Help My House Pilot Program

Final Summary Report

June, 2013

PREPARED FOR
Central Electric Power Cooperative and
The Electric Cooperatives of South Carolina

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Collaborative Efficiency

Working together towards energy efficiency

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Executive Summary

The **Help My House (HMH)** Loan Pilot Program was a test of energy efficiency as both a consumer product and a cost-effective replacement for investment in new generation by electric utilities. The pilot provided on-bill financing (OBF) for energy efficiency measures in 125 homes, and analyzed the financial impacts on the electric system shared by South Carolina's 20 electric cooperatives (co-ops). A post-retrofit analysis of the performance of these homes showed a reduction in electricity use by more than a third—an annual savings that averaged nearly 11,000 kWh. Homes became more comfortable and the total electricity bills of participants went down. As a result, participants are extremely satisfied with the program and their co-ops, and the co-ops now better understand the financial impacts for an expanded and ongoing program.

What is On-Bill Financing?

OBF allows individuals to finance energy efficiency retrofits with low-interest loans that they repay on their monthly electric bills. There are other stand-alone OBF programs —more than 30 co-ops around the country have some type of OBF program.[1] South Carolina's HMH program is based on a 2010 state law that ties the loan to the meter and allows co-ops to disconnect for non-payment. The loan obligation is passed on to the next homeowner when a home is sold or to the next tenant when a rental property changes hands.

Pilot Program Background

The pilot program was spearheaded by Central Electric Power Cooperative (Central), the wholesale power provider to South Carolina's 20 distribution electric cooperatives and the 1.5 million members they serve, and The Electric Cooperatives of South Carolina (ECSC), the co-ops' marketing and public policy partner. In 2010, Central's Board of Directors adopted a set of energy efficiency objectives that included a 10 percent target reduction in residential energy use within 10 years and a reduction in average wholesale power costs for the residential class, all while maintaining or improving member satisfaction.

Participating Cooperatives

- Aiken Electric
- Black River Electric
- Broad River Electric
- Horry Electric
- Palmetto Electric
- Pee Dee Electric
- Santee Electric
- Tri-County Electric

The pilot was created to test an OBF program that could help meet these goals in a region where family income levels are 15 percent below the national average. Many families in this region lack the cash for down payments or access to financing for energy efficiency investments. The pilot program was designed to finance "whole house" efficiency upgrades through 10-year, 2.5 percent interest loans, and to examine the impact on individual members, participating co-ops, and wholesale power purchasing. Central and ECSC formed KW Savings, a nonprofit, to administer loan funds obtained from the U.S. Department of Agriculture's Rural Economic Development Loan and Grant (REDLG) program.

[1] Database of State Incentives for Renewables and Efficiency. 2013. www.dsireusa.org/incentives

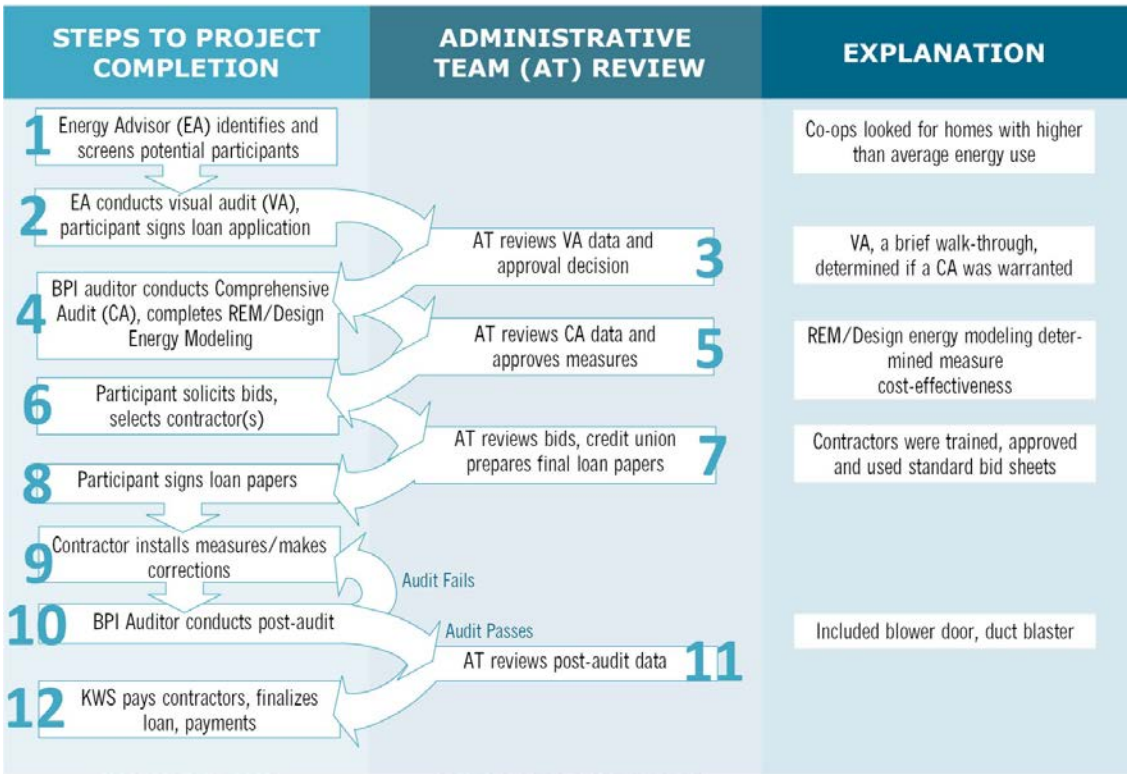
Pilot Program Team

Central and ECSC assembled a pilot program team in early 2011 of several organizations to help design and implement the program.

- **The Environmental and Energy Study Institute (EESI)** in Washington, D.C. assisted with program design and outreach. EESI informs key stakeholders, including Congress and opinion leaders.
- **Ecova**, a firm that implements energy efficiency programs for utilities, assisted with program planning, management and analysis.
- **Integral Analytics** conducted the cost-effectiveness analyses.
- **Advanced Energy** provided training for energy auditors and contractors.
- **Carton Donofrio Partners**, a marketing and consumer research firm, conducted surveys and analyzed the views of program participants.
- **1st Cooperative Credit Union** prepared and processed loan documents.
- **KW Savings** paid contractors and now manages loan repayments and program operations.
- **Participating co-ops** marketed the pilot, screened prospects, conducted audits, presented loan documents, advised participants and provided strategic project guidance.

The administrative team—comprised of staff from Central, ECSC and Ecova—developed the pilot procedures and processes. To help ensure data quality, the pilot plan stipulated that each major step of the process would feature review and approval by the administrative team, as shown in the diagram below. A field manager played a key role in support of co-op energy advisors, auditors and contractors by conducting on-site training and leading the effort to resolve technical or performance issues.

PROJECT WORKFLOW



Program standards and procedures were consistent throughout the pilot, but co-ops participated in slightly different ways. Most co-ops conducted their own outreach and marketing. While each co-op targeted members with above average energy use, they employed a variety of different approaches. Co-ops were responsible for screening the applicants. None of the co-ops checked credit scores or requested credit reports, but each co-op did check applicants' electric bill payment history.

All but one co-op designated an employee to be an energy advisor to conduct the visual audits, as noted in the Project Workflow. A few co-ops volunteered staff to perform the more comprehensive energy audits. Comprehensive post audits on each home provided quality assurance and made project participants more comfortable with the program.

Results

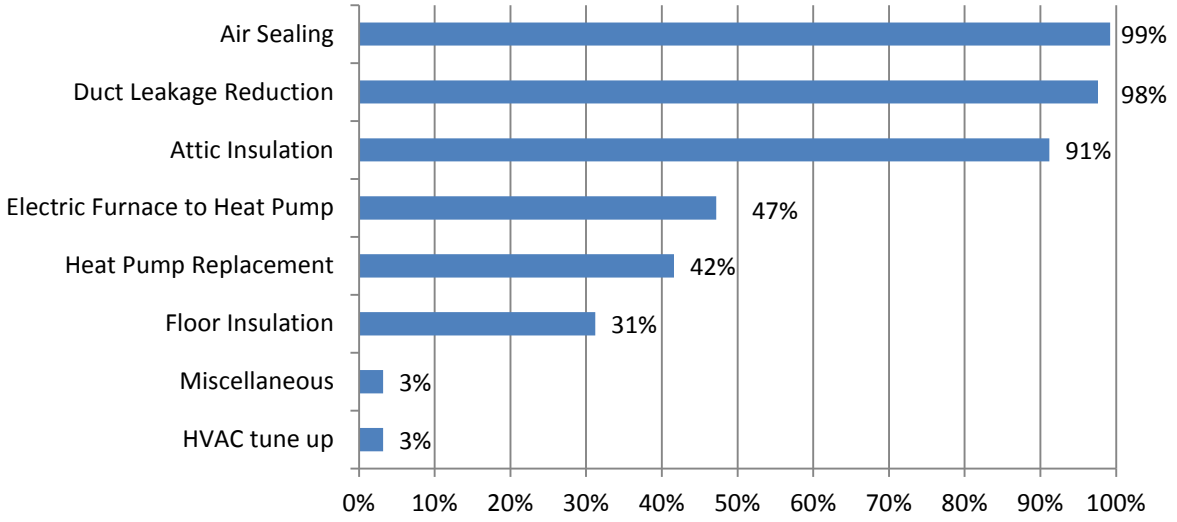
Each of the eight participating co-ops had at least one home complete the process. Installations began in June 2011, and 125 retrofits were complete by February 2012, 25 more than the program goal. Fifty-three were single family site-built homes and 72 were manufactured homes.

Participation by Co-op

Co-Op	Visual Audits	Comprehensive Audits	Contractors Paid
Aiken Electric	34	28	18
Black River Electric	39	29	25
Broad River Electric	40	24	16
Horry Electric	9	8	6
Palmetto Electric	9	7	4
Pee Dee Electric	3	3	1
Santee Electric	34	25	19
Tri-County Electric	47	39	36
Total	**215**	**163**	**125**

The comprehensive audits evaluated each potential measure for cost-effectiveness, which the pilot defined as a package of measures that would produce energy savings sufficient to cover the annual cost of loan repayments. The pilot applied a "whole house" approach, in which all of the measures were evaluated as part of the same system. The following graph shows the percentage of homes which received each measure. Nearly every home needed air sealing and duct sealing. Over 80 percent received HVAC upgrades and more than 90 percent of the homes required attic insulation. The average loan was $7,684.

Measure Installations



Data Collection and Analysis

Co-ops documented at least one year of billing history before and after measures were installed. This data was used to determine energy savings, demand savings and cost-effectiveness for each

home. Because weather fluctuates, the data was also weather normalized to illustrate what the savings would be for a typical meteorological year (TMY).

The pilot program results were impressive. The average home cut electricity use by 34 percent, nearly 11,000 kWh per year. Average simple payback is just over six and a half years—far shorter than the 10-year loan term. The average participant is making the loan payment and still pocketing $288 in net savings per year. The measures are expected to last at least 15 years. As a result, after the loan is paid off, annual savings for an average home will increase to more than $1,100 per year, producing a net cumulative savings after 15 years of more than $8,500.

Average Energy Savings from HMH Homes

	Monthly	Annual
Predicted savings for TMY (kWh)	966	11,593
Actual savings for TMY (kWh)	901	10,809
Predicted $ savings for TMY	$107	$1,285
Actual $ savings for TMY	$96	$1,157
Loan repayment	$72	$869
Net (actual savings - loan)	$24	$288

Of course, not all homes perform at an average level. There are outliers on the low end and on the high end. Annual energy savings exceed loan payments in more than 80 percent of the HMH homes. Of the 23 homes not producing a positive cash flow, 19 of them are within $10 per month of being positive. And every home, except for one unfortunate situation where a home burned down, will provide savings far in excess of loan payments long before the end of the expected lifetime of the energy efficiency measures. (The cause of the fire was unrelated to the retrofit.)

In addition to energy savings, the post-project data analysis also documented demand savings. The performance of the HMH homes during system (coincident) peak is important, because Central pays more for power during peak. The coincident peak demand savings were 27 percent during the summer peak in June and 46 percent during the winter peak in January.

The reduced summer and winter loads make more efficient use of the distribution system, but the financial impact on the co-ops and the Central system is determined by the load factor, which is simply the average kWh load for the period divided by the peak hour kW use. A higher load factor is desirable because it means the load is more constant. A more constant load is less expensive to serve because fewer generation, transmission and distribution resources are needed.

There was no net impact of the HMH pilot retrofits on load factor over the course of the year, according to the analysis. Average monthly peak demand and energy use were reduced at the same rate. Homes that have undergone HMH retrofits have had no effect on system load factor.

Member Satisfaction with the Pilot

The pilot examined member satisfaction through two surveys conducted after the HMH retrofits were complete. The first survey was conducted shortly after energy efficiency measures were installed but before participants had a good sense of how their homes were performing. This survey included participants as well as co-op members who knew of the pilot but did not participate. The second survey was conducted in March and April of 2013, a full year after the HMH homes had been retrofitted, and included only those consumers who participated in and completed the program.

In both surveys, members expressed a high degree of satisfaction with the pilot program and their co-ops. More than 95 percent of program participants are more satisfied with their co-op as a result of participating in the Help My House program. Why? They have lower electricity bills. They feel their co-op is trying to help them. They had a positive experience with one or more of the select group of trained contractors and their homes are now more comfortable.

Participant Testimonials from the Survey

- *I am saving about $300 to $400 a month.*
- *They were genuinely concerned about my high utility bills.*
- *It is not a big payment. It is something I can afford.*
- *I would not be in the home if I did not get the Help My House loan.*
- *They cut the payments in half, and the house is more energy efficient. It saves energy.*
- *During winter, it keeps it warm. During summer, it keeps it cool.*

The first survey included non-participants, those who had been contacted about the pilot but did not participate. Of the non-participants, 74 percent felt the same or higher satisfaction despite their lack of involvement in the program. This number is surprisingly high considering that many of the members contacted about the program were on a high bill complaint list. The few non-participants who were less satisfied were disappointed that their homes did not qualify for the pilot despite high energy bills.

HMH Spawns New OBF Programs

The positive results from the HMH pilot and positive member reactions have convinced more South Carolina co-ops to move ahead with OBF programs. Three of the eight co-ops that participated in the pilot have initiated ongoing OBF programs.

- Aiken Electric launched in the spring of 2012 using their own funds to provide loans. Since then they received a REDLG loan, have streamlined the process used in the pilot and issued 80 loans for completed projects.
- Black River Electric has used $100,000 of its own funds to provide loans at 5 percent interest. This rate exceeds the threshold in the South Carolina statute, which is why the co-op does not tie loans to the meter or disconnect for non-payment.
- Santee Electric launched in February 2013 by funding its own loans. The co-op is now applying for a $1 million REDLG loan to expand and sustain the program.

Two other South Carolina co-ops which observed the HMH pilot are moving forward as well.

- Lynches River is working on an application for a REDLG loan.
- York Electric is running a small OBF pilot to test an approach in which homes will receive the same kind of energy efficiency measures offered in HMH, but also have load management switches installed to reduce peak use.

The Co-op Business Case for OBF

The HMH pilot provides some useful information for distribution co-ops that wish to develop a business case for OBF. The business case informs the co-op's decision of whether to invest in an OBF program and at what scale. The business case is not solely financial, though financial considerations are important. Co-ops are owned by their members and member satisfaction is a critical metric, making the program's popularity with members a key factor.

One aspect of energy efficiency that co-ops may be concerned about is that, in the short term, energy efficiency reduces revenue needed to cover fixed costs. The financial impact of this reduction in sales depends upon each co-op's rate structure, but it would take a very large efficiency effort for many years before the lost revenue impact would be significant. Hypothetically, if an aggressive program operated for 10 years, a rate increase of less than 1 or 2 percent would make up for all the lost revenue. If load control devices (which Central has successfully deployed in other projects) were included in the OBF program in addition to the energy efficiency measures, the improvement in load factor would offset about half of this impact.

In the long term, energy efficiency reduces the need for new and expensive generation resources. It appears possible to run an expanded OBF program, if run efficiently and at sufficient scale, to achieve full cost recovery. This would mean all program costs would be borne by the program participants. However, even if the cost were $500 per home and the homes saved about 5,000 kWh per year, which is about half what the HMH homes are saving, the cost for these savings over a 10-year period is about 1.0 cent/kWh. This is much less than Central's current cost to buy power, which is closer to a levelized cost of 7.0 cents/kWh, and much less than the expected cost for new generation.

Recommendations

1) Co-ops are encouraged to consider offering OBF programs. The HMH pilot showed that OBF programs can be a great service to members.
2) Co-ops that offer OBF should collaborate with other co-ops and with state and national organizations to standardize the program to reduce program costs and improve quality.
3) Co-ops offering OBF should identify an organization to serve a centralized support function to improve the efficiency and the quality of program delivery.
4) OBF programs should support emergency replacements for heat pumps and water heaters and should target homes with old HVAC systems.

5) OBF programs should deploy load control devices and energy efficiency measures simultaneously, which will improve load factor and benefit the system, the power purchaser, and even the non-participants.

6) A supporting organization or group of affiliates (such as Central, ECSC and KW Savings in the S.C. example) should facilitate the development of business plans for interested co-ops to foster collaboration and to assist co-ops in fully recovering program administrative costs.

7) Co-ops should consider broadening the energy service offering in OBF to include renewables and eventually energy storage.

Introduction: The Need for On-Bill Financing

Central Electric Power Cooperative (Central) aggregates the power supply for its members and owners, South Carolina's 20 electric cooperatives. More than 1.5 million South Carolinians use electricity supplied by cooperatives. Central is interested in energy efficiency as a resource that can be integrated into a diversified, long-term, cost-effective strategy to help meet growing electrical demand and to minimize the high cost of new electric generation.

In 2010, Central's Board of Directors adopted a set of energy efficiency objectives that includes a 10 percent reduction in residential energy use within 10 years and a reduction in average wholesale power costs for the residential class, all while maintaining or improving member satisfaction. Working closely with the co-ops' marketing and public policy partner, The Electric Cooperatives of South Carolina (ECSC), Central seeks to accomplish its energy efficiency goals in a region where family income levels are 15 percent below the U.S. average.

Many homeowners are unable to invest in energy efficiency or participate in energy efficiency programs because they lack the funds or the access to financing for purchasing efficiency measures. While a few South Carolina co-ops have offered energy efficiency loan programs in the past and others continued to do so, Central and ECSC began exploring ways to strengthen the ability of co-ops to provide on-bill financing (OBF), which enables members to borrow low interest money for energy efficiency retrofits with no down payment and repay it as part of their electric bills.

Both organizations supported South Carolina Act #141 of 2010, which passed in March 2010 and contained a number of important provisions. This bill allows utilities to tie the loan repayment to the meter instead of the customer, enabling the loan obligation to be passed on to the next homeowner when the home is sold. The bill also allows utilities to disconnect for nonpayment. Interest rates cannot exceed 4 percent above the one year Treasury bill rate. Each home receiving a loan for energy efficiency must have the following 'bookend' audits by a qualified auditor; one upfront to identify cost-effective measures and one after the project (and before contractor payment) to ensure the work was done properly. Finally, the bill requires the utility to file a notice of a "meter conservation charge," ensuring that a homebuyer will be aware of this obligation to make loan payments. The South Carolina bill provides the tools to expand energy efficiency financing and provide loans without a credit check. This enables utilities to reach an income group that was previously not able to invest in energy efficiency.

OBF is something co-ops are familiar with: there are more than 30 unique OBF programs in co-ops around the U.S.[2] Actions pending in the legislative and executive branches in 2013 could greatly increase this number. A bill to create a Rural Energy Savings Program (RESP), which would provide loans and assistance to co-ops around the country to start or scale up OBF programs, was first introduced in the U.S. House of Representatives in March 2010 by South Carolina Rep. James Clyburn. The bill passed the House with bipartisan support in September 2010, but failed to reach the Senate floor. During the next Congress, the Senate passed RESP in June 2012 as part of the

[2] Database of State Incentives for Renewables and Efficiency. 2013. www.dsireusa.org/incentives

farm bill, but the bill stalled again when the House did not pass its own farm bill. Introduced into its third Congress in 2013, RESP is again part of the Senate farm bill. The outcome of this current iteration of RESP will be known by the fall of 2013.

As a complement to RESP, the U.S. Department of Agriculture (USDA) announced plans in July 2012 to establish the Energy Efficiency and Conservation Loan Program within USDA's Rural Utility Service (RUS). USDA published rules in 2012, but they are not yet finalized. The program would provide loans to rural electric cooperatives for energy efficiency improvements, including on-bill financing programs.

An economic analysis from Coastal Carolina University[3] estimated that a full-scale energy efficiency effort by South Carolina co-ops that included a fully implemented OBF program could produce up to 1,500 new jobs after one year and more than 7,000 jobs after 20 years. The analysis was based on a program that, within 10 years of full-scale implementation, would save South Carolina's cooperative-served homes a projected $166 million per year in addition to the energy savings allocated to repaying program-related loans. The annualized savings would grow to $355.5 million after 20 years.

Creating the Pilot

Although federal OBF legislation was still uncertain, Central and ECSC started exploring the possibility of a pilot program to use OBF to promote residential energy efficiency. They began looking at the experience co-ops were having around the country, particularly the How$mart™ Program in Kansas. In order to explore the possibility of federal support for OBF programs, they also began discussions with the Environmental and Energy Study Institute (EESI), a Washington, D.C. energy policy think-tank respected by both parties in Congress. These conversations resulted in a partnership agreement announced in October 2010 with EESI providing advisory services in the development of a pilot program.

In spring of 2011, Central's board agreed to proceed with an OBF pilot program with the following objectives:

1. To develop a template that could be used with a full-scale RESP
2. To establish a record that could be used in applying to the federal RESP once the legislation is passed
3. To determine how a full-scale RESP could best be structured to meet Central's goals.

EESI received funding from the Doris Duke Charitable Foundation to assist with pilot design and outreach and to report to key stakeholders, including Congress as well as state and national opinion leaders. EESI later received additional support from the Surdna Foundation and the Merck Family Fund to expand outreach and stakeholder engagement activities. Central applied for a loan from the US Department of Agriculture's Rural Economic Development Loan and Grant (REDLG) program,

[3] Dr. Donald Schunk, research economist, in a study commissioned by ECSC, December 2009

agreeing to form KW Savings Co., a nonprofit entity that would process consumer loans for energy efficiency. The USDA approved the $740,000 loan, enabling the pilot to offer 2.5 percent financing over 10 years. This was the first REDLG loan ever to be applied to energy efficiency.

The formation of KW Savings Co. was a significant development. This organization was supported by the CEOs and staff of Central and ECSC. KW Savings was directed by a board that included the CEOs of Central and ECSC as well as CEOs and board members from distribution co-ops. KW Savings handled the funding from REDLG, providing a structure in which any risks associated with loan repayment could be managed. KW Savings provided the loans to the HMH participants and distributed the loans by paying contractors directly for completed work. The co-ops collected the loan repayments as part of the electric bill. Technically, this made the pilot an on-bill repayment (OBR) program, since the loan funds were coming from a third party.

Pilot Planning

Co-ops expressed interest in participating in the pilot at an April 2011 kickoff meeting. Central hired Ecova, a firm specializing in utility energy efficiency programs, to lead the pilot planning and staff the pilot once it was launched. Central, ECSC and Ecova developed a planning process featuring an implementation team and six advisory groups, each comprised of staff from the participating co-ops, Central, ECSC and Ecova. Non-participating co-ops were also invited to join the advisory groups. Overseeing the advisory groups was a steering committee made up of all 20 co-ops and a leadership team of staff from Central, ECSC, EESI and Ecova.

This collaborative planning effort capitalized on the knowledge of the customer that co-ops have because of their strong relationships with their member-owners. Co-ops, aided and assisted by Central and ECSC, are continually interacting with the members and conducting pilots and surveys. The co-ops involved in the planning demonstrated their depth of understanding by bringing up specific examples of homes they believed would make good candidates for the pilot.

Integral Analytics, an energy efficiency consulting firm, led the development of an Impact Analysis Plan that established the initial research questions the pilot was designed to answer. Those questions were:

- How much energy use and peak demand were actually reduced by each pilot program participant?
- How did the installation of measures impact participants' load factors (average kW divided by peak kW)?
- How accurate were the savings estimates calculated during the on-site evaluation?
- How accurate were the preliminary cost estimates provided by the contractors?
- How did the projects' actual cash flows compare to the cash flows estimated by the audit?
- How did the actual savings compare to the savings estimated by DOE-2, a building energy simulation tool, which used a prototypical South Carolina house?

Shaped around these questions, the pilot aimed to assess whether energy savings could cover the costs of the measures over a 10-year loan, which is well under the expected life of the measures. Could projects be implemented in which the energy savings exceeded the loan repayment and provided a positive cash flow to the participant? If so, once the loan was paid off, the borrower would see benefits until the end of the measure's life. The pilot was designed to explore the market potential for a full-scale program by gauging co-op members' satisfaction with their co-ops and the concept of on-bill financing as a method of payment for home energy efficiency improvements.

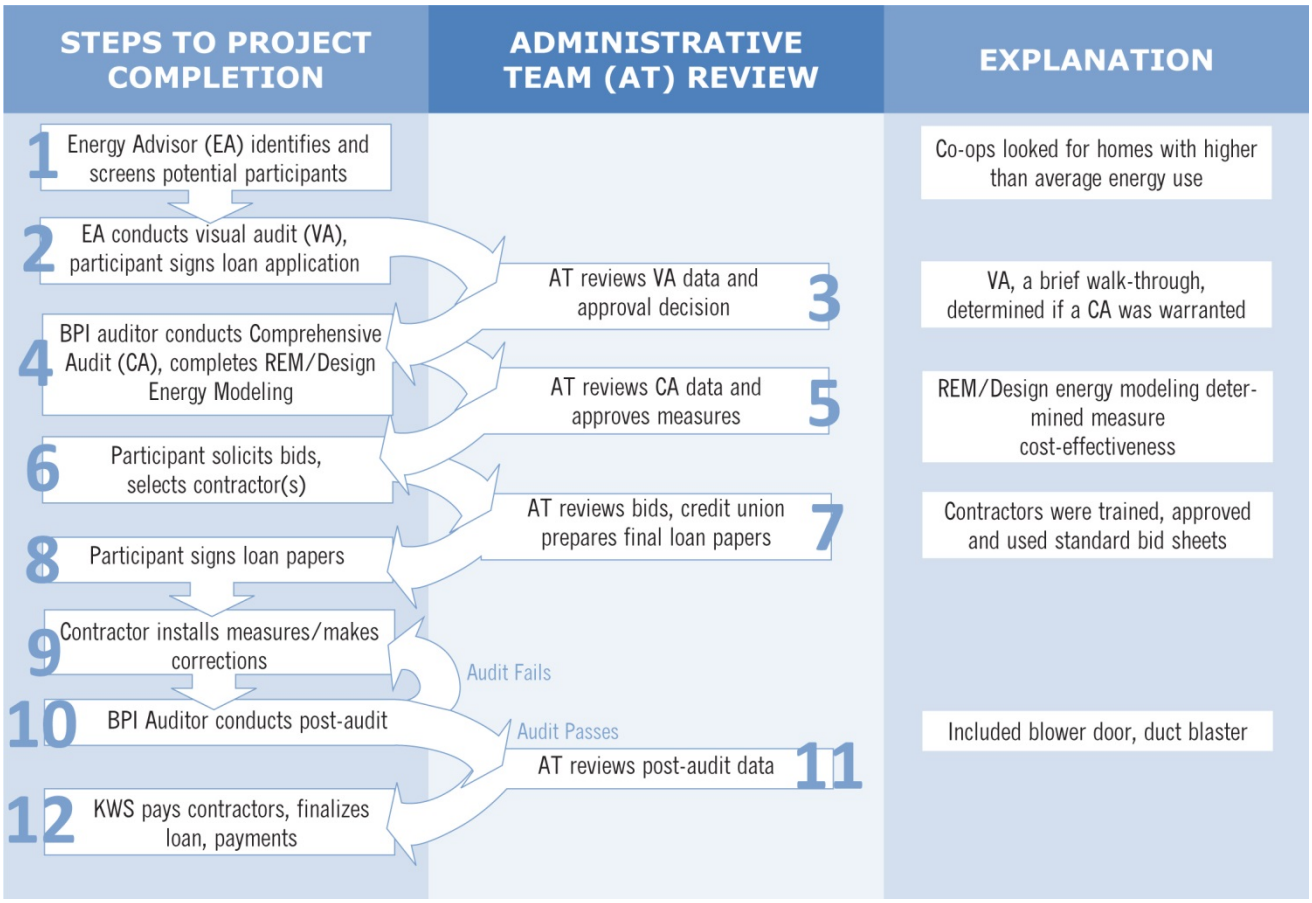
Recognizing that both a *product* and a *consumer-member transaction* needed to be designed, ECSC and Central enlisted Carton Donofrio Partners (CDP), a full-service marketing and consumer research firm based in Baltimore, to better understand market potential, test the program model with consumer-members and address the question of their satisfaction with the co-ops. CDP's efforts were intended to help answer an important question: What would it take in a full-scale program to get consumer-members to participate? CDP developed a plan to visit homes, observe participant interactions with the pilot staff and process, conduct surveys and report on the views of pilot participants. CDP was also responsible for developing messaging, assisting with the selection of a pilot name and creating marketing materials as needed by participating co-ops.

The administrative team—comprised of staff from Central, ECSC and Ecova—developed the pilot procedures and processes. Once the pilot was under way, these organizations would schedule the auditors, track each participant and allocate resources and technical support to assist the co-ops. Quality assurance was an important focus throughout the pilot's implementation, providing peace of mind for consumers through a high-touch, quality-controlled transaction managed by their cooperatives.

To help ensure data quality, the pilot plan stipulated that each major step of the process would feature review and approval by the administrative team. Central provided a field manager to the pilot who played a key role in support of energy advisors, auditors and contractors by conducting on-site training and leading the effort to resolve technical or performance issues.

Two other affiliated organizations also played key roles. Specifically, 1st Cooperative Federal Credit Union, which serves co-op employees and is based at ECSC, prepared and processed loan documents. The aforementioned KW Savings also paid contractors and managed loan repayments. Additionally, both in the pilot and in the local co-op programs it has spawned, KW Savings and its governing board function as brand managers, a vital role required to build and maintain consumer confidence in the program. Figure 1 illustrates the full workflow, which, for the most part, has been adopted by co-ops that continued running HMH after the pilot.

Figure 1 – Project Workflow



The eight participating co-ops listed in Table 1 worked with the team from Central, Statewide and Ecova to develop a plan for retrofitting a sample of 100 homes. Each co-op contributed a local plan describing the pilot functions and activities that they would carry out with their own staffs.

Table 1

Participating Cooperatives

Aiken Electric
Black River Electric
Broad River Electric
Horry Electric
Palmetto Electric
Pee Dee Electric
Santee Electric
Tri-County Electric

The completed plans had co-ops playing a variety of roles. Seven co-ops decided to conduct their own outreach and marketing by designating an employee as an Energy Advisor. This employee conducted brief, initial walk-through "visual audits" to pre-qualify homes before the required comprehensive audits (CAs), important quality assurance tests that serve to diagnose home energy efficiency issues. Two co-ops volunteered staff to perform the CAs, which were performed to Building Performance Institute (BPI) standards, to identify cost-effective efficiency measures and to prescribe the work needed.

The plans detailed a post-installation component for quality assurance. After the measures were installed, the same auditors would visit the site to determine if the work was done properly by contractors before they were paid. One co-op relied on turn-key support from Ecova for all field and administrative activities. Four co-ops agreed to qualify and retrofit as many of the homes as possible in their service areas while the others developed implementation plans that limited the number of homes they worked with in the pilot.

Preparing for Launch

Developing Pilot Processes and Procedures

The administrative team set up procedures and training, prepared forms, and established data transfer mechanisms, review processes, and tracking systems. A legal team developed contracts for the auditors and the contractors. They also prepared a packet of seven loan documents that each participant would sign to formalize their participation in the pilot.

Measure Identification

As the eight participating co-ops honed their implementation plans, preparations began for the pilot's launch. One important step was measure identification, which required a preliminary analysis of projected energy savings. The preliminary analysis provided direction for the training and the preparation of auditing and energy modeling procedures. To conduct this analysis, Integral Analytics used DOE-2 building energy simulation software to model a prototypical home, operating under local weather data. Contractors interested in the pilot provided estimates of measure costs. For the pilot, cost-effectiveness was defined as a set of measures that was projected to produce more than enough annual energy savings to cover loan payments on a 10-year, 2.5 percent interest loan. In other words, each individual project must be projected to provide a positive annual cash flow for program participants. Central Electric's system is winter-peaking, which means electric space heat use is high on the coldest days. Summer is hot and humid, creating high air conditioning loads. Building envelope measures and HVAC measures represent the greatest opportunities for energy savings in this type of climate. At the request of Central and ECSC, Integral Analytics' measure analysis used a "whole house approach," in which all of the measures could be assessed as part of a package. The preliminary analysis identified the measures in Table 2 as cost-effective.

Table 2 – Likely Cost Effective Measures Identified by Integral Analytics Measure Identification

Building envelope	• Add insulation under floors and in crawl spaces • Add attic insulation • Seal air leaks
Heating, Ventilation and Air Conditioning (HVAC)	• Tune up existing systems • Seal ductwork • Replace forced air electric (FAE) systems, which are often referred to as "resistance strip heat" in South Carolina, with efficient heat pumps • Replace the oldest and least efficient heat pumps with newer and much more efficient models

The measure identification did not consider some smaller but still possibly

cost-effective measures such as lighting, efficient showerheads or plug load measures. Load control switches on water heaters or air conditioners were not included.

The measure identification analysis conducted by Integral Analytics helped to develop the real cost-effectiveness test that would be used in the field, by certified auditors, with a specific house and bid costs from contractors. The auditors needed a field audit tool to determine cost-effectiveness under these actual conditions. Integral Analytics assisted the administrative team in selecting REM/Design™ as the audit software for the pilot. This program is a popular building audit and building energy simulation software program. It has been tested for accuracy by the National Renewable Energy Laboratory and is often used to identify cost-effective energy efficiency measures. The pilot program team worked carefully with Advanced Energy (a subcontractor to Ecova) and the Architectural Energy Corporation to customize menus so that different auditors would enter data consistently.

The administrative team put together a separate spreadsheet tool to incorporate data that was not contained in a REM/Design file and put in place quality assurance procedures to ensure that audits and data collection were being done correctly.

Auditor Selection and Training

South Carolina's OBF law (Act #1041 of 2010) requires an audit and a final inspection by an auditor certified by BPI or a similar organization. The administrative team recruited and selected four qualified independent auditors. Two of the eight participating co-ops had staff members with the qualifications to conduct the audits, so they decided to perform that work themselves.

Advanced Energy conducted a two-day training session focused on using consistent procedures for the on-site audits and the REM/Design modeling. The auditors also received instruction on the required final inspection procedures associated with their role in determining whether work was satisfactorily completed so that contractors could be paid.

Auditors were trained to conduct an energy savings analysis that required extensive data collection on each home under consideration for the pilot. This detailed energy audit generally took several hours, which is longer than a typical audit in an ongoing, streamlined program, to collect construction information including insulation levels, window types and heating and cooling system types. The auditor also conducted a blower-door test to determine air leakage through the building envelope and a duct-blaster test to determine air leakage from ductwork to the exterior of the home.

Energy advisors from the participating co-ops stayed an additional day for training on how to conduct visual audits. The visual audit was a quick walk-through audit to identify whether the home had sufficient energy efficiency opportunities to offer the prospective participant a free comprehensive audit.

Contractor Selection and Training

The state's OBF law requires utilities to provide a list of qualified contractors to members upon request. The administrative team involved the co-ops in assembling a list of prospective contractors, solicited applications from the contractors and then ranked candidates based on their qualifications. Twenty contractors were approved and participated in a two-day training session, learning about the program standards for all energy efficiency measures, quality assurance processes and the details of the pilot program. When training was complete, contractors were required to sign an agreement with KW Savings before they were allowed to bid on homes in the pilot. The agreement stipulated that contractors must hold all necessary permits, licenses and insurance and clearly stated that contractors would not be paid for completed work until a post-retrofit comprehensive audit verified that the work had been completed to the pilot's required standards. The pilot's field manager provided on-site training for quality assurance purposes as crews began installing measures in the homes. Additional contractors expressed interest later in the pilot and were added to the list after they received training and signed agreements.

Marketing

The marketing firm Carton Donofrio Partners offered several ideas for a pilot name. The co-ops selected "Help My House," a name they had used for previous residential energy efficiency efforts. CDP also developed direct-mail marketing materials for some of the participating co-ops as well as talking points that energy advisors could use to educate interested co-op members.

CDP designed a marketing plan which was aimed at co-op members who had higher than average electricity use, because their homes would be the ones most likely to yield a cost-effective project. Some co-ops marketed the pilot to members who called to complain about high electric bills. Other co-ops directed their marketing efforts toward members with average monthly bills over a certain amount.

Implementation

The Help My House (HMH) pilot was implemented as eight coordinated but separate pilots. Co-ops played different roles, used different outreach approaches and had different priorities and timelines. One co-op selected prospective participants and conducted visual audits in June 2011 before planning was even completed. Others did not begin those activities until later that fall.

The program screened applicants using a number of criteria in an effort to ensure that homes accepted into the program would provide adequate data for analysis. Only all-electric homes were accepted, which excluded a number of applicants that were using propane, wood or even unvented gas logs. Applicants were required to supply a full 12 months of energy use data. Single family homes, either site built or manufactured, were eligible. Duplexes, triplexes, multifamily or townhomes were excluded, as were homes with unusual loads such as home businesses and homes with a greenhouse or swimming pool.

The energy advisors began screening prospects before they were contacted by looking at energy use data. They continued screening during the first conversation about the HMH program and continued screening with the visual audit. During this process, 215 homes received visual audits, and 163 then underwent comprehensive audits. Ultimately, 125 homes ended up with weatherization projects funded by the HMH loans.

The vintage of selected homes varied as noted in Table 3. More than half were manufactured homes, which was an important group to measure since 26 percent of co-op homes are manufactured. The average electricity use of selected homes was more than 31,000 kWh per year, which is dramatically more than a typical home in South Carolina co-op territory that uses about 17,000 kWh per year.[4]

Table 3 - Home Summary by Vintage and House Type

House Type	Year Built	# of Homes	Average Square Footage	Average Attic R-Value	Average Wall R-Value	Average Floor R-Value	Average Annual kWh
Single Family Detached							
	1900-1909	1	2,100	13.0	0.0	0.0	39,243
	1920-1929	1	1,909	0.0	0.0	0.0	29,881
	1940-1949	3	1,678	8.7	3.7	0.0	30,206
	1950-1959	6	1,763	13.5	5.5	3.2	29,612
	1960-1969	8	1,667	13.5	7.8	3.8	33,079
	1970-1979	16	1,689	16.1	10.3	7.4	31,633
	1980-1989	10	1,858	19.3	10.6	8.3	29,234
	1990-1999	6	2,003	19.2	9.3	7.5	33,016
	2000-2009	2	2,619	24.5	13.0	19.0	35,737
	TOTAL	**53**	**1,808**	**15.9**	**8.7**	**6.3**	**31,511**
Manufactured Home Double Wide							
	1970-1979	2	1,652	19.0	11.0	1.9	27,423
	1980-1989	10	1,547	9.6	9.6	1.9	28,173
	1990-1999	43	1,796	10.3	9.6	2.0	31,483
	2000-2009	13	2,123	9.6	9.6	1.9	34,552
	TOTAL	**68**	**1,818**	**10.2**	**9.6**	**2.0**	**31,463**
Manufactured Home Single Wide							
	1980-1989	1	1,008	9.6	9.6	1.9	31,218
	1990-1999	3	1,253	9.6	9.6	1.9	27,579
	TOTAL	**4**	**1,192**	**9.6**	**9.6**	**1.9**	**28,489**
Average		**125**	**1,793**	**12.6**	**9.2**	**3.8**	**31,388**

[4] According to Central's 2013 Appliance Saturation Survey.

The homes that participated in HMH were diverse, not only in terms of vintage and type, but also geographically, ranging from the coastal lowlands to the foothills in the northwest corner of the state (a map of S.C. co-ops is Attachment A of this report). Each of the eight participating co-ops had at least one home complete the process. Table 4 reflects the different goals, priorities and approaches of the participating co-ops that resulted in different levels of participation. The end date of the pilot was scheduled for mid-December 2011, and more than 100 completed projects were approved by that date. However, as word spread about the pilot demand from their members continued to rise. Pilot sponsors and co-ops decided to extend the end date to allow additional members to participate. This resulted in 125 homes being retrofitted by February of 2012.

Table 4 - Participation by Co-op

Co-Op	Visual Audits	Comprehensive Audits	Post Audits Approved	Contractors Paid
Aiken Electric	34	28	18	18
Black River Electric	39	29	25	25
Broad River Electric	40	24	16	16
Horry Electric	9	8	6	6
Palmetto Electric	9	7	4	4
Pee Dee Electric	3	3	1	1
Santee Electric	34	25	19	19
Tri-County Electric	47	39	36	36
Total	**215**	**163**	**125**	**125**

The next step for the selected homes was the comprehensive audit. The auditors entered detailed data on each prospective home into REM/Design to estimate savings and cost-effectiveness. As expected, this modeling showed that upgrades to heating and air conditioning systems presented the largest opportunities for energy savings. More than half of the participating homes were heated with heat pumps; the remaining homes were heated with forced air electric (FAE) furnaces.

Table 5 - Heating System by House Type

House Type	Heat Pump	FAE furnace	Total
Single Family Detached	43	10	53
Manufactured Home DW	22	46	68
Manufactured Home SW	0	4	4
Total	**65**	**60**	**125**

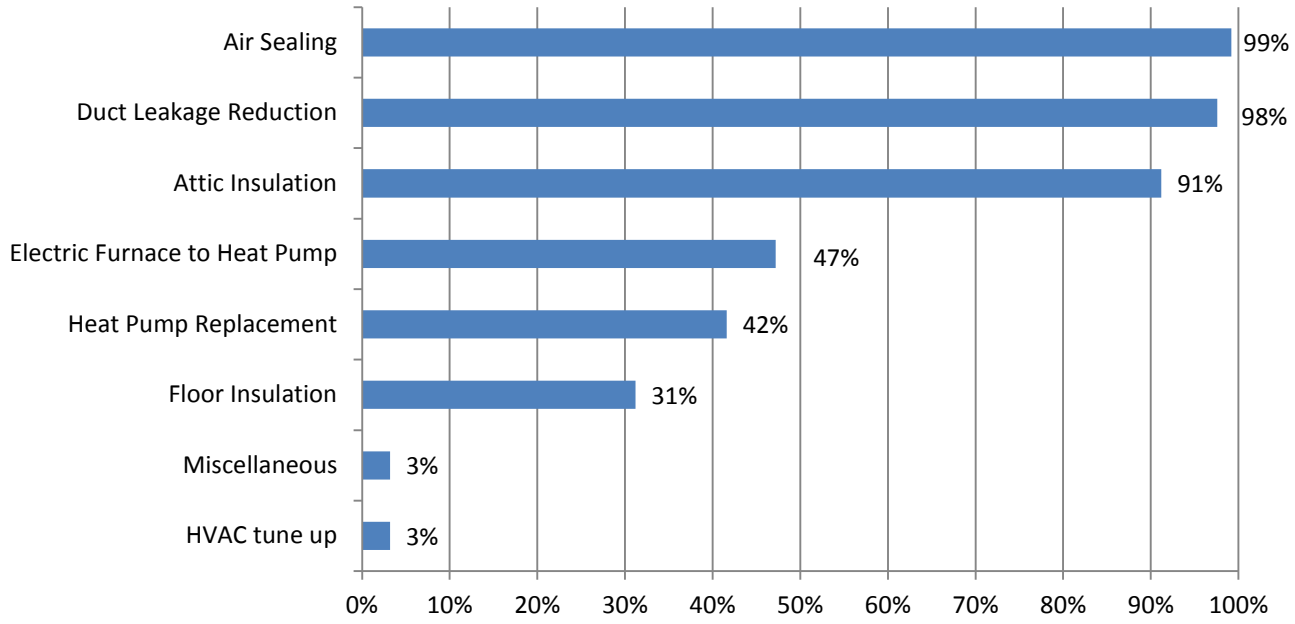
Air conditioning can also be a significant energy efficiency opportunity. All homes in the pilot had some form of air conditioning. Homes that are heated with a heat pump are typically cooled with the same heat pump, while those heated with FAE furnaces are cooled with central air. As a result, nearly half of the participating homes were cooled with heat pumps and the other half with a central air conditioner. The remaining few used window air conditioners.

Table 6 - Air Conditioning System by House Type

House Type	Heat Pump	Central AC	Window AC	Total
Single Family Detached	40	12	1	53
Manufactured Home DW	20	47	1	68
Manufactured Home SW		3	1	4
Total	**60**	**62**	**3**	**125**

The homes selected provided an ample supply of efficiency opportunities. Most of the homes were poorly insulated. For example, more than 90 percent required attic insulation. Eighty-nine homes had attic insulation measuring R11 or less, which is far below the standard recommendation of R38. More than 90 percent of homes needed air sealing and duct sealing. Figure 2 shows the percent of homes in the pilot that ended up with each measure.

Figure 2 - Measures Installed in Pilot Homes



Energy Savings Analysis

The HMH pilot program was conceived and designed to determine the cost-effectiveness of energy efficiency measures and whole home retrofits. The pilot defined cost-effectiveness as annual energy savings exceeding annual loan payments. Measures must be cost-effective in order for an OBF program to be viable. Co-ops are also concerned about the effect of whole house

weatherization on system peak. This analysis examines energy savings, demand savings and the value of each of these to the participants and to the co-ops.

Program staff and contractors went to great lengths to gather and analyze the data to answer these questions. The energy savings analysis occurred in two phases. The first phase resulted in an Interim Impact Analysis, which included all of the data on housing characteristics and the measures installed. Savings were predicted by the auditors using the REM/Design software. The second phase integrated the actual energy performance of the homes and culminated in a Final Impact Analysis written by Integral Analytics.

The first phase of this analysis began with the collection of at least one year of pre-retrofit energy use data, supplemented by data about the home and the energy efficiency measures from the visual and comprehensive audit. The auditors' recommendations, once approved by program staff, provided guidance to the contractors as they submitted bids to the homeowners. Pilot program staff entered the costs for installing each measure and corrected the measure characteristics if they differed from the original audit recommendations. Program staff updated the REM/Design model in this manner at least twice to ensure that it accurately depicted the energy efficiency measures as they were installed. By the time data collection on the home was complete, auditors and program staff recorded more than 350 data points on each home.

Program staff provided all of the energy modeling data and at least 12 months of pre- and post-retrofit energy use data to Integral Analytics to help them determine actual energy savings as a part of the Final Impact Analysis report. The energy savings were adjusted for weather differences between the pre-project and post-project monitoring periods. This assessment also determined how much energy savings there would be on each home during a Typical Meteorological Year (TMY).

The REM/Design energy modeling predicted TMY average energy savings of 11,593 kWh/year, as shown in Table 7, which is 37 percent of the average total electric use. The average loan in the program was $7,684 which required a payment of $73/month. Energy savings were predicted to be about $107/month.

Table 7 - Average Energy Savings from HMH Homes

	Monthly	Annual
Predicted savings for TMY (kWh)	966	11,593
Actual savings for TMY (kWh)	901	10,809
Predicted $ savings for TMY	$107	$1,285
Actual $ savings for TMY	$96	$1,157
Loan repayment	$72	$869
Net (actual savings - loan)	$24	$288

Integral Analytics conducted a billing data analysis one year after the last measures were installed, following a methodology that is recognized under two different widely accepted protocols.[5] Participants' energy use before and after was fed into the Integral Analytics analysis. The usage data was weather normalized so that pre- and post-project energy use could be compared fairly. The analysis showed that actual average savings per home were about $96/month. This means that the actual performance of the homes compared to the predicted performance, which is known as the "realization rate,'" is 93 percent. Integral Analytics, which conducts this type of analysis for programs around the U.S. reports that a realization rate of more than 85 percent is considered a superior result.

The results of the billing data analysis were very precise. Integral Analytics looked at the statistical significance of all of the data used in this analysis and found that the level of precision in this analysis is 10 times as high as the minimum acceptable level required for this type of analysis when conducted as part of a program evaluation for an investor-owned utility. The energy billing data analysis has a 95 percent level of confidence with a +/- 10 percent accuracy.

The HMH pilot applied a "whole house" approach, in which all of the measures were evaluated as part of the same system. The average simple payback of pilot homes is 6.6 years. The billing data analysis calculates the savings for each measure. The replacement of older and inefficient heat pumps with new, efficient heat pumps was prevalent among participating homes and, on average, proved to be cost effective with a simple pay back of 8.6 years. New HVAC systems, according to the modeling, had the longest payback of measures completed. In many cases, the longer payback of the HVAC retrofit was offset by the other upgrades in the larger package of measures.

Table 8 - Predicted Measure Savings and Costs

Measure	% of Homes	Average Predicted Annual Savings (kWh)	Average Predicted Annual Savings	Average Actual Installed Costs	Average Payback (Yrs)	Average Predicted Monthly Savings
Attic Insulation	91%	1,887	$212	$1,231	5.8	$18
Floor Insulation	31%	4,135	$468	$730	1.6	$39
Elec. Furnace to Heat Pump	47%	6,540	$726	$5,088	7.0	$61
Heat Pump Replacement	42%	4,785	$522	$4,514	8.6	$43
HVAC tune up	3%	2,397	$223	$118	0.5	$19
Duct Leakage Reduction	98%	2,048	$228	$674	3.0	$19
Air Sealing	99%	1,420	$155	$971	6.3	$13
Miscellaneous	3%	639	$72	$0	0.0	$6

[5] The California Energy Efficiency Evaluation Protocol and the International Performance Measurement and Verification Protocol.

The results of the HMH pilot demonstrate that, on average, energy savings are more than sufficient to cover loan repayments. The typical participant enjoys a net savings of $288 per year, as shown in Figure 3. This is a very positive return, especially since measures were 100 percent financed. The typical participant has a positive cash flow, with energy savings exceeding loan repayments, in the first year.

Figure 3 - Annual Savings for an Average HMH Home During 10-year Loan Term

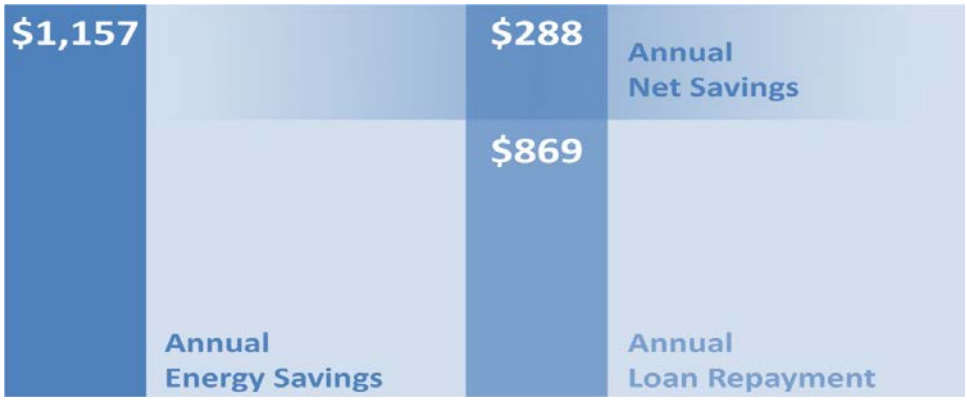
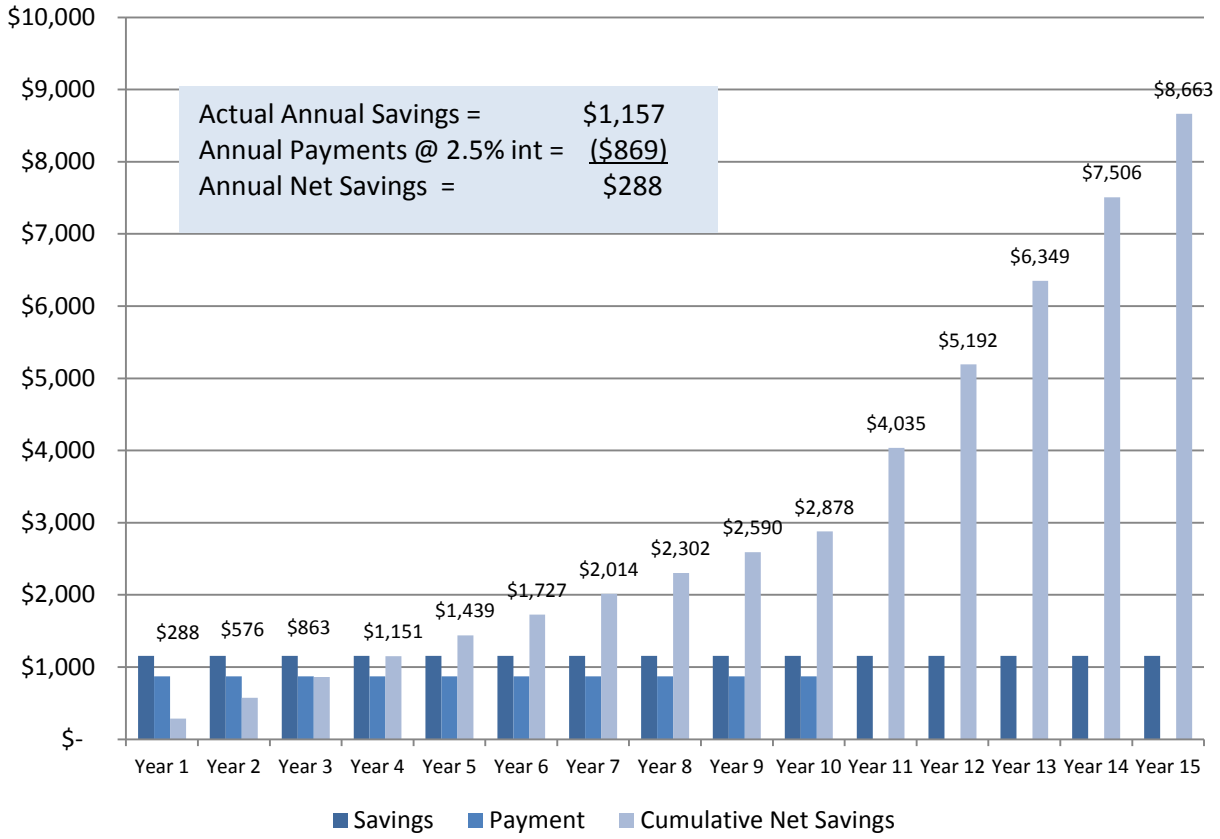


Figure 4 illustrates the cumulative effect of this cash flow.[6] Once the loan is paid off after 10 years, cash flow rises significantly. Over the 15-year period after the efficiency improvements are made, the average participating home is projected to see a net savings of $8,663.

[6] The projected costs and savings are in nominal dollars and not discounted. Electric prices are not escalated.

Figure 4 - Net Savings Analysis



Of course, not all homes perform at an average level. There are outliers on the low end and on the high end. The chart below shows that, while most homes had realization rates between 50 percent and 125 percent, there were 18 homes with realization rates under 50 percent. Annual energy savings exceed loan payments in more than 80 percent of the HMH homes. Of the 23 homes that are not producing a positive cash flow, 19 of them are within $10/month of being positive.

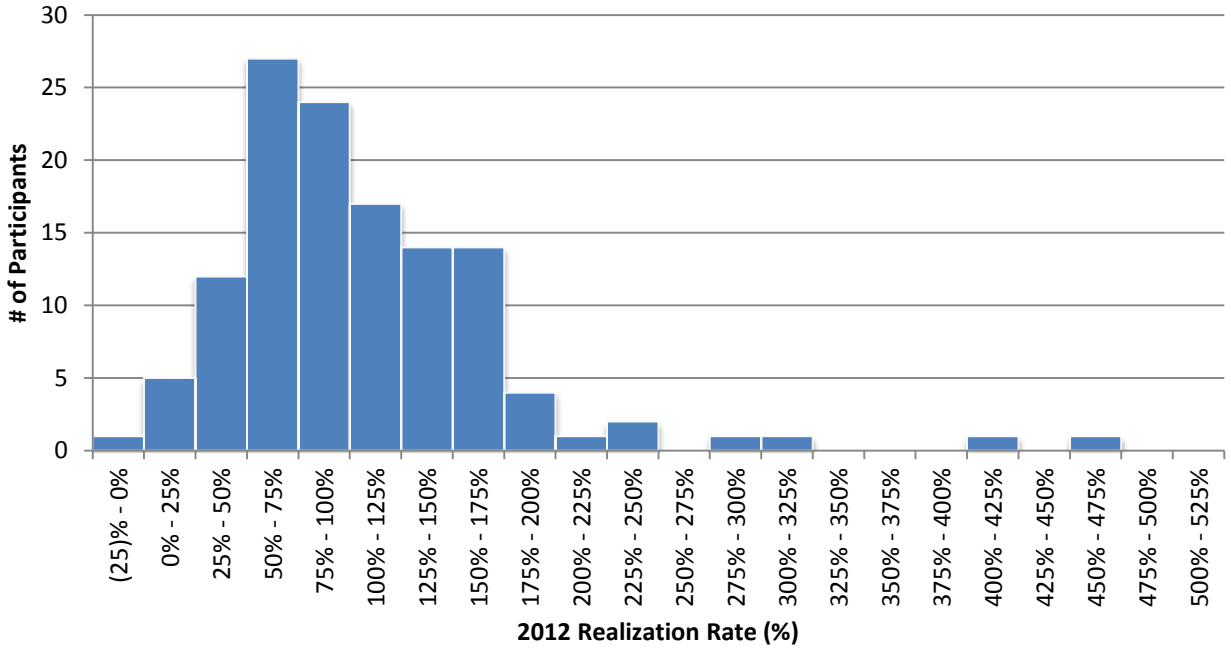
KW Savings and Central staff looked into some of the homes that are outliers on the low end, in which savings are significantly less than expected. What they found falls into one of three categories:

1. Human error. Even with the extensive quality assurance procedures employed in HMH, there will still be some data errors and other mistakes. In a few cases, the original audit information appears to be wrong, classifying the existing HVAC system as a FAE when it was a heat pump. This type of error would result in an overestimation of savings.
2. Lifestyle changes. This can happen when occupants choose to enjoy a higher winter or lower summer thermostat setting after the retrofit. This common phenomenon is known as the “take-back” effect or “rebound” effect. One of the homes was occupied by a single occupant before the retrofit, who set the thermostat lower than normal in the winter.

However, the thermostat settings were increased when the occupant's daughter and new grand-daughter moved in after the retrofit.

3. The house no longer exists. This is a rare case, but it happened in HMH when one of the homes in the program was destroyed by fire. (The cause of the fire was unrelated to the weatherization.)

Figure 5 - Distribution of Realization Rates by Participants



Value of Energy Savings

The value of energy savings for the participant is simply kWhs saved multiplied by the kWh rate. Non-participating members can be affected as well, if the impact of reduced revenue from energy savings on the distribution co-op is passed on to its members in the form of reduced service or increased electric rates.

Energy savings affects the distribution co-op in two ways. In the short term, the value of energy savings has a negative financial effect on the co-op due to lost revenue. Some of the revenue loss can be offset by a reduction in variable costs, primarily a reduction in power purchases. However, since some of the co-op's fixed costs, such as staffing, debt service or system maintenance, are bundled up in the kWh rate, the co-op will be less able to cover these costs as kWh sales decline. This shortfall will be addressed by cost-cutting or by spreading some of this cost to all co-op members. Over the long haul, however, reduced sales could benefit the co-op by helping defer the purchase of higher priced power.

The value of lost energy sales to the electricity supplier and power provider depends on a number of factors. If the load shape improves and load factor increases, this could help offset the financial impact of reduced revenue on the co-op. The timing of new generation is another factor. Central's power providers are currently projected to have surplus generation capacity for the next 15 years, an unforeseen result of the drop in electricity demand growth that has occurred as a result of the economic downturn of the last several years. Unless there are significant rate, regulatory or other changes, reducing energy sales will not have the effect of deferring new generation resources for many years.

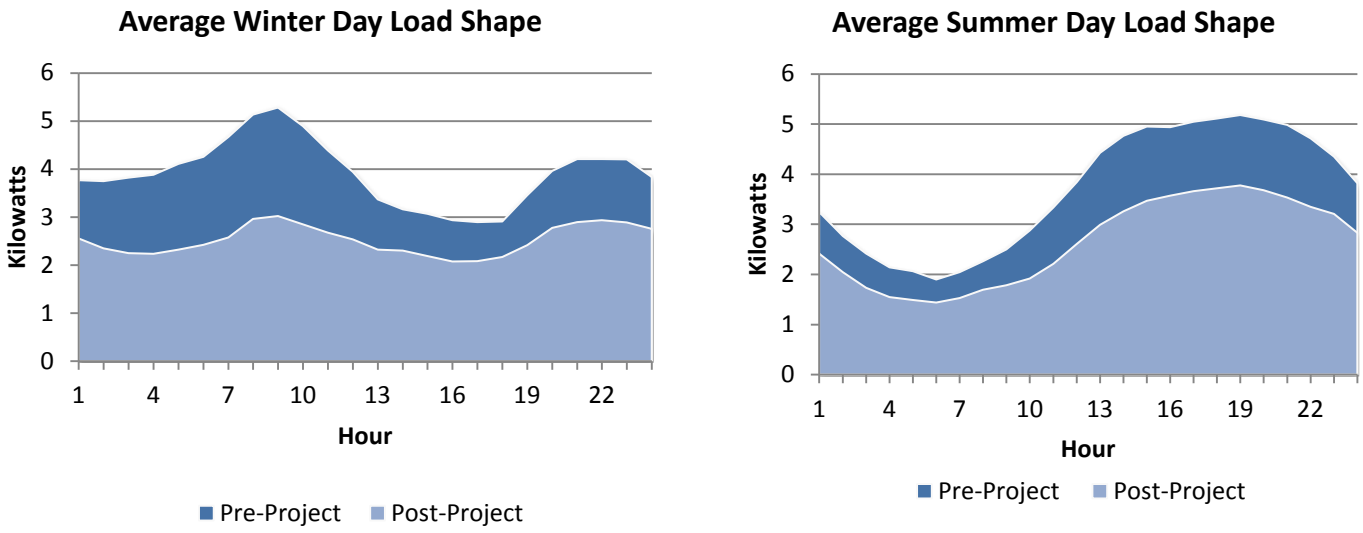
Demand Savings

Residential users typically pay the same price per kWh regardless of when it is consumed, but the wholesale power that Central Electric purchases for its member co-ops consists of two components: an essentially flat energy charge across all hours and significant demand charges on monthly and annual peaks. The HMH pilot was designed, in part, to determine the effect of energy efficiency retrofits on peak consumption.

In the last several years, many of the homes served by co-ops in South Carolina have been equipped with advanced metering systems, which collect energy use data in hourly increments or even more frequently. Integral Analytics conducted an hourly billing data analysis on 48 of the 125 homes for which hourly use data was available in order to determine hourly savings during periods when the system was at peak demand.

The analysis models hourly use with hourly weather data, which enabled Integral Analytics to determine how the retrofits reduced energy use on the warmest summer days and the coldest winter days when the system was at peak demand. This model predicts how the retrofitted homes would perform during a typical meteorological day. The graphs below show the average hourly demand for each peak season. The difference between the pre-project line and the post-project line is the average hourly demand savings per home. The difference between the two lines over the entire year is the annual energy saved.

Figure 6 - Average Daily Load Shape by Season (kW)



The load shapes illustrate a substantial reduction in average use during peak hours. The reduced summer and winter loads make more efficient use of the distribution system, but the financial impact on the co-ops and the Central Electric system is determined by the load factor. Calculating load factor is a matter of dividing average energy by peak hourly demand. A higher load factor is desirable because it means the load is more constant. A more constant load is less expensive to serve because less money is needed to build or buy peak generation, transmission and distribution resources.

Integral Analytics conducted a billing data analysis on the homes with hourly data to calculate pre-project use during system peaks in a TMY. The table below shows what this model estimates the load factor to be before and after a HMH retrofit.

Table 9 - TMY Average Participant Load Factor Change (System Peak)

	Pre-Project (TMY weather normalized)			Post-project (TMY weather normalized)			Change in Load Fct
Month	**Avg kW**	**Peak kW**	**Load Fct**	**Avg kW**	**Peak kW**	**Load Fct**	
January	5.53	7.22	0.77	3.16	3.92	0.81	5%
February	4.74	6.74	0.70	2.82	3.75	0.75	7%
March	2.93	3.13	0.94	1.89	2.13	0.88	-5%
April	2.95	3.19	0.92	1.99	2.06	0.97	4%
May	2.87	3.99	0.72	2.01	3.04	0.66	-9%
June	3.52	5.08	0.69	2.48	3.70	0.67	-3%
July	3.76	5.03	0.75	2.69	3.66	0.73	-2%
August	3.52	4.54	0.78	2.48	3.12	0.79	2%
September	3.22	4.75	0.68	2.23	3.42	0.65	-4%
October	2.78	3.61	0.77	2.25	2.99	0.75	-2%
November	2.80	3.40	0.82	2.29	2.79	0.82	-1%
December	5.22	5.85	0.89	3.02	3.30	0.91	3%
Total			**0.78**			**0.78**	**0%**

Table 9 shows a reduction in average kW and peak kW occurring in all 12 months. Load factor, however, is a function of the relationship between average use and use during system peak. Use drops every month during the coincident peak, but the load factor increases in some months and decreases in other months. The net impact on load factor over the year is 0 percent. According to this analysis, homes that have undergone HMH retrofits would have no effect on system load factor.

The HMH pilot did not include any load management measures because doing so would have introduced additional variables into the analysis and weakened the co-ops' ability to draw conclusions on cost-effectiveness of the efficiency measures. The South Carolina co-ops have an

existing demand reduction program which includes the installation of over 120,000 water heater switches and air conditioner control devices. To bring more value to the cooperatives and their members, demand reduction devices could be installed on homes receiving energy efficiency retrofits. A water heater switch reduces demand by 0.7kW in the winter time and 0.3kW in the summer. An air conditioner switch reduces the summer time peak an additional 1.0kW. Any combination of load reduction devices brings additional value to an efficiency retrofit program.

Value of Demand Savings

The residential member does not benefit directly from demand savings because the residential kWh rate is the same no matter when the electricity is used, and there is no demand charge. Several co-ops have time-of-use rates in the residential rate class, but they are rarely used by co-op members.

The distribution co-op, however, can benefit from demand savings. The value of demand savings to the co-ops is driven by wholesale power contracts that have significant demand components and can be as much as $15/kW per month. The price is higher for the power purchased during system peaks because Central pays more to suppliers during system peaks. Central buys most of its power from two generators: Santee Cooper and Duke Energy. The power they purchase consists of both monthly and annual demand charges on peak hours.

The analysis by Integral Analytics looked at demand during system peak hours each month and calculated a load factor, which is simply the average demand divided by peak demand. For a home to have a 100 percent load factor, it would use the same amount of energy for each hour of the year. The load factor for all South Carolina co-ops is 45 percent, which is below average compared to systems around the country.

For the distribution utility, reducing demand during coincident peak hours reduces expenditures for power purchase, and one to two kW per month in load management switches provide a counterbalance for some of the lost revenue that is caused by energy efficiency.

Member Satisfaction with the Pilot

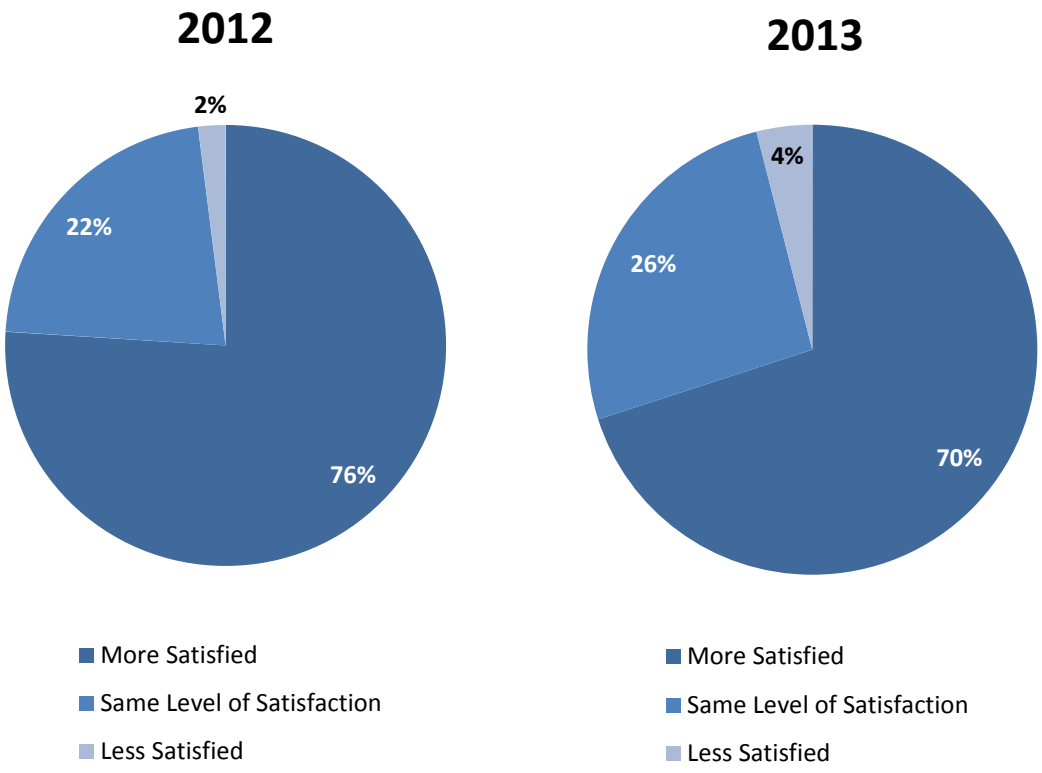
Carton Donofrio Partners conducted two surveys after the HMH retrofits were complete. The first survey was conducted in early 2012, shortly after energy efficiency measures were installed but before participants had a good sense of how their homes were performing. This survey included participants as well as co-op members who knew of the pilot but did not participate. The second survey was conducted in March and April of 2013, a full year after the HMH homes had been retrofitted, and included only those consumers who participated in and completed the program.

The first survey provides a view into the opinions of both the participants and those who had been contacted about the pilot but did not participate. The vast majority (92 percent) of co-op members contacted about the pilot had the same or higher satisfaction with their co-op as a result of being contacted. Seventy-four percent of non-participants felt the same or higher satisfaction as a result of the program. This number is surprisingly high considering the fact that many of the members contacted about the program were on a high bill complaint list. The few non-participants who were

less satisfied were disappointed that their homes did not qualify for the pilot despite high energy bills.

Both surveys asked participants about the level of satisfaction with the co-op compared to one year prior. Ninety-eight percent of the participants surveyed in 2012 had the same or higher level of satisfaction with the co-op compared to the previous year. In the 2013 survey, this number dropped slightly to 96 percent.

Figure 7 - HMH Participants Overall Co-op Satisfaction Compared to Year Before



Nearly all participants (96 percent) in the 2012 survey were satisfied with the installation of the efficiency measures. The same percentage of participants (96 percent) responded that they felt their homes were more comfortable after the improvements. The second survey reaffirmed the findings of a year earlier. In fact, 70 percent of program participants showed they are even more satisfied one year later.

Comfort is likely an important reason for this high level of satisfaction. After living in their newly efficient homes for a full year, 76 percent of program participants say their homes are a lot more comfortable, while an additional 13 percent say their homes are somewhat more comfortable.

In addition, participants are generally happy about their energy bills. Specifically, 89 percent of participants are either somewhat satisfied or very satisfied with post-retrofit electricity bills.

Another important reason why participants had such a positive reaction to the program is that most would not have been able to afford to make the kind of energy efficiency improvements that were implemented in the HMH pilot. The survey asked participants about different program aspects. Ninety-one percent said they "like it a lot" that the improvements performed on the home were completely financed by the loan. The survey found that 64 percent had annual household incomes under $45,000.

The results of the Carton Donofrio surveys are consistent with studies around the country about energy efficiency programs.[7] Participants in whole-house retrofit programs generally feel their homes are more comfortable as a result of the efficiency improvements, and they value that additional comfort.

Case Studies

The Norsworthy Home in Summerton

Table 10

Norsworthy Home Summerton, SC Santee Electric
Site built home, 1979
Size: 2013 sq. ft., 3 bedrooms
Energy efficiency measures: New heat pump, duct sealing, air sealing, attic insulation
Loan amount: $6,540

Before their home was retrofitted through the Help My House pilot in early 2012, Teri and John Norsworthy, both retired and living on fixed incomes, routinely paid high electricity bills. "Last year our electric bill went as high as $500 in one month," Teri explained. The couple, whose home is served by Santee Electric, jumped at the chance to participate in HMH pilot. An initial audit showed that their home needed insulation, a new heat pump, duct sealing and air sealing.

"Today," says Teri, "our home stays at the temperature we set the thermostat on and the entire home is very comfortable." Electric bills are way down to "between $150 and $200 less a month." Her husband John agrees, saying "you save enough to more than pay for the work. It doesn't make sense to me that anybody wouldn't do it."

The Jones Home in Hemingway

Another Santee Electric member — Andrea Jones, 42 — has sung the praises of her cooperative and the Help My House program to friends and neighbors since work was completed in early 2012 on the double-wide manufactured home owned by her and her mother, Betty, who died in April 2013.

The Joneses' contractor, Carolina Green Energy Systems, repaired and installed new duct work, blew 27 bags of insulation into the attic, patched holes under the home and replaced the original electric furnace and air conditioning units with a high efficiency heat pump. "Also, there was a hole

[7] Two of the many sources are papers presented at the ACEEE Summer Study on Energy Efficiency in Buildings cover this. Leah Fuchs was the lead author for 2004 paper and Greg Clendenning for a 2012 paper.

in the wall from when our home was installed," said Jones. "We have a fireplace, and it was behind the fireplace. [The contractor] said it was a big gigantic hole, and that's where a lot of the air was escaping."

The hole and other air leaks were sealed, and the remaining measures were addressed at a total cost of $8,400. Before Help My House, the Joneses were routinely paying monthly electric bills of $500 to $700 for their home, a 2006 model. "Our December 2010 bill was $779," said Jones. "Since the work was finished, our highest bill was $277." Those substantial monthly savings resulted in a return on investment in just two and a half years.

Table 11

Jones Home Hemingway, SC Santee Electric
Manufactured home, 2006
Size: 1976 sq. ft.
Energy efficiency measures: New heat pump, duct sealing, air sealing, attic insulation
Loan amount: $8,400

The savings on her electric bill have come at a very good time for Jones. She has been out of work since her mother's death. She also recently underwent surgery, and she shares the home with her two young children, ages 2 and 8. She says not only do the energy savings easily cover the $69 per-month loan payments added to her electric bill, but the house is also more comfortable and even seems like a healthier place to live.

"Comfort is much better," said Jones. "The family room, the biggest room, was the coldest room in winter and, in the summer it would be the hottest room. It is the furthest room from the (HVAC) unit. Now it is comfortable. Seems like the air is better to breathe, too. I tell people to go to Santee Electric and ask them about the program."

Feedback from Contractors and Co-op Program Staff

HMH program staff hosted a meeting in January 2012 to hear feedback from the contractors who installed the measures in the pilot program homes. Representatives from 14 of the 16 contractors who did any work on the pilot attended the meeting. They stressed the value of the co-op serving as a "trusted adviser" to the homeowners, making them feel more comfortable in agreeing to efficiency measures that were less familiar to them. The contractors asked that co-ops continue playing this role and convert the pilot to an ongoing energy efficiency loan program. They also offered useful ideas, such as requiring auditors to call the contractor immediately if any problems are found on the final inspection. The contractors added that the HMH pilot did a good job overall on managing the expectations of participants but could do even more to inform homeowners about the benefits of air sealing and blower-door testing.

Lead staff from the eight participating co-ops provided detailed feedback to the implementation team via in-person presentations. Six saw a need for an OBF program and four expressed an interest in launching similar programs at their co-op. The co-ops praised the contractors for their constructive and positive reaction to quality assurance visits and noted that contractors routinely went above and beyond the scope of work without additional compensation. All of the co-ops recommended

streamlining the process to save money and expedite projects. Some of the ideas for streamlining included:

- Minimizing the number of visits to the home
- Reducing audit time by using a 'pressure pan' for testing duct leakage instead of a duct blaster
- Providing a check list as a scope of work to contractors

None of the participating co-ops showed interest in a long-term, full-scale program when the pilot began. At the end of the pilot, however, four of the participating co-ops expressed interest, and two others indicated they would be interested in a statewide program if Central's board decided to launch one in the future.

After the HMH pilot was over, those co-ops interested in pursuing OBF formed a working group and began meeting. Six members of the working group filled out a short form about their goals and motivations. Five of the six listed "help members, improve satisfaction" as the primary goal.

Ecova, the contractor that supported implementation of the pilot, presented detailed recommendations to the working group about the transition from a pilot to an ongoing program. Some of these recommendations included:

- Design the program to be scalable to keep the quality up and response times down if demand grows.
- Consider employing tools to improve program operational efficiency, including streamlined and automated audit procedures and audit reports, program tracking software and customer relations management software to manage interactions with participants and prospective participants.
- Consider running larger scale programs as a way to reduce the cost for each home.
- Consistent procedures, standards, data management, branding and marketing materials among co-op programs will pay big dividends by providing stronger signals into the marketplace and to contractors and by freeing up staff time.
- A strong core support team led by Central, ECSC and KW Savings will enable many of these economies of scale to be realized.

HMH Spawns New OBF Programs

The positive results from the HMH pilot and positive consumer reaction have convinced more South Carolina co-ops to move ahead with OBF programs. Three of the eight co-ops that participated in the pilot have initiated ongoing OBF programs.

- Aiken Electric used Ecova as a turn-key implementation contractor in the pilot, but decided to staff their ongoing program themselves. They launched in the spring of 2012 using their own

funds to provide loans. Since then they have received a loan from the REDLG program, streamlined the process used in the pilot and issued 80 loans for completed projects.

- Black River Electric has been providing loans using their own funds over the last year, lending more than $100,000 at 5 percent interest. This interest rate exceeds the threshold in the South Carolina statute. As a result, the co-op is not empowered to tie loans to the meter or to disconnect for non-payment. Black River is performing credit checks and filing UCC-1 forms with the Secretary of State to give public notice of its security interest in appliances and other goods financed by the loan.
- Santee Electric launched its OBF program in February 2013 by funding its own loans. They are now looking into applying for a $1 million REDLG loan to expand and sustain the program.

Two other South Carolina co-ops who observed the HMH pilot are making efforts towards OBF programs.

- Lynches River is working on an application for a REDLG loan.
- York Electric is running a small OBF pilot, using their own funds, to test an approach in which homes will receive the same kind of energy efficiency measures offered in HMH but also have load management switches installed to reduce peak use.

The Co-op Business Case for OBF

The HMH pilot provides some of the information distribution co-ops need to develop a "business case" for OBF. The business case is important because deciding to invest in an OBF program and deciding the scale of the program are both important financial decisions for a co-op.

The most important part of the business case is not financial, though financial considerations are important. Co-ops are owned by their members, and member satisfaction is a critical metric. This has been true over the 75 year history of electric co-ops in South Carolina, but may be even truer today. Many utility industry experts see the tide changing from a "commodity-centric model to a consumer-centric model."[8] Co-op members around the country are beginning to have more choices for energy related services. They can install solar panels or download apps for their phone to better manage their energy use. If co-ops are to stay relevant to their members, many believe they will have to offer more value through more and better energy services.

HMH, though a startup with new staff and a pilot program with lots of process and data collection, had a positive impact on member satisfaction. The How$mart™ program operated by Midwest

[8] National Rural Electric Cooperative Association. 2013. "The Electric Cooperative Purpose: A Compass for the 21st Century". NRECA, Arlington, VA.

Energy in Kansas, which served as one of the models for HMH, also produces member satisfaction gains.[9]

One aspect of energy efficiency that receives a lot of attention from utilities is that, in the short term, energy efficiency reduces revenue. The financial impact on each co-op's bottom line depends on how its rates are structured. A co-op has fixed costs for equipment and personnel that do not change as sales rise or fall. The co-op also has variable costs, mostly for power purchases, that increase or decrease along with sales, depending on the terms of their power purchase agreement. Ideally, fixed costs are fully recovered by the service charge on each account. In this way, the drop in revenue can be compensated for by the reduction in variable cost of power purchases.

During periods when electricity demand is growing rapidly there seems to be less concern about lost revenue from energy efficiency. Increases in electricity demand are often more than enough to make up for the drop in sales that occurs in a small percentage of the homes that participate in an energy efficiency program.

The local co-op collects some of its revenue used to pay for fixed costs through the service charge. For most co-ops, the service charge is not enough to pay for all of the fixed costs. Fewer kilowatt hours sold would then necessitate painful budget cuts or revenue increases through higher service or energy charges (the price per kilowatt hour). The amount of revenue that must be made up depends on the percentage of fixed costs that are covered by the service charge.

Here is a simplified example of how reduced sales could impact electric rates. The example assumes that other factors effecting electric demand, wholesale electric rates and other costs do not change. In this example, the co-op is currently covering one-third of its fixed costs through a service charge and runs an OBF program for 10 years. Each year, 1 percent of the homes in their service territory participate for a total participation of 10 percent, which would be a program much larger than any program currently operating in South Carolina. If each home in the program reduced their use by 30 percent, the residential class would see an aggregated 3 percent reduction in energy use. At the end of the 10 year period, this co-op would be collecting about 2 percent less revenue to cover distribution expenses as a result of the reduced sales due to the program. If this co-op decided they would make up for the entire 2 percent drop in revenue to cover distribution expenses over the 10 year period by increasing the energy charge, the kWh rate would have to increase by about 0.7 percent. The remainder of the 2 percent drop in revenue is offset by reducing costs for purchased energy.

Deploying load control is an attractive alternative to increasing rates. Load control on the water heaters and air conditioners on each home receiving a whole house retrofit would provide 0.8 to 1.0 kW of demand savings. This would offset about half of the lost revenue impact through reduced costs for peak power. Central is confident they can achieve this much demand savings per home

[9] Midwest Energy Survey shows 97 percent of participants rate their satisfaction with the co-op at the highest level compared to 85 percent of the general population, in spite of the fact that many participants in How$mart enter the program as high bill complaint customers.

with simple load control devices. There are two options for making up for the other half of the lost revenue. The load control program could be deployed in twice as many homes as receive whole house retrofits, or the demand savings per home could be increased with other load control devices or techniques. The latter option would be challenging.

Here is a hypothetical example of how an efficiency program could benefit co-op members even as the co-op experiences lower sales. In this example, shown in Table 12, it is assumed that a co-op serves everyone in the residential class with a program that would cut energy use by 30 percent. Assuming that it ran the program efficiently and passed all administrative costs through to the participants, using the previous example's rate structure, the co-op would have to raise its rates by 13.5 percent to make up for the lost revenue. However, as the participants cut their use by 30 percent, their overall electric bills are reduced by more than $300 per year, which is a 20 percent savings on the electric bill.

This is just a hypothetical example, as there is no evidence that an expanded HMH program or any other program can achieve 30 percent savings with every residential customer, but as a hypothetical example it shows how the cost of electric service to the co-op member could go down even as electric rates to cover distribution expenses go up.

Table 12 - Hypothetical Example of Cost Impact on Retail Members

100% Participation

	kWh use per month	Retail Rate Cents/kWh	Monthly Electric Bill	Monthly Savings	Annual Savings
Electric use before efficiency program	1,250	10.2	$127.50	- - - -	- - - -
Post Program 30% energy savings*	875	11.6	$101.25	$26.25	$315.00

Another important part of the business case is the long term financial impact. Barring significant market changes, such as the possibility of new carbon regulation, Central has an adequate supply of energy for many years based on the power purchase contracts it has in place. However, over a 10 or 20 year time frame, Central could be looking for more energy supply. Electricity demand is expected to begin to grow again after flattening over the last few years. Traditionally, electric power planners relied on centralized generation to supply demand growth, but over the last few decades energy efficiency has sometimes played a major role in the rate of demand growth. A growing number of utilities consider energy efficiency to be a legitimate resource option on par with new generation and, consequently, develop integrated resource plans to evaluate their options.

The cost of the energy savings from an OBF program could be quite low. It is possible that a program could be set up to recover completely its costs through an adder calculated as a percent of the loan balance. However, even if the cost were $500 per home, and the homes saved about 5000

kWhs per year, which is half what the HMH homes are saving, the levelized cost for these savings over a 10 year period is about 1 cent/kWh. This assumes the load factor remains the same.

Central is currently paying a levelized cost of about 7 cents/kWh. In 10 years, Central could be on the market to buy energy at this cost or more. If, during that time, just 100,000 homes cut their energy use by 5000 kWh per year, that is a savings of about 6 cents/kWh on about 500,000 MWhs each year, or about $30 million annually.

Could HMH Be Scaled Up?

In the 1980s, co-ops in South Carolina began to see the advantages of load management. They understood that the advantages to the electric system depended on the scale of the load management effort. Since that time, the state's cooperatives have deployed some 120,000 load control switches on equipment in co-op service territory.

South Carolina co-ops will decide if the business case for OBF is sufficiently strong to consider scaling up programs. The feasibility of scaling up an OBF program depends on the answers to several questions.

How many homes in South Carolina have the potential for these kinds of savings?
The homes in HMH were not selected randomly and are not a representative sample of homes in South Carolina co-op service territory. No attempt was made to make the HMH sample representative, apart from ensuring a mix of manufactured and site-built housing. Only electrically heated homes were eligible. Co-ops were advised to seek homes that were good candidates for whole house retrofits, namely, homes with above average energy use.

One can compare the HMH sample to the homes in co-op territory throughout South Carolina, by using a survey recently conducted by Central Electric. This recurring survey, which Central refers to as the "Appliance Saturation Survey," is a very large sample of about 1,000 homes per co-op in South Carolina, which totals about 20,000 homes in total. This sample is a good representation of the population of homes in South Carolina service territory. The table below compares the HMH sample to the appliance survey.

Table 13 - Comparing Samples

	HMH Homes	Appliance Survey Homes
Electricity is the primary heat source	100%	73%
Housing Type		
Site built	42%	68%
Manufactured home	58%	26%
Other	0%	6%
Average size of site built	1808 sq. ft.	1964 sq. ft.
Average size of manufactured homes	1783 sq. ft.	1403 sq. ft.

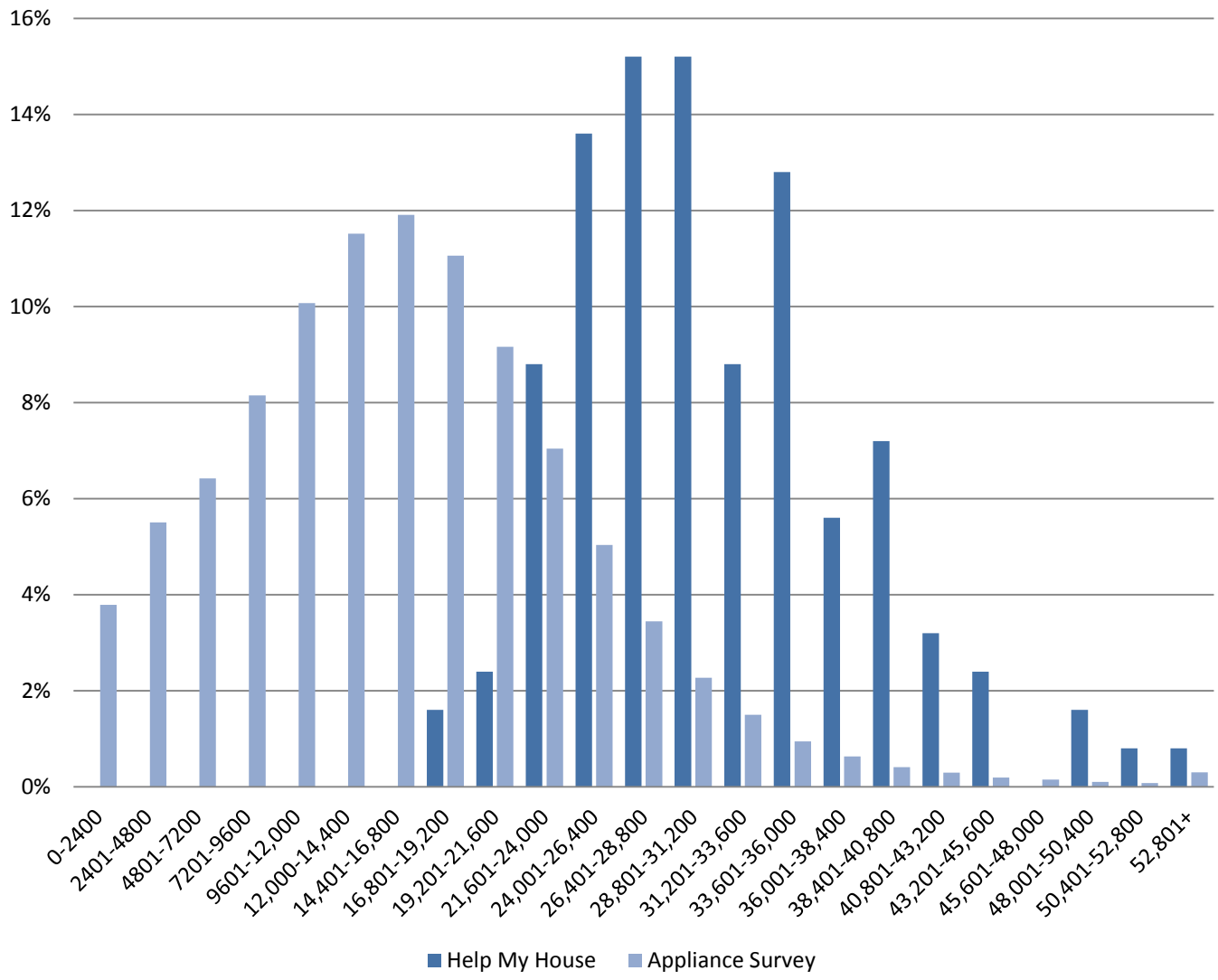
Table 13 shows some clear differences between the sample of HMH homes and the population. Part of this difference stems from the electric heat eligibility requirement because manufactured housing is more likely to be electrically heated than single family detached homes.

The HMH homes consumed much more energy than the average. The table below compares the monthly electric consumption for HMH homes, before they were retrofitted, to the population of homes in South Carolina's co-op service territories as represented in the Appliance Saturation Survey. HMH homes could be expected to use more electricity for no other reason than they were all electrically heated.

Every HMH home had energy use that was in the top third of homes in South Carolina co-op territory. Figure 8 shows a dramatic difference, but it cannot, by itself, quantify the number of homes in South Carolina that are good candidates for OBF. It would take a detailed look at the energy efficiency potential of homes around South Carolina to provide this information.

Looking closely at electricity consumption provides one perspective on the number of homes that might be good candidates for OBF, as homes with higher than average energy use are likely to provide opportunities for energy savings sufficient to cover loan payments. Another perspective is to look at tying the overall program to heat pump replacement. There are about 400,000 heat pumps installed in the 650,000 homes in co-op service territory in South Carolina. If only 5 percent of those are replaced each year, this would amount to 20,000 new heat pumps installed annually. If an OBF program could be set up to serve this emergency replacement market and designed to be widely used by residential HVAC contractors, a sizable portion of this market could be attracted. It would be attractive to many homeowners if it was convenient with low interest and a 10-year term. Furthermore, the loans could be used to pay for insulation and air sealing as well.

Figure 8 – Electricity Consumption/Year (kWhs)



How much money would it take to run a scaled-up program?

- The HMH program was a high touch, administratively complex program, requiring a large effort for planning and training. Timelines were tight, and an enormous amount of data was gathered and compiled. The HMH pilot was designed as a research pilot rather than a model of lean and efficient program administration.
- There are many ways to streamline an OBF program. Aiken Electric has been issuing loans for about a year and has been able to cut back on the administrative processes and auditing effort. For example, Aiken has determined that double wide manufactured homes, which are very common among program participants, can receive simpler audits because the homogenous quality of these homes provides an opportunity for a more standardized approach to measure identification.

- The HMH program was just 125 homes spread across eight co-ops. Scaled up programs could reach hundreds of homes in a single co-op. The higher volume would justify some readily available software tools that would greatly reduce program administration. Software is available to do program tracking, customer relations management and even scheduling.
- Larger program volumes provide the opportunity for outsourcing some or all of the program administration. Contractors who specialize in planning, marketing, contractor management or even turnkey implementation are available.
- It is quite common for loan programs to charge fees to borrowers to cover administrative costs. Could a fee of 3 to 5 percent on the outstanding loan principal could be enough to cover the administrative costs of running a lean but scaled-up program? Independent analysis by Ecova, by the managers of the How$mart™ program in Kansas and by Central suggest the answer is "yes."

Are there financial and human resources available for a scaled-up program?

- Financing for energy efficiency is available. The USDA has been providing REDLG loans and is proposing a change in the rules for RUS loans that would enable hundreds of millions of loans to co-ops for energy efficiency loan programs. CoBank and the National Rural Utilities Cooperative Finance Corporation (CFC) are both willing to loan for energy efficiency programs. Some co-ops are willing to use their own funds for loan programs.
- Finding the funds for program marketing and administration will be a problem, unless the program is streamlined and runs at a sufficient scale that these costs can be fully recovered by a project fee, calculated as a percent of the loan balance.
- Contractors were attracted to the HMH program and appeared willing to hire more help if business grew. They were eager to see the program grow and sounded confident that there was a major local market for home energy efficiency projects.

Other Accomplishments

The HMH Pilot has succeeded in addressing the goals of determining cost-effectiveness of whole-house measures in an OBF program. Along the way there have been several other accomplishments. The HMH Pilot has:

- Served as a model for national policy as the first energy efficiency effort to access USDA/RUS REDLG loan dollars for an On-Bill Financing program
- Been presented by South Carolina co-op leaders to officials at the White House Council on Environmental Quality, the U.S. Department of Energy, the U.S. Department of Agriculture, the Environmental Protection Agency, the Office of Management and Budget, the Aspen Institute Clean Energy Forum, the National Association of State Energy Offices, the Southeast Energy Efficiency Alliance, the Southwest Energy Efficiency Program and the Nicholas Institute at Duke University

- Been presented at a number of conferences, including the American Council for an Energy Efficiency Economy Summer Study, the Residential Energy Services Network conference and the Association of Energy Services Professionals Spring Conference
- Been aided substantially by the trust members have in their co-ops and been successful in transforming a high percentage of prospective participants into those with completed energy efficiency projects (of 151 homes approved to solicit bids, 125 projects were completed)
- Built a network of contractors who are investing in training and equipment, and who show a desire to adopt a business model offering more energy efficiency products and services
- Established an on-bill repayment structure, in which KW Savings handles loan funds obtained from the REDLG program and pays contractors. Co-ops collect the loan repayments and send this money back to KW Savings. At this point there have been some late payments but no loan defaults. The one home that burned down (for reasons unrelated to the energy efficiency work) is being called an ”inactive” account.

Conclusions

1) Continued high member satisfaction is a paramount goal of the South Carolina co-ops. The program, even as a pilot without a streamlined process, had a very positive impact on member satisfaction. One year after the pilot ended, 70 percent of participants said they were more satisfied with their co-op, and another 26 percent were just as satisfied. Even those members who were contacted by the program and did not receive a loan responded well. Seventy-four percent of these non-participants responding to a survey shortly after the pilot ended said they were as satisfied or more satisfied with their co-op, which is somewhat surprising because many of these non-participants wanted to be involved in the program but were not eligible for various reasons.

   South Carolina co-ops that participated in the HMH pilot also expressed satisfaction with implementing the pilot. When the HMH pilot concluded, four participating co-ops and four non-participating co-ops expressed interest in moving ahead with OBF, and all but one cited the importance of serving members as their primary reason. Co-ops around the country see member services as important, too. A recent high-profile planning group working with the NRECA on a vision for co-ops in the future underscored the need for more comprehensive and consumer-centric energy services as a key to member satisfaction.

2) The energy efficiency measures installed in the HMH pilot are performing well. The average home is saving 10,809 kWhs per year (about 34 percent of electricity use) and reducing energy costs by $1,157. Following one year of post-retrofit bill analysis and monitoring, the actual savings was about 93 percent of what was predicted by the initial comprehensive audits.
3) Homes that were retrofit in HMH are reducing coincident peak use in almost exactly the same proportion as the reduction in energy use.

4) HMH homes benefit the environment. The average HMH home reduces about 10.8 metric tons of CO2 emissions in a TMY, based on Central's estimate of 1 ton/MWH. Altogether, the 125 homes reduced emissions by approximately 1,350 metric tons of CO2 per year. If 200,000 homes in South Carolina achieved the same level of savings as HMH, the emission reduction would be about 2.4 million metric tons of CO2/year.

5) Whole house retrofits with OBF can produce a positive cash flow such that energy savings each year are more than sufficient to cover the member's payments for the full 10 year term on a 2.5 percent loan. More than 80 percent of the HMH homes are saving more each year than their loan payments. Of the 23 homes that are not producing a positive cash flow, 19 of them are within $10/month of being positive. Once the 10 year loan is paid off, all participants will enjoy savings until the end of the life of the energy efficiency measures. HVAC measures typically last 15 years, and insulation measures last much longer.

6) Whole house retrofits, if they were accompanied by load control switches on water heaters or air conditioners, would result in higher load factor. The HMH homes' coincident peak savings were about the same percentage as the overall energy savings. If these homes had been equipped with load control devices, the net effect on load factor would have been positive.

7) The HMH pilot was effective in reaching members with high bills and greatly reducing their energy use. The pilot's ability to provide OBF without checking credit appears to be a critical factor. The market research firm stated that most HMH participants would not have been able to purchase a retrofit without the financing offered through the program.

8) Not all South Carolina homes are good candidates for OBF. A precise estimate of the percentage of homes that would be good candidates for OBF would require additional data collection and analysis. Nonetheless, a cursory look at the number of homes in co-op territory that have higher than average energy use, combined with the number of homes that replace heat pumps each year, suggests that the market could be quite large.

9) The pilot program was not intended to be a model of a streamlined program design. The HMH pilot succeeded in demonstrating some aspects of a program design, such as the cost-effectiveness of a package of retrofit measures, the strength of a centralized support structure and the appeal to members of 100 percent financing. The HMH pilot had a target of just 100 homes and was not meant to be the start of an ongoing process. For this reason little effort was made to automate processes. The data intensive nature of the pilot made it a resource and time intensive process.

10) There are advantages of co-ops working together in a coordinated and consistent manner. A few of those advantages include:

    a) A group of co-ops could achieve a larger scale program, which then makes additional tools and resources affordable.
    b) A group of co-ops working on a larger scale will be able to attract and better manage contractors, which will improve quality assurance.
    c) A branded and consistent program operating in many co-op territories will make it easier to market and control quality.
    d) Co-ops will be better able to share information and lessons learned.

An important achievement of the HMH pilot was the structure that combined the efforts of the participating co-ops with a central administrative support function. All but one of the participating co-ops handled the customer-facing responsibilities. Some co-ops chose to play a larger role in the field work. A strong centralized administrative team, working with KW Savings, the non-profit formed by Central and Statewide to administer loan monies, set up consistent procedures, hired auditors and recruited and managed contractors. In the end, the HMH pilot encouraged flexibility to address local needs, with participating co-ops able to play somewhat different roles while the overall program maintained consistent standards and a common brand. Finally, the program also collected a vast amount of data in a consistent manner.

11) Perhaps the most telling result of the pilot is the participating co-ops' change in perspective on OBF programs. As the pilot began, none of the co-ops involved had expressed any intention to offer an ongoing OBF program. Since the pilot ended, three co-ops have launched their own OBF programs, and two co-ops that had not participated in the pilot are taking steps towards launching their own OBF program.

12) The business case, in sum, for a co-op to implement an OBF program is:

    a) In the short term

        i) Participants have a very positive experience. Member satisfaction will increase with a well-run program. High bill customers can experience some of the largest reductions.

        ii) Load factor impacts appear to be minimal or nonexistent. Peak loads are coming down in about the same proportion of overall energy use.

        iii) The energy savings will create lower sales and lost revenue. However, if even 10 percent of the homes in a co-op participated, the rate increase necessary to recover this revenue would be less than 1 percent.

    b) In the long term

        i) Deferred generation investment is not a big item for South Carolina co-ops now, after experiencing lower demand growth the last several years. When the need for more power becomes an issue, energy efficiency is likely to cost less than 2 cents per kWh compared to new generation, which will cost much more.

Recommendations

Central Electric makes the following recommendations:

1) Based on the HMH pilot success, South Carolina co-ops are encouraged to consider going forward with an on-bill financing program, as the program can be a great service to their members. In addition, by incorporating load control deployment, the program could improve load factor, which is a system benefit to even the non-participants.

2) South Carolina co-ops that decide to pursue OBF should collaborate with other co-ops in the state as well as with state and national organizations in order to standardize the program

offering. This collaboration can bring economies of scale to all parties in ways that will reduce program costs and improve program quality.

3) South Carolina co-ops that pursue OBF should agree on a centralized support function that will improve the efficiency and the quality of program delivery. This support function could be paid for with a small charge added to the loans in the program. KW Savings is an important part of the centralized support and can help all the co-ops protect the HMH brand. The brand and the centralized structure have momentum with contractors.

4) Co-ops should consider incorporating program design features into OBF programs to enable the program to handle emergency replacement of HVAC and water heater equipment. This program can also support the replacement of aging but not yet failed equipment.

5) Central should develop a load management strategy that can be added to the HMH model in order to ensure a positive impact on load factor. Central should assist in a field trial of this strategy and continue to monitor and enhance the performance of homes in the program during system peaks.

6) Central, ECSC and KW Savings should facilitate the development of business plans for interested co-ops who are pursuing an ongoing OBF program. These business plans should consider what a centralized support function could look like, and weigh the pros and cons of different scales of effort. The business plans should be written after fully exploring the many models of streamlined whole house programs around the country. How$mart™ Program administrators at Midwest Energy in Kansas believe it is possible to recover fully all OBF program costs for loans and for program administration and marketing if the program were scaled up and equipped with the proper support. Fully recovering these costs would require a fee, calculated as a percent of the loan balance. There are a host of resources that could be deployed to help a scaled-up program run efficiently, from software programs to training to implementation contractors.

7) Central should consider integrating additional technologies such as distributed generation and distributed storage into an ongoing, growing OBF program. A program this comprehensive could be an effective tool for the distribution system and an asset for member services. Such an integrated program could be a step towards the very likely future of co-ops becoming energy services providers and not solely electricity providers.

ATTACHMENT A

South Carolina Co-ops