin's Pub rebuilt after the fire was the priority. It wasn't until BetterBuildings' energy retrofits were put in place that anyone recognized their benefits.

WORK DONE

- Installed PV solar panels for electricity generation
- Installed a new heating and air conditioning system
- Shored up the basement with spray foam insulation

Buttoning up a home to make it cozy

Jennifer Reed
14 Wentworth Street
Plymouth



project at a glance

Completion date	3/28/13
Building age	1920
Square footage	2,940 sq ft
Construction	2 x 4
Number of floors	2

Project cost (pre-rebate)	$4,465
BetterBuildings rebate	$1,917
BetterBuildings 1% loan	n/a
BetterBuildings partner rebates	$2,448
Projected energy savings	29%
Estimated annual oil savings	144 gallons
Estimated annual hardwood savings	one cord

Jennifer Reed of Plymouth wasn't sure what to expect when she attended a Button Up NH workshop at the library one night. She certainly didn't expect to win up to $2,000 towards an energy improvement project in her home. When her name was drawn, after letting out a big "Yes!" she looked towards the workshop host and said, "I'm going to start the paperwork tomorrow!"

Jenny had recently moved into her home and during the first heating season in her home noticed what she refered to as "a vortex of cold air" that rose up from her basement. She heated her home with a combination of oil and wood from a stove.

Home Energy Contractor Bill Newell of Newell and Crathern was able to complete the project (from energy audit to implementation) in just 3 short weeks. The work that Bill and his crew did at the Reed house focused on adding insulation to the attic and basement and air sealing the housing envelope.

The first morning after the project was completed, Jenny noticed the difference right away. "Because they completely sealed the basement and eliminated the vortex of cold air, I walked around without my slippers, sweatshirt, and quilted vest on. A miracle! " she exclaimed.

The upgrades should save Jenny at least $800 a year and save the environment about 4,500 pounds of carbon dioxide. The work was projected to pay for itself in 2½ years, but - thanks to the Button Up grant - it was even faster. "All I paid for was a new basement door, $120.00," she said. "Unbelievable!"

Homeowners who worked with BetterBuildings (like Bev Newton, above) received financial and technical guidance to ensure the project best suited their home and their wallets.

WORK DONE

- Attic insulation – blown in cellulose to R-50
- Air sealing – dam and seal attic entrance, air seal 6 basement windows, air seal doors, and attic eaves
- Basement insulation closed cell spray foam where floor cantilevers over back and under front dormer area over porch

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A NH BEACON COMMUNITIES PROJECT

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A case of form following function

Coliseum Senior Residence

7 Coliseum Avenue
Nashua

project at a glance

Completion date	11/16/12
Building age	1980
Square footage	77,000 sq ft
Construction	concrete block
Number of floors	5

Project cost (pre-rebate):	$293,165
BetterBuildings rebate:	$73,291
BetterBuildings co-loan	n/a
BetterBuildings partner rebates:	$24,224
Projected energy savings:	9%
Estimated annual gas savings	1,690 therms
Estimated annual electricity savings	134,363 kWh

BETTER BUILDINGS
A NH BEACON COMMUNITIES PROJECT

Coliseum Senior Residence is a 77,000 sq. ft. building with over 100 apartment units. Following the addition of a new wing in early 2012, the owners decided to complete an energy upgrade on the older section.

With funding from NH BetterBuildings and NHHFA's Greener Homes Program, owners implemented all of the recommendations provided in the energy audit report.

Each apartment had a wall-mounted air conditioning unit. The sleeves around these units leaked in the summer and winter, to the point that tenants were using blankets around them. Custom covers for these A/C sleeves air sealed and insulated these areas using ridged foam and weatherstripping in a custom made box. These boxes are removable and come with a finished oak top so they can be used as an end table whether sitting over the A/C unit or placed somewhere else in the summer.

The double pane windows were in poor condition and difficult for older tenants to operate. Some couldn't shut them completely, leading to significant air infiltration. Efficient new windows with airsealed frames greatly improved comfort and savings year round.

Other improvements included Energy Star clothes washers and refrigerators, lighting upgrades in the units and in the hallways, and low-flow devices for sinks and showers.

Together, these improvements are expected to generate savings of almost $18,000 per year for the facility in addition to important improvements in tenant comfort.

To seal air leaks from mounted A/C units, contractors installed custom covers that could double as end tables.

WORK DONE

- Fabricated custom A/C covers
- Installed new windows
- Replaced in-unit lighting
- Upgraded hallway lighting
- Stairwell lighting replacement
- Installed Energy Star washing machines and refrigerators
- Installed low flow faucet aerators and showerheads

Saving a business through efficiency

Middle Earth
95 Main Street
Berlin

project at a glance

Completion date	1/18/13
Building age	1910
Square footage	4,960 sq ft
Construction	brick w/flat roof
Number of floors	2

Project cost (pre-rebate)	$54,806
BetterBuildings rebate	$13,701
BetterBuildings 1% loan	$19,999
BetterBuildings partner rebates	$10,961
Projected energy savings	15.5%
Estimated annual oil savings	450 gallons
Estimated annual electricity savings	4,259 kWh

BETTER BUILDINGS
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Dick Poulin's store, Middle Earth, desperately needed energy improvements. Their oil consumption was so high they were getting oil deliveries bi-weekly. The economic conditions in Berlin were nearly as cold as its winters. Sales at Middle Earth were down; the cost of heat was up. Cash flow was limited and he was running out of money to keep the building open. Something had to give.

Recognizing he needed help fast, Berlin BetterBuildings staff convinced Dick to apply to the program and helped him identify additional grants from partners to defray his costs. An analysis of the building quickly identified areas in which his 100 year old structure could be upgraded to improve comfort and operating costs.

Energy professionals sealed the building envelope with a combination of spray and ridged insulation. An upgrade of all the lighting cut down on the power use. But key to the successful retrofit was the replacement of the antiquated oil furnace with a high-efficiency pellet boiler. The system was installed with a hopper large enough to hold three-tons of pellets, minimizing the effort required to keep the boiler fed.

Now during the cold Berlin winters, Dick's employees say their workspace is very comfortable. The building only requires one delivery of pellets for the season, instead of heating oil deliveries every other week. Most importantly, the reduced operating costs have helped Dick balance the books. Thanks to BetterBuildings, he's able to keep his business alive.

Realizing the savings from a comprehensive energy retrofit has made the difference between red ink or black.

WORK DONE

- Installed vacuum pellet boiler with 3 ton storage
- Installed spray foam insulation in the basement and rear walls
- Installed 4" ridgid insulation on roof
- Replaced all T-12 light bulbs with T-8 bulbs and ballasts
- Installed TPO roof membrane on the flat roof

No more frozen soil on the shelf

Nashua Farmers' Exchange

38½ Bridge Street
Nashua

The Nashua Farmers' Exchange is a retail feed and farm store located in a Civil War era train depot that served the Concord and Nashua & Lowell Railroads. The project renovated the retail portion of the building to create a well-insulated and efficiently heated and cooled space.

While the building retained some of its original trusses and framework, changes over the years hid many of these features and left the building with poorly functioning insulation, air barriers, and heating system. Owner Gene Harrington explained that bags of soil along the floor of the exterior wall would freeze even while the thermostats a few feet above would reach 68° and shut off.

A worn, suspended ceiling was removed along with an upper ceiling requiring asbestos abatement. A drywall ceiling was added at almost 10 feet high, exposing the bottoms of the original timber trusses and creating much more headroom. Loose fill cellulose insulation was blown into the new attic space to an R-50. The interior walls of the building were completely gutted, dense packed with cellulose and covered in vapor barrier before drywall and a faux posts cut from large beams found during ceiling demolition were added as accents.

An unsightly and inefficient gas furnace in direct view of shoppers was replaced with a high efficiency gas furnace. Old fluorescent T-12 lighting was replaced with high performance T-8 lamps.

The results are a more beautiful and more comfortable store. With the upgrade of large south facing single pane windows to Thermopane glazing, Gene noticed there is enough solar heat gain and insulation to keep the furnace from firing much at all in winter. They immediately saved 84% in heating costs. Those energy savings can mean a lot to any business's bottom line.

project at a glance

Completion date	11/28/12
Building age	Late 1800s
Square footage	1,450 sq ft
Construction	post & beam
Number of floors	1

Project cost (pre-rebate)	$110,863
BetterBuildings rebate	$27,249
BetterBuildings co-loan	$62,796
BetterBuildings partner rebates	$23,639
Projected energy savings	47%
Estimated annual gas savings	826 therms
Estimated annual electricity savings	3,342 kWh

US Senator Jeanne Shaheen toured the Nashua Farmers' Exchange, and cited the BetterBuildings project as a model for energy efficiency best practices.

WORK DONE

- New raised ceiling with R-50 cellulose
- Replaced existing interior walls with dense pack cellulose, vapor barrier, and drywall.
- Replaced old front door and rear swinging doors
- Sprayed 4" closed cell foam under floor
- Installed high efficiency gas furnace with 4 ton heat pump and new ductwork
- Replaced front glass with Thermopane storefront glazing
- Upgraded light fixtures with high performance T-8s
- Installed programmable thermostat
- Demo'ed dropped ceiling and asbestos abatement

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Everything you want - and more!

Rand's Hardware
71 Main Street
Plymouth

project at a glance

Completion date	3/5/13
Building age	1922
Square footage	21,920 sq ft
Construction	wood frame; brick
Number of floors	2

Project cost (pre-rebate)	$67,500
BetterBuildings rebate	$16,875
BetterBuildings co-loan	$24,224
BetterBuildings partner rebates	$24,105
Projected energy savings	42%
Estimated annual oil savings	1,889 gallons
Estimated annual electricity savings	4,104 kWh

BETTER BUILDINGS
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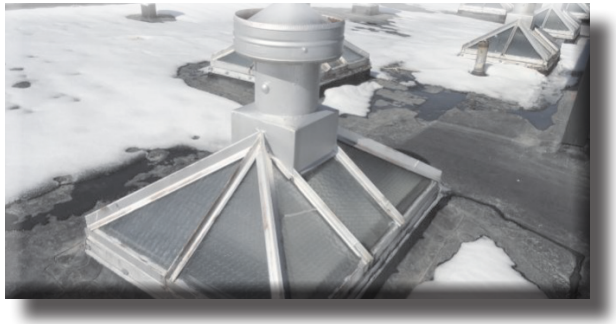
Steve Rand came to Plymouth BetterBuildings with a plan. He wanted to install a solar hot water system for his commerical multi-use building on Main Street. However, an energy analysis from the Plymouth Area Renewable Energy Initiative (PAREI) revealed additional opportunities for energy savings.

After taking a closer look at the property, which included a hardware store, offices, and some apartments, the team found some inefficiencies with the building envelope. They recommended beefing up the insulation in the attic and getting a better seal around the building's distinctive skylights. They also told Steve there could be additional electrical savings if he upgraded the lighting.

BetterBuildings worked with its partners to get Steve additional resources to defray some of the costs. The project received grants from BetterBuildings, the Retail Merchants Association, New Hampshire Electric Cooperative, and the State of New Hampshire.

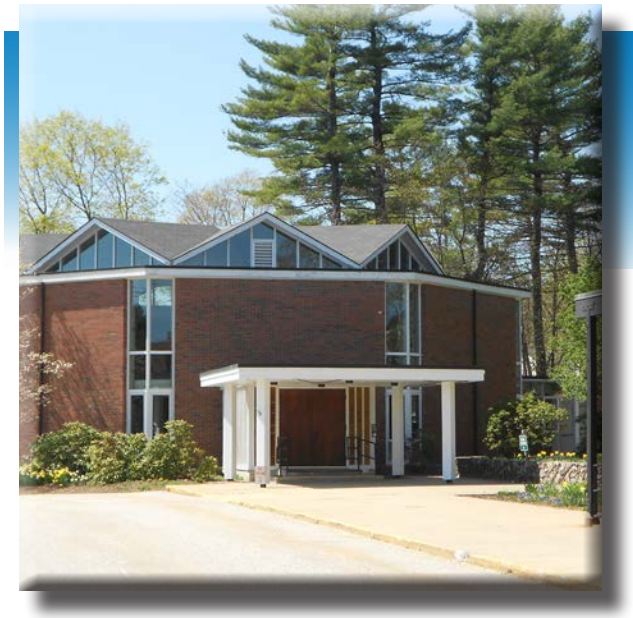
Thanks to these additional upgrades, the building was more comfortable and efficient in the short term, and in the long term, the project will pay for itself in seven years. Steve Rand was able to get everything he wanted – and more!



Steve Rand came to BetterBuildings thinking about one energy-saving measure. The staff was able to demonstrate the benefits of doing even more.

WORK DONE

- Installed attic insulation, upper and lower roof
- Installed a solar hot water system
- Implemented lighting improvements
- Insulated panel for skylights



Comfort so good you can hear it

Unitarian Universialist Church

274 Pleasant Street
Concord

The Unitarian Universalist Church is an historic architect designed structure built in 1960. The property is on the historic register and therefore presented some challenges. It's a one story brick and glass building. The heating system was old and very costly to operate. The structure has several glass walls in addition to many transom windows. At the initial facilities committee meeting it was clear that the comfort of the communicants was a high priority. The sanctuary was unusable in the summer and services had to be held in the activity hall. To remedy this, new windows and a new air handling unit were installed. This dramatically increased the ventilation to the sanctuary making it more comfortable for services in the summertime.

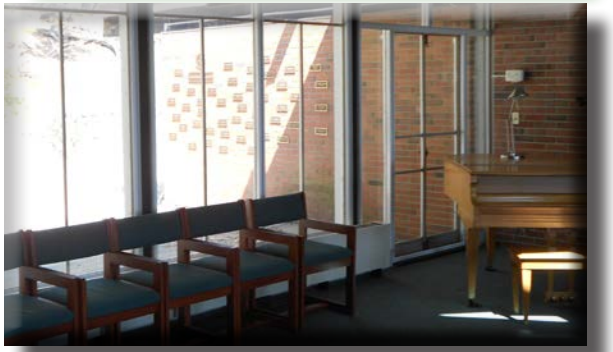
The heating system was replaced with a new more efficient hydronic heating system with zones to enable church members to adjust the heat in each area according to use.

The banks of windows represent the "inside/outside" feel that the architect was trying to convey in concert with the Unitarian philosophy. But they were are old and prone to drafts. Several of the transom windows were replaced and others were equipped with magnetic storms to reduce heat loss and increase comfort. Several heat recovery ventilators were installed ensuring that the heat is consistent in the winter while providing adequate air exchange.

At a recent church function to celebrate the completion of the project, members of the church were delighted and thankful for the increased comfort in the building. One gentleman explained he could "now hear the service clearly" and did not have to "turn up my hearing aid."

WORK DONE

- Installed a new hydronic heating and ventilation system to service the large building
- Mitigated heat loss issues with a combination of installing some new windows and repairing others.



A challenge to balance historical and religious sensibilities, the upgrades provided efficiency and comfort for all communicants.

project at a glance

Completion date	4/31/13
Building age	1960
Square footage	13,809 sq ft
Construction	brick
Number of floors	1

Project cost (pre-rebate)	$850,000
BetterBuildings rebate	$150,000
BetterBuildings co-loan	$700,000
BetterBuildings partner rebates	n/a
Projected energy savings	45%
Estimated annual gas savings	5,643 therms
Estimated annual electricity savings	n/a

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Achieving the triple bottom line

Venture Printing

44 Main Street
Plymouth

project at a glance

Completion date	11/14/12
Building age	1943
Square footage	5,490 sq ft
Construction	wood frame
Number of floors	1

Project cost (pre-rebate)	$33,160
BetterBuildings rebate	n/a
BetterBuildings 1% loan	$16,670
BetterBuildings partner rebates	$16,542
Projected energy savings	54%
Estimated annual oil savings	790 gallons
Estimated annual electricity savings	n/a

Venture Printing owner Dawn Lemieux came to the Plymouth BetterBuildings program early on, wanting to see what she could do to reduce energy consumption and improve the comfort and indoor air quality of her building on Main Street.

The single story 1940s building had its challenges: the floor plan was chopped up into small sections and some work spaces were way too hot and some were way too cold. The whole building smelled strongly of printing ink and chemicals, and there were definite drafts coming in through the building exterior.

BetterBuilding partners sharpened their pencils to come up with solutions. Lakes Region ThermalScan (serving as energy auditor and project advisor) was able to install a heat recovery ventilation system to improve the air quality of the building without wasting heat from the building, add two new air source heat pumps that provide both heating and cooling, upgrade the lighting in the customer service area, and insulate and air seal the building envelope.

To help finance the project BetterBuildings partners, the Retail Merchants Association and the New Hampshire Electric Co-op, provided substaintial rebates.

After completion, Dawn experienced a hefty drop in her energy costs, money that gets reinvested in her business. The subsequent reduction in CO_2 emissions is the equivalent of saving 27.4 barrels of oil. Also, the much-need ventilation system has made the office quieter and helped minimize the odor associated with the printing press, providing a more comfortable working environment for the staff.

With BetterBuildings, Dawn has been able achieve the triple bottom line: people, planet, and profit. And that you can put down in ink.

One of the heat exchanges installed at Venture Printing that helped the business responsibly balance the needs of people, of the planet, and of profit.

WORK DONE

- Improved insulation and air sealing
- Conducted lighting upgrade
- Installed heat pumps
- Implemented heat recovery ventilation system

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NEW HAMPSHIRE OEP OFFICE OF ENERGY AND PLANNING

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Harnessing the power of the pellet

Chip and Joyce Lebrecque
677 Fourth Avenue
Berlin

project at a glance

Completion date	4/27/12
Building age	1911
Square footage	1,502
Construction	wood frame
Number of floors	2

Project cost (pre-rebate)	$27,493
BetterBuildings rebate	$750
BetterBuildings 1% loan	n/a
BetterBuildings partner rebates	$23,528
Projected energy savings	40%
Estimated annual oil savings	666 gallons
Estimated annual electricity savings	315 kWh

Although a relatively small home, Chip and Joyce Labrecque's house was still extremely expensive to heat. Even with the boiler running full blast, the home was filled with drafts and cold spots. Joyce resorted to wearing battery-powered socks to keep her feet warm.

When the Berlin BetterBuildings office opened, they recognized the value of increased energy efficiency, and soon signed up to have the home insulated and air-sealed. The energy analyst outlined important measures which could increase the home's efficiency an estimated 37%.

The Labrecques took advantage of the shared funding and committed to implementing all the suggested measures in the proposed scope of work.

In September 2011, the Northern Forest Center, the City of Berlin, and Maine Energy Systems partnered to create the Berlin Model Neighborhood Project. The goal was to create a model community of wood pellet boiler-heated homes, to create momentum in conversion from imported oil-heated homes of all sizes to locally-harvested wood-heated homes. This helped develop the demand for delivery infrastructure and the encouragement of local talent for installation and maintenance of the pellet boilers.

When the couple heard about the Berlin Model Neighborhood Project, they leapt at the chance to participate. Now, not only is the home thoroughly weatherized, it's heated by a clean, sustainable fuel.

And best of all, Joyce no longer needs to wear heated socks!

BetterBuildings worked with the Lebrecques to provide sensible residential energy solutions, including the installation of a high-efficiency wood pellet boiler.

WORK DONE

- Installed flow control devices
- Added 6 CFL watt bulbs
- Insulated hot water pipes
- Installed dense pack cellulose to exterior walls
- Added air sealing, including exterior doors, pipe penetrations, and all openings between floors
- Spray foamed basement walls, rim joists, and crawl space.
- Increased the efficiency of the attic ventilation
- Sealed and added insulation to attic floor
- Installed OkoFen wood pellet boiler

BETTER BUILDINGS
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An Evaluation of the NH BetterBuildings Program

Matthew Magnusson, MBA
Cameron Wake, PhD
Corey Johnson

September 2013

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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.

<u>NH BetterBuilding project characteristics:[2]</u>

- 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 necessary to limit the payback of the project to about 4 to 5 years. One way to do this is to utilize available incentives.

Lessons learned from this study:

- There is a role for programs like NH BetterBuildings, and any new programs should be very well integrated 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.
- Significant customer education is an important part of any program. Explanations of energy audits, energy efficiency measures, paybacks, and financing options are key elements to getting customers to make efficiency investments.
- 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.

Based on the cost information collected from NH BetterBuildings, an estimate of Better Buildings 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 out of pocket (unfinanced) 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.

[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.

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.

Using Better Buildings funds through a competitive process, 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 and implement the program.[6] 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 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 NH BetterBuildings 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 with DOE to develop guidelines for 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

[6] The balance of funds went to other entities.

categories: 1) low-income – 100% grant funded, through Community Action Agencies, 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 with regard 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 assist with implementation of 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 (years) 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 (years) 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

Within 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 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 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 ratepayer-funded 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

Indirect Business Tax	Other Taxes	Corporations	Total
$321,800	$79,400	$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

Project Type	Projects		Fund Requirements		
	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 current fuel prices alone do not provide enough incentive for many customers 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 impact of energy prices on project payback. Increases in fuel prices lead to faster payback on energy efficiency projects.

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

Lessons Learned from the BetterBuildings Program

As part of the evaluation process for NH BetterBuildings, the NH 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, NH 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 NH 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 NH BetterBuildings and the Home Performance with Energy Star (HPwES) program run by the state's utilities.

Overall, survey respondents and interviewees indicated that the NH 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 NH 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 is that 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 and incentive programs would be coordinated for the customer. .

While contractors should be able to openly and fairly compete for business, because they are representatives of the program, they also should be accountable regarding competent and professional service. This is particularly important in a building retrofit program where the health and safety of building occupants can be negatively impacted by substandard work. 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 NH BetterBuildings executed partnership contracts with three utilities that run the HPwES program in New Hampshire. Formally integrating with HPwES allowed NH 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 NH 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 NH 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 NH 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 NH BetterBuildings loans (29%), commercial NH 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, some 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 some 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 NH 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 NH 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 NH 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 NH BetterBuildings communities partnered with the NH Retail Merchants Association to help gain better exposure with potential commercial customers.

As was the case with NH 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 a total of $10.4 million in energy efficiency activity with $1.0 million in energy savings annually.[15] 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 of loans and grants in an energy efficiency project? Based on the project characteristics observed in this program, 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 a loan product alone, and it appears that in order for energy efficiency projects to be attractive to customers, it may be necessary for incentives (or reduction in project cost) to bring the payback of the project to 4-5 years. In addition, more education is needed so that consumers understand that energy efficiency programs are good investments even with slightly longer paybacks.

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.

[15] 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 trigger 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.

BETTER BUILDINGS
A NH BEACON COMMUNITIES PROJECT

Blended Programs

A NH Better Buildings and Home Performance Case Study

Blended Programs – NH Case Study

BETTER BUILDINGS
A NH BEACON COMMUNITIES PROJECT

- NH BetterBuildings
  - $10 M for Residential and Commercial EE
  - Focus on Leverage and Financing
- NH Home Performance with Energy Star (HPwES)
  - Run by 4 Public Utilities
  - Rebates and On-Bill Financing
- Combined Program
  - Shared Rebates, BB funds for financing capital
  - $1.8 M from BetterBuildings
  - $600,000 from System Benefit Charge
  - 580 homes

Motivations for Combining Programs

- Customer Experience
- Contractor Process
- Taking Advantage of Existing Frameworks
- Consistent Marketing

Barriers

- Regulated Funding Sources
  - HPwES - regulated by PUC docket
  - BetterBuildings – Federal ARRA Funding
- Multiple Utilities
- Start Up Funds
- Administrative

Scaling the Wall – Overcoming Barriers

- Who Is Important?
  - Customers
  - Contractors
  - Regulators
  - Administrators
- Who's Gonna Give?
  - Funding
  - Audit and Implementation Process
  - Reporting
- Relationships are the Key

Unique Benefits

- Original Motivations Met
- Pushing the Boundaries of Existing Programs
  - Fuel Neutral Pilot to Permanent
- Learning about the Marketplace
  - Deep Dive Measures
    - Going beyond “cost effective”
  - Higher Loan Amounts
    - $2,200 average to $6,800