The Greatest Generation: A New Retail Store Model for Delivering Energy Efficiency in Massachusetts

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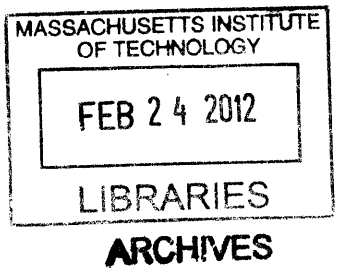

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This thesis is dedicated to my parents and family who have done what they could to be there for me throughout graduate school. Completing my graduate education is an accomplishment they should find great pride in. Look at how far we have come.

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This thesis represents an evolution of ideas and is really just a beginning. I look forward to the discussions and collaboration that may follow. Please reach me at elijah.hutchinson@gmail.com with any questions, thoughts, or comments.

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A New Retail Store Model for Delivering Energy Efficiency in Massachusetts

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Abstract

The mitigation of greenhouse gases (GHG) and reduced energy consumption in the United States has proven to be a great challenge in the face of climate change. While technological innovation and renewable energy continue to evolve and scale to meet growing energy demands, energy efficiency has been identified as a key resource for achieving climate objectives in a cost-effective and timely manner. Within Massachusetts, much work has been done by regulators, utilities, community groups, businesses, and individuals to enable energy efficiency at various scales and through various frameworks. Yet, for many within the state and across the country, the ability to access efficiency gains has been limited by identified market barriers, program structures, knowledge gaps, supply-chain complexity, perceived benefit and even general apathy towards energy efficiency. As available program resources become more limited and the economy retracts, the need for innovative and sustainable program models has created a moment of opportunity to reconsider the way in which utilities deliver energy efficiency. Based on previous program evaluations, interviews, new case studies, and market information, what follows is an investigation into a proposed retail store model for energy efficiency products and services. This thesis is an investigation into the elements of retail store that could make the model viable in Massachusetts, the benefits and costs of such a model, and a review of how energy efficiency and retail stores work to encourage consumers to purchase efficiency. A proposed retail store, "The Greatest Generation", addresses many of the market transformation barriers for energy efficiency while providing a consumer-focused platform that is scalable, cost-effective for utilities, and more able to penetrate the market for energy efficiency. The development of a pilot utility-funded retail store using a third-party private operator is a viable option within Massachusetts to address climate change.

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Introduction

Energy efficiency has been the goal of several policies and programs across the United States since the volatility of oil prices spawned conservation awareness in the 1970s. Four decades later, there is a broader understanding that energy efficiency, or getting the most value out of the energy we consume, is vital to our national security, climate objectives, and our desire to maximize cost-savings when possible. On multiple scales, from the individual to the federal government, there exists a complex interaction of public policy, popular culture, and personal choice that impacts how effectively our resources are used. And yet, few combinations have worked to produce lasting change suitable enough to manage climate change.

The problems have been defined, and the solution is not singular. A few states, like Massachusetts, California, and New York have been at the forefront of creating incentives and policies, modernized energy resources, and fostering innovation to create bold and new strategies—the limits of which typically fall within the bounds of technical, budgetary, and programmatic barriers. Underlying these barriers are the challenges in demonstrating that market and adoption barriers can be overcome through political will, available capital, and popular or organized community support. However, many approaches or models have been tried and are in the process of producing real gains in efficiency that perhaps best exemplify what can be done to unlock the potential impact of energy efficiency.

Globally, we are at a threshold moment for climate change considering future emissions scenarios. Climate models indicate that emissions from energy and non-energy sources could stabilize at the atmospheric concentration of CO^2 at 430 parts per million (ppm) and a mean warming of 1.3°C if *no additional* CO^2 emitting devices are built and all existing carbon producing devices were allowed to live out their useful lifespan.[1] In other words, with 450 ppm and 2°C being the widely agreed upon international benchmark for climate goals, climate change will result unless a proposed climate solution is an indefinite ban on any device that uses or produces CO^2. While few would call that a viable possible solution, the upside is that the

[1] "Future CO2 Emissions and Climate Change from Existing Energy Infrastructure", Science 329. 2010.

most threatening sources of emissions have yet to be built. How we will manage our emissions growth is unclear, but energy efficiency is one of the most cost-effective means to achieve much of the energy savings needed.[2] Reviewing recent energy efficiency programs across the United States, savings range widely depending on program components and available resources.[3] However, it is estimated that energy efficiency may be able to meet 50 percent or more of expected growth in energy demand in the United States by 2025.[4] To hold global GHG emissions stable, developed countries like the United States need to reduce GHG emissions by 75% by 2050. According to the American Institute for Architects, buildings in the United States account for an estimated 10% of global emission, making building retrofits a vital tool in battling climate change.

Massachusetts has had a unique role within the United States in addressing climate change through energy efficiency. According to the American Council for an Energy-Efficiency Economy (ACEEE), Massachusetts ranks the best state in the nation for leadership in energy efficiency and program delivery. Massachusetts plans to generate $6 billion in energy savings from $2.1 billion of investment in energy efficiency in electricity and natural gas through the Green Communities Act of 2008 (GCA). GCA makes energy efficiency the state's "first fuel" by establishing that electric and gas resource needs are first met through all available, cost-effective energy efficiency and demand reduction resources. The Energy Efficiency Advisory Council (EEAC) established by the GCA collaborates with electric and gas utilities over a three-year planning cycle to achieve 2.4% in electricity savings and 1.5% of gas savings in 2012. These are the most aggressive state efficiency standards in the nation.[5]

As a result of GCA, plans implemented by gas and electric distributers are working to create a sustained shift in the way we use energy, making energy efficiency an important part of the state's available energy portfolio. These investments put Massachusetts on track to reducing GHG emissions by 5 to 6% over the first three year of GCA. In the first year of implementation,

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[2] "Understanding Cost-Effectiveness of Energy Efficiency Programs", National Action Plan for Energy Efficiency. November 2008.
[3] "Driving Demand for Home Energy Improvements". Lawrence Berkeley National Laboratory. September, 2010.
[4] "Vision for 2025", National Action Plan for Energy Efficiency. November 2008.
[5] "The 2011 State Energy Efficiency Scorecard", American Council for an Energy-Efficient Economy. October 2011.

electric and gas savings have achieved targeted savings goals, saving enough energy to power 85,000 households and heat 14,000 homes annually—the GHG emissions equivalent of removing 74,000 cars from the road. This has been achieved spending 10% less than budgeted and has created or retained nearly 4,000 jobs within Massachusetts.[6] These aggressive efficiency savings were achieved through working with the resources and capacities of utilities, underscoring the important role utilities can play in advancing programs addressing efficiency.

Beyond the efficiency gains from GCA, the Global Warming Solutions Act of 2008 (GWSA) commits the state of Massachusetts to reducing GHG emissions 25% below 1990 levels by 2020 and a further reduction to 80% below 1990 levels by 2050. Enabling the GWSA is Massachusetts' Clean Energy and Climate Plan for 2020. Released in 2011, the plan calls for meeting reduction goals by calling for policies and programs that reduce GHG emissions from the building stock of Massachusetts by 9.8%, which includes a 7.1% reduction in building emissions through cost-effective energy efficiency alone. Targeting the building stock is critical for achieving energy savings as buildings consume more than 50% of the energy used in Massachusetts and are responsible for greatest GHG emissions for any sector.[7] As such, when accounting for potential resources for finding GHG emissions reductions, the building stock and energy efficiency account for almost a third of projected GHG savings.

Mass Save is the major program mechanism through which Massachusetts addresses efficiency and the building stock. Sponsored by the gas and electric utilities in Massachusetts and coordinated with the Massachusetts Department of Energy Resources (DOER), Mass Save is the platform used by utilities to redirect rate payer funds into subsidizing energy efficiency for their customers. Generally, utilities or Program Administrators (PAs) like NSTAR and National Grid contract with vendors like the not-for-profit Conservation Services Group (CSG) who then subcontract the audit and retrofit services to prequalified Independent Installation Contractors

[6] "Efficiency as our First Fuel: Strategic Investments in Massachusetts' First Fuel", Energy Efficiency Advisory Council. July 2011.

[7] "Massachusetts Clean Energy and Climate Plan for 2020", Office of the Secretary of Energy and Environmental Affairs. December 29, 2010.

(IIC) or Home Performance Contractors (HPCs).[8] This program structure is under regular review and evolves as program capacity grows and responds to the demands experienced in the marketplace.

In order to meet the requirements of GWSA according to DOER, what is needed now are newer initiatives and programs that access a greater number of customers, and get even greater energy savings for each of the customers accessed. Energy efficiency programs have had targeted savings of 5 to 10% of energy use, when now efficiency savings need to be targeted at 15 to 20% or beyond (exceeding 2% of retail sales).[9] Reports over the past two years have been produced which focus on the central challenges to achieving deeper efficiency to a broader customer base within Massachusetts. These have been published by the PAs and the EEAC, Northeast Energy Efficiency Partnerships (NEEP), American Council for an Energy Efficient Economy (ACEEE), Lawrence Berkeley National Lab (LBNL), The Green Justice Coalition (GJC), MIT's Energy Efficiency Strategy Project (EESP), and other stakeholder reports and academic papers. Found in these Massachusetts program reviews are common barriers with existing program models, especially related to serving hard to reach customers, access to financing, expanding the capacity and communication between contractors and vendors, marketing language, standardized data collection, limited penetration in the rental market, pre-weatherization issues, having too many steps in the audit and retrofit process, lack of vendor or contractor trust, and the challenges of going beyond achieving more than the most basic efficiency measures.[10, 11, 12, 13, 14, 15, 16]

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[8] "Massachusetts 2010 Residentail Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011.

[9] "Energy in Massachusetts: Energy Efficiency as "First Fuel", Massachusetts Department of Energy Resources. PowerPoint Presentation by Christina Halfpenny, Division Director, Energy Efficiency. 2011.

[10] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011.

[11] "Massachusetts Special and Cross-Sector Studies: Community-Based Partnership Interim Process Evaluation Findings", Opinion Dynamics Corporation and Evergreen Economics. July 2010.

[12] "A Regional Round-Up of Energy Efficiency Policy in the Northeast & Mid-Atlantic States", Northeast Energy Efficiency Partnership". Fall 2011.

[13] "The 2011 State Energy Efficiency Scorecard", American Council for an Energy-Efficient Economy. October 2011.

[14] "Driving Demand for Home Energy Improvements", Lawrence Berkeley National Laboratory. September 2010.

[15] "Moving Towards Community Driven Energy Efficiency", Green Justice Coalition. November 2011.

As the stakeholders in GCA engage in the next three year planning cycle for 2013 – 2015, innovative program models are needed that use investments of ratepayer funds dedicated to energy efficiency for targeted results. It is estimated that ratepayer funded efficiency could increase nationally by about 12% per year through 2020 resulting in a funding resource of $12 billion.[17] Utilities as PAs have played an instrumental role as a recipient of ratepayer funds in as much as they are able to demonstrate investment in cost effective efficiency measures. Traditionally, utilities function by providing energy distribution and generation resources to end users. However, as long energy efficiency is monetized, they have the interest and capacity to think sophisticatedly about how to earn money by not only producing energy, but also by saving energy. This is a paradigm shift for utilities in many ways—perhaps most significantly in that it requires a redefinition of their customer and purpose.

Utilities have an established infrastructure that at one end has the access to energy and at the other end has a customer or end user. No longer simply an energy seller, they can now create energy as a resource through energy efficiency and earn an income from energy savings. However, delivering energy efficiency requires a level of consumer engagement and collaboration that can be costly to many. The adoption of new technologies, unless regulated into the market, can be slow if consumer interest is low and perceived risk is high, making these utility-funded programs, subsidies, and coordinated energy services critical to enabling energy efficiency. But with these programs come new understandings of program and market barriers, as well as the opportunity to address these barriers to efficiency with new program strategies.

It is an imperative that new strategies for achieving broader and deeper efficiency in Massachusetts respond to these established barriers. It is also an imperative that new strategies are cost-effective at delivering efficiency, ensuring the smartest (and legal) investment of rate-payer funds. Out of the 2.7 million homes in Massachusetts, only about 2% of homes receive energy audits on an annual basis. Of those that do get audits, only about 20% yield retrofits. That roughly yields about 12,500 homes receiving some level of energy efficiency upgrades in

[16] "Community Energy Efficiency Programs: Identifying Challenges and Uncovering Solutions", MIT Energy Efficiency Strategy Project. July, 2010.

[17] Barbose, Galen et. al. "The shifting landscape of ratepayer-funded efficiency in the United States". The Electricity Journal. October, 2009.

2010.[18] Considering that over $40.4 million was spent by PAs in 2010 under the Mass Save program for electric and gas savings, it is costing Massachusetts about $3,200 to retrofit each home. Included in the $3,200 per home retrofit cost is about $1,800 of incentive funding per project. The balance of funds, or about $1,400 per home, goes to program administration, marketing, training, and program evaluation.[19, 20] Assuming program incentives and rebates remain the same (in fact, under Mass Save they are capped at $2,000 per household), one challenge for new strategies can be framed as follows: Can a new program model be developed whereby more than 12,500 households receive efficiency upgrades that go beyond the current 10% reductions in energy consumption? Another challenge for new programs may be to not have the aforementioned as a goal, but rather get similar energy savings and customer participation levels from sectors and markets not currently well accessed through existing programs, for example renters or other hard to reach populations.

GCA as a tool for program evaluation uses a Total Resource Cost Test (TRC Test) where the "benefits" of a program are weighed against the "costs" of a program. If the ratio of benefits over costs is greater than 1.00, it suggests that that a program is an appropriate investment under GCA. There are currently approximately 40 different programs under GCA which have TRC Tests ranging from 1.23 ("O Power" program gas benefit) to 6.56 ("C&I New Construction and Major Renovation – Government" program electric benefit).[21, 22] The TRC Test for the 2010 electrical benefit of Mass Save, as budgeted, has a benefit to cost ratio of 4.51 (equal to $44.5 million in costs divided by $201.1 million in net benefit).[23] Newer program models may not have a TRC Test as high as 4.51, but they may also be valuable and worthy of implementation because of their ability to access customers that are otherwise difficult to reach with existing

[18] Conservation Services Group, Steve Cowell, CEO. Presentation to "MIT 11.379: Enabling an Energy Efficient Society". October 18, 2010.
[19] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[20] "2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[21] Ibid
[22] "2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[23] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.

programs, target certain submarkets, or are used to leverage other technologies or programs beyond energy efficiency, such as solar installation or demand response for example. In fact, programs that have a TRC Test *below* 1.00 are also permitted as "pilot programs" and include the Community Mobilization Strategy (CMI) retrofit programs. These mostly residential outreach programs have benefits beyond energy savings and ensure broader participation in the benefits of GCA. A look at the TRC Test and existing programs tells us that a proposed program that is inclusive of hard to reach populations while having a TRC Test greater than 1.00 would be a novel opportunity. Also, as a benchmark against the Mass Save program, what can a new retrofit program do with $3,200 per household?

Why a Retail Store Strategy?

There are several challenges in accessing efficiency in the residential sector, the extent to which is made clear by existing program participation levels, the required outreach for CMI strategies, and the degree to which deeper retrofits are able to get completed. The first few years of Mass Save have accessed thousands of households, but program participation cannot rely on skimming the easiest to access customers who are the most proactive and patient program participants. In order to achieve climate goals in the near future, aggressive and innovative new models are going to be needed that access hard to reach customers, address multi-tenanted properties, and make getting retrofits a more enriching and enjoyable experience for consumers.

A one-stop-shop retail store model functioning as a vendor for utility-funded efficiency services and other energy technologies and services is an approach deserving further investigation. I hypothesize that energy efficiency in order to be scalable needs better commodification for it to be consumed at scale. The willingness of consumers to purchase energy efficiency partially depends on how efficiency is presented and explained. A retail model has several advantages: this innovation would emphasize messaging and branding; be nimble enough to adjust to changing technologies and markets; could be customized to meet local demand; and focus on a

customer-centered perspective that could shift energy efficiency from something a customer *needs to do* to something a customer *wants to do*. The challenge is to connect effectively with a consumer base or community and subsequently deliver services that satisfy customer interests, while meeting energy savings objectives within program budget allocations. A fully integrated utility-funded retail program model for energy efficiency products and services currently does not exist, but there are nascent beginnings of a shift for both utilities and the retail market in realizing the economic and climate potential of bringing energy efficiency into a retail store setting.

However, being a retail store alone does not address all existing program and market barriers. The advantages of retail are constrained by how the retail is designed, operated, and it's suite of offerings and services. Retail has the ability to make utility-sponsored energy efficiency programs more approachable, while also allowing vendors to customize energy efficiency plans that respond to the physical uniqueness of homes, and the unique interests of each customer. The more transparent interface permits a broader and more intimate customer engagement. Notwithstanding, while the retail store model in itself has its advantages, how that store is operated will ultimately determine its success. A compliment to existing programs, this retail store model has broader implications beyond energy efficiency and beyond the residential sector. Furthermore, taking into consideration the ability to franchise and scale retail stores, and the flexibility of retail to adapt to evolving technologies and changing markets, a successful retail store model supported by utilities as a means to deploy efficiency has implications beyond Massachusetts. Already major chain retailers like Home Depot and Best Buy have expanded into the retrofitting, efficiency, and the energy technology market. Other boutique-style retailers and entrepreneurs have also lent credibility to the retail store model.

Current trends in retail stores and energy efficiency have shown great promise in their ability to deliver energy efficiency and other energy services in a customer focused and cost effective way. Yet across the United States, there is little rate-payer and utility financial support for a retail store model for selling efficiency. While the relationship between retail and utility-funded energy efficiency programs is nascent, a few organizations, large companies, and entrepreneurs

have attempted to varying degrees of success to target energy efficiency in a retail setting. The cases explored in this thesis illustrate the challenges faced and the successes achieved that can inform the elements to be included in the proposed program and retail model. These companies and organizations were selected based on their relevancy to a retail model for energy efficiency, their exposure to utility programs, and the potential for high-volume sales and capacity. All are in their early stages of investigating the potential of a retail model as an opportunity for future growth and are mostly in the early stages taking advantage of an influx of consumer products and energy service companies. If I want to live an energy efficient lifestyle, where can I go? Can energy efficiency be something people spend money on to gain a perceived benefit that goes beyond cost-effectiveness? Retailers are beginning to understand that people can spend money on efficiency even if it is not subsidized, and that it can be a "lifestyle" product, an accessory, or a gift to give to someone else. Massachusetts has an opportunity to open up the marketplace for energy efficiency and expand the accessibility of existing programs in a way that some other utilities and businesses have already realized.

Massachusetts Residential Retrofit Programs

Massachusetts has a strong and impressive track record of policies and programs that seek to innovate, collaborate, and perform in the residential retrofit sector. Reviewing these existing programs is necessary so that market barriers can be identified and addressed when considering new program design. Only very recently have reviews been available that summarize the impacts of energy efficiency residential programs in Massachusetts. Reviewing these outcomes helps underscore the scale to which certain program elements may impact effectiveness. Also, these programs help to benchmark success for future programs and pilots while revealing limitations in existing program capacity.

Existing Program Review

Residential CMI Operations and Outcomes

Community Mobilization Initiatives (CMIs) are part of the Massachusetts Department of Public Utilities (DPU) Three Year Plan for Electric and Gas Savings (Three Year Plans) under GCA. CMIs are a subset of the Mass Save program but often have additional sources of revenue as they try and access hard to reach customers and provide jobs in underserved communities. These programs are considered pilots under GCA and therefore are not required to meet a threshold TRC Test value. PAs provided training, technical assistance, and program management to partnering community groups promising to increase marketing and deeper penetration, similar goals to a retail model. The Green Justice Coalition, one such community partner for several CMI initiatives defines CMI as:

> *... a new term for energy efficiency outreach campaigns where community-based organizations that have long-standing relationships with homeowners, tenants and small businesses in economically marginalized communities and other groups*

that have a strong record of clean energy education and outreach, develop a community mobilization outreach model that implements a large-scale bundled neighborhood approach to energy efficiency retrofitting.[24]

These residential retrofit programs targeting incomes between 60% and 120% AMI are separate from the Low-Income Residential portfolio of the Mass Save program, but function to provide leads and increase participation in the Residential portfolio of the Mass Save program. Additional sources of funding in addition to the Mass Save program include Energy Efficient Community Block Grants (EECBG), American Recovery and Reinvestment Act funds (ARRA or stimulus funds), private foundation grants, municipal grants, and other sources of funds depending on program sponsors and participating organizations. Participating programs include Renew Boston Residential, New Bedford CMI, Chinatown CMI, Chelsea CMI, Springfield CMI and Lynn CMI. Currently, there is program review information for Renew Boston Residential, New Bedford, CMI, Chelsea CMI, and Chinatown CMI. Program descriptions and outcomes can be found in Figure 1.[25, 26, 27] At the time of these reports, Lynn CMI and Springfield CMI had not kicked off yet and thus there is no program review information. Note that since Chinatown is geographically in Boston, their program received additional subsidy from the Renew Boston program providing a cap of $1,500 in gap funding, compared to Chelsea residents who received only $500 in gap funding.

[24] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[25] "Massachusetts Special and Cross-Sector Studies: Community-Based Partnership Interim Process Evaluation Findings", Opinion Dynamics Corporation and Evergreen Economics. July 2010.
[26] "Moving Towards Community Driven Energy Efficiency", Green Justice Coalition. November 2011.
[27] Conservation Services Group, Steve Cowell, CEO. Presentation to "MIT 11.379: Enabling an Energy Efficient Society". October 18, 2010.

Figure 1: Active Residential Community Mobilization Initiatives (CMIs) and Program Outcomes

	Renew Boston Residential	New Bedford CMI	Chelsea CMI	Chinatown CMI
Timeframe	5 months (August-December 2010)	6 months (July-December 2010); ended April 2010	10 months (Novemeber 2010-August 2011)	10 months (Novemeber 2010-August 2011)
Network	15 community groups	5+ community groups	5+ community groups	5+ community groups
Goals	3,000 weatherizations (through end of 2012) 150,000 households by 2020	50 retrofits (1-4 units); 4 multi-family (5-20 units)	50 retrofits (1-4 units); 4 multi-family (5-20 units)	50 retrofits (1-4 units); 4 multi-family (5-20 units)
Screening	636 energy assessments	90 audits; 2 multi-family audits	-	-
Outcomes	43 weatherizations	6 retrofits; 0 mulit-family	12 retrofits; 2 multi-family	15 retrofits; 3 mulit-family
Community Outreach	2,478 leads	visit 1,961 homes (3x); 818 leads; 35 multi-family	-	-
Median Cost per Home	$2,800	-	$1,900	$2,700
Cost Range	-	-	$800 - $4,100	$300 - $4,200
Median Incentive	1,900	-	$1,500	$2,000
% paying no out of pocket	-	-	67%	93%
Total Cost	$150,000 marketing & outreach to 2011	$112,000	-	-
Electric Savings	1211 GWh	.078 GWh	-	-
Gas Savings	16,510 MMBTU	.484 MMBTU	-	-

The timeframe of available data for these programs in Figure 1 ranges from 5 months to only 10 months and these months are the earliest stages of activity for these programs, yet the extent to which they underperform is revealed. Across all programs, the outcomes are low relative to the goals, yielding little environmental impact. The median cost of renovation for these homes ranges from $1,900 to $2,800, with a very wide fluctuation of cost ranges on a project by project basis. The median incentive used for these homes ranges from $1,500 to $2,000, with the areas supported by the Mass Save program having more incentive support. It is important to

note though that these programs have goals beyond energy savings, and the net economic benefit of jobs and increased community resources should not be discounted.

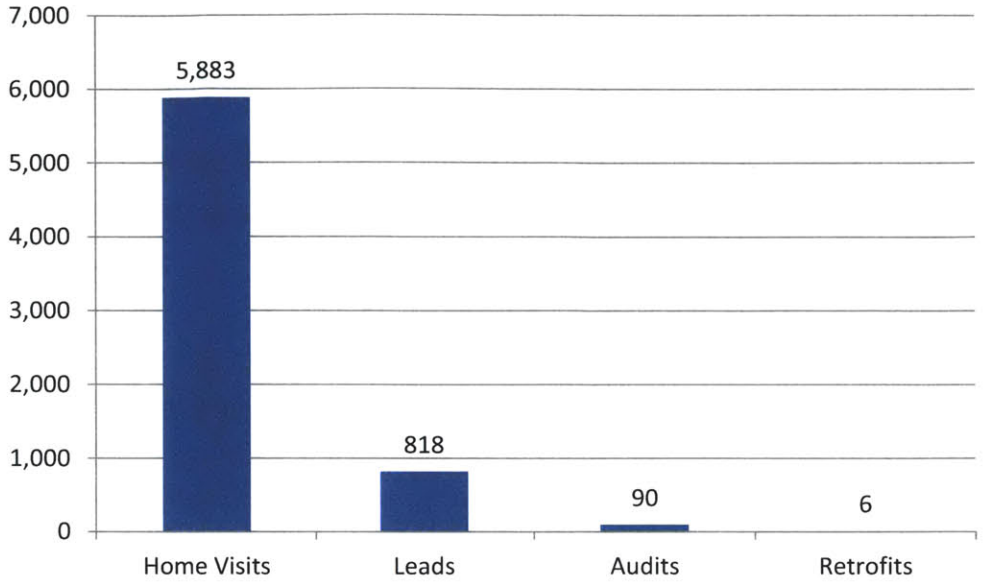
Note that the level of review and the program aspects highlighted vary as these evaluations were completed by two different third-party consultants, the results of which were approved for publication and endorsed by their respective organizations. The most complete picture for a CMI strategy is the New Bedford program which in its evaluation contained more detailed information on community outreach:

> *Interestingly, to reach 818 households, outreach staff had to visit 1,961 households. This represents a 42% reach rate through the canvassing effort. From the data provided to us, it appears that the outreach team made three efforts to reach each household. This level of outreach intensity was deemed appropriate due to the hard-to-reach nature of the target audience.*[28]

With two-thirds of the program lifecycle represented in 6 months of data, the level of Community Outreach relative to Outcomes is illustrated in Figure 2. It took almost 6,000 home visits to get to 6 retrofits. For the last three months of the program, additional retrofits may have come out of the home visits and leads, but the success rate is about 0.1%. As part of the Residential Portfolio of GCA, the program budget for community-based pilot programs in 2010 was $920,480. Only about one-third or $321,006 was actually spent. Comparing these programs on the basis of funding is difficult because of a broad range of sources of gap financing, layered program subsidies, and community partner program overhead. However, these programs reach some of the hardest to reach populations in Massachusetts and would logically require substantial monetary and non-monetary resources.

[28] "Massachusetts Special and Cross-Sector Studies: Community-Based Partnership Interim Process Evaluation Findings", Opinion Dynamics Corporation and Evergreen Economics. July 2010.

Figure 2: New Bedford CMI Community Outreach to Program Outcomes



Mass Save Program Planning

Mass Save is a $40.4 million dollar program in 2010 to address state-wide resdiential energy efficiency. About 2% of the homes in Massachusetts, mostly single-family homes, have received energy audit and about 20% of those homes do some level of follow-up retrofitting. Actual expenditures for the program in 2010 were lower than budgeted at $36.6 million for both gas and electric savings. Program participants, spending, and energy savings are summarized in Figure 3 for the overall residential portfolio.[29] The residential portfolio includes 10 programs in 2010, for example ENERGY STAR consumer products subsidies, Mass Save, O Power, and the Heat Loan Program, but does not include the Low Income Residential portfolio or the CMI pilots. Together, these programs have exceeded targeted energy savings while being under budget; actual reductions in GHG emissions from the Residential Portfolio are 17% greater than expected and 10% under budget.

[29] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011. (reproduced)

Figure 3: Green Communities Act Residential Portfolio Total Program Outcomes, 2010

	Program Spending (million $)	Participants	Annual GWh Savings	Lifetime GWh Savings	Annual Therms (million)	Lifetime Therms (million)	Annual GHG (metric tons)	Lifetime GHG (metric tons)
Actual	$114	1,063,000*	182	1,587	7.2	100.7	127,089	1,358,593
Goal	$126	663,000	152	1,172	6.5	110.4	108,263	N/A

* Inflated due to differences in accounting for customer participation in retail lighting sales

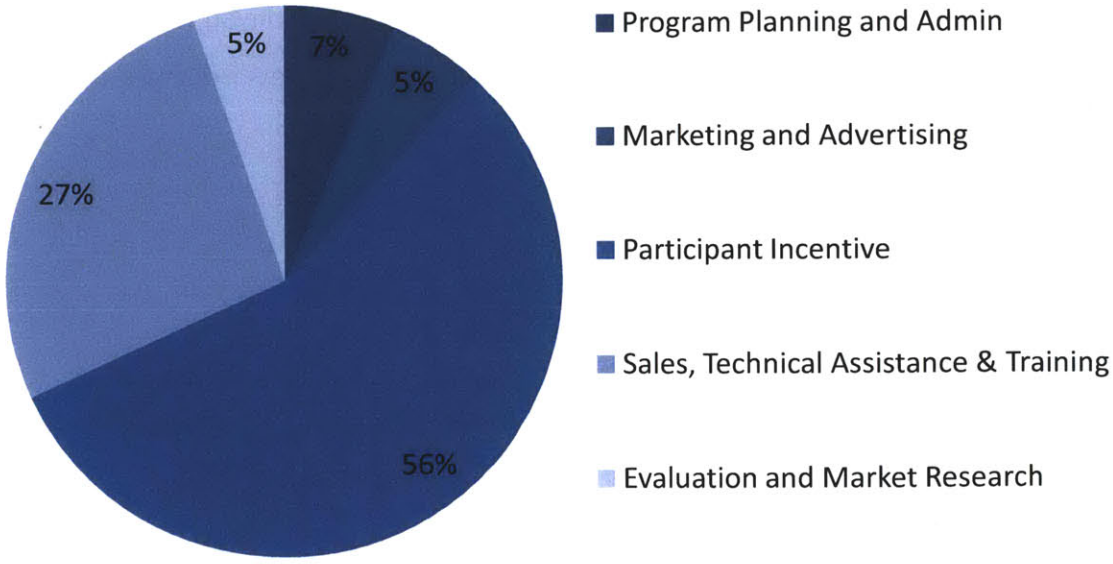
It is estimated that in 2010 approximately 12,500 homes received some level of energy efficiency upgrades.[30] Dividing the Total PA Budget in Figure 4 by the number of homes serviced, it cost Massachusetts about $3,100 to retrofit each home. Included in the $3,100 per home retrofit cost is about $1,800 of incentive funding per project. As seen in Figure 5, as a percentage of Total PA Costs, Participant Incentive is 56% of utility expenditures the Mass Save program. The balance of funds, or about $1,300 per home, is used for Sales, Technical Assistance and Training (27%), Program Planning and Administration (7%), Marketing and Advertising (5%), and Evaluation and Market Research (5%).[31, 32] Not included in Total PA Costs but also an expense of the Mass Save program is the $1.6 million bonus payment or Utility Performance Incentive that is paid to utilities for meeting certain performance targets.

[30] Conservation Services Group, Steve Cowell, CEO. Presentation to "MIT 11.379: Enabling an Energy Efficient Society". October 18, 2010; "Next Step Living", Geoff Chapin, CEO.
[31] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[32] "2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.

Figure 4: Mass Save Budget, 2010 – 2012

Mass Save Three Year Plan Budget	2010	2010 - 2012	Annual Average
Program Planning and Admin	$2,621,908	$8,221,106	$2,740,369
Marketing and Advertising	$2,189,075	$7,188,719	$2,396,240
Participant Incentive	$22,746,858	$89,036,021	$29,678,674
Sales, Technical Assistance & Training	$10,760,232	$41,419,667	$13,806,556
Evaluation and Market Research	$2,120,100	$9,787,890	$3,262,630
Total PA Costs	**$40,438,173**	**$155,653,403**	**$51,884,468**
			$0
Utility Performance Incentive	$1,571,846	$5,000,644	$1,666,881
Total PA Budget	**$42,010,019**	**$160,654,047**	**$53,551,349**

Figure 5: Program Administrative (Utility) Costs, 2010



For the program budget and incentive expenditures noted, the expected electric and gas savings of the program are described in Figure 6.[33, 34] Under the Three Year Plans, participation in the Mass Save program was expected to be 36,000 participants in 2010. Over the course of the program 140,458 households were expected to be served, making the expected average annual participation in Mass Save at almost 47,000 participants. Participation in the program has not achieved it's goals, nor has expected electric and gas savings been met—the degree to which is unclear.

Figure 6: Mass Save Electric and Gas Savings, 2010 – 2012

				Mass Save	2010	2010 - 2012	Annual Average
				Participants	36,443	140,458	46,819
				Gas (MMBTU)	785	4,082	1,361
				Gas (Therms)	7,851	40,815	13,605
Electric Savings	Capacity (kW)	Annual		Summer	8,517	38,794	12,931
				Winter	4,887	18,208	6,069
		Lifetime			161,747	765,597	255,199
	Energy (MWh)	Summer (Annual)	Peak		6,630	26,962	8,987
			Off Peak		8,284	31,841	10,614
		Winter (Annual)	Peak		5,475	21,559	7,186
			Off Peak		8,198	32,242	10,747
		Total Annual			28,587	112,603	37,534
		Lifetime			262,976	1,101,489	367,163
Non Electric Resources	MMBTU	Avoided Natural Gas			78,649	387,509	129,170
		No. 2 Distallate			279,291	1,321,541	440,514
		No. 4 Fuel Oil			0	0	0
		Propane			8,279	39,173	13,058
		Wood			0	0	0
		Kerosene			0	0	0
	Gallons	Water			22,630,401	108,294,189	36,098,063

[33] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.

[34] "2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.

Understanding expenditures and energy savings, is not the same as understanding the benefits and costs under the TRC test for Mass Save. Costs include not only costs to PAs and the costs of providing incentives, but also the out-of-pocket costs to program participants. Program participant costs account for about $10 million in spending a year as seen in Figure 7.

Figure 7: Total Cost of Mass Save, 2010 – 2012

COST SUMMARY	Program Administrator Costs		Participant Costs	**TOTAL COSTS**
	Program Costs	Performance Incentive	Customer Contribution	
	$154,108,734	$4,981,842	$29,155,942	**$188,433,543**

Figure 8: Total Benefit of Mass Save, 2010 - 2012

BENEFITS SUMMARY				
Total Gas Benefit				$394,534
Electric Benefits	Capacity	Generation	Summer	$34,530,524
			Winter	$0
		Transmission		$15,329,777
		Distribution		$44,689,753
		DRIPE		$9,588,986
		Total		$104,139,040
	Energy	Winter	Peak	$20,780,146
			Off Peak	$24,437,535
		Summer	Peak	$35,244,516
			Off Peak	$19,572,540
		DRIPE		$24,960,945
		Total		$124,991,764
Non-Electric Benefits	Resource Benefits	Avoided Natural Gas		$118,510,677
		No. 2 Distillate Fuel Oil		$620,234,596
		No. 4 Fuel Oil		$0
		Propane		$24,465,191
		Wood		$5,940
		Water		$8,466,119
		Kerosene		$0
	Non-Resource Benefits			$0
	Total			$771,138,974
TOTAL BENEFITS				**$1,000,664,312**

The expected benefits of Mass Save are detailed in Figure 8 and are broken down into gas benefits, electrical benefits, and non-electrical benefits, such as the benefits of not using certain resources like water and avoiding the use of natural gas for example. The primary source of savings comes from No. 2 Distallate Fuel Oil ($620 million), accounting for more than 60% of the total benefit. Avoided Natural Gas is the second largest source of program benefit ($119 million) and accounts for almost as much benefit as all electric benefits combined ($125 million).

Knowing the details of the expected costs and benefits of Mass Save, the TRC Test (benefits/costs) is detailed in Figure 9.[35, 36] The benefit to cost ratio of 5.31 essentially means that for every dollar that Mass Save costs, $5.31 of benefit is generated.

Figure 9: Total Resource Cost Test Mass Save, 2010 – 2012

TRC TEST	B/C Ratio	Net Benefits	Total Benefits	Total Costs
	5.31	$812,230,769	$1,000,664,312	$188,433,543

Mass Save Program Outcomes

During the planning of Mass Save, detailing this cost ratio is essential for gaining regulatory approval for the use of rate-payer funds for energy efficiency. The actual expenditures and outcomes for the Mass Save program have been reported through Mid-Term Mofication (MTM) and Quarterly Reports to the EEAC from PAs. PAs reported 2010 participation levels at about 41,000 participants which significantly differ from my estimation that 12,500 households participated in Mass Save. Discrepancies can be due to the PA reports being preliminary and unaudited as well as my potentially incomplete estimation based on data offered from program vendors. How participation is defined can also vary amongst PAs and between PAs and vendors.

[35] "2010 – 2012 Massachusetts Joint Statewide Three-Year Electric Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.
[36] "2010 – 2012 Massachusetts Joint Statewide Three-Year Gas Efficiency Plan", Massachusetts Department of Public Utilities. October 29, 2009.

The PAs report that overall they have been successful in meeting their residential goals under Mass Save, and have done so spending less than anticipated (Figure 10).[37] For the first quarter 2011 report an average of 940 Kwh of savings per participant was achieved. That is substantial given that the planned savings for all of 2011 is 1,092 kWh. For all participants in the Mass Save program electric savings were almost 10 GWh for first quarter 2011, meaning that savings are on target to meet the annual electric savings goal of 40 GWh.[38]

Figure 10: Mass Save Electric and Gas Program Outcomes, 2010

Mass Save 2010	Participants	PA Expenditures	Energy Savings (annual MWh)
Q1	12,839	$ 5,561,421	7,010
Q2	8,887	$ 5,018,635	7,717
Q3	7,860	$ 3,933,266	6,083
Q4	11,754	$ 7,671,497	11,046
Total	**41,340**	**$ 36,591,204**	**31,856**
Goal	40,753	$ 40,480,075	28,588
% of Goal	**101%**	**90%**	**111%**

These reviews become the basis for which the EEAC decides how to modify the Mass Save program for the next planning cycle. One finding is that costs for program implementation by the PAs varies significantly; the cost to deliver the program for the PA with the highest cost of program delivery is 51% greater than the state average cost for program delivery.[39] Program delivery under Mass Save varies across PAs, although substantial gains have been made in standardizing service delivery. Three main drivers for costs variations across PAs are differences in housing and demographic characteristics across service territories; varying assumptions in input factors in cost models and inconsistent application of Evaluation, Measurement, and Evulation (EM&V) procedures; and differing program preferences among PAs reflected in

[37] "Quarterly Report of the Program Administrators" Fourth Quarter 2010
[38] "Initial Review Comments on 2011 Q1 Quantitative Quarterly Reports", EEAC Consultants. May 10, 2011.
[39] "Report to the Energy Efficiency Advisory Council on 2012 Mid-Term Modifications Proposed by the Massachusetts Electric and Gas Program Administrators", MA EEAC Consultant Team. November 4, 2011.

program budget allocations.[40]

In response to the MTM recommendations for revisions to Mass Save, all PAs and the EEAC are focusing on strategies for gaining access to more customers and creating opportunities for deeper energy savings.[41, 42] The residential sector retrofit program is an outgrowth of the traditional retrofit programs that have been conducted by utilities for dozens of years, and as such traditionally reaches the same kind of customer. Market segmentation, targeted customer support, and the deeper savings needed will prove challenging in a business as usual approach to the residential sector. Mass Save illustrates the potential impact utility-funded energy efficiency can have. Program evaluation suggests that additional opportunities exist to both improve the delivery of Mass Save, and/or opportunities exist to create new programs that complement Mass Save. This can be done addressing the identified challenges of existing programs and focusing on markets that current programs do not reach. Broader and deeper savings is clearly a priority for residential efficiency programs going forward. For the homes and households that are qualified for getting energy upgrades, accessing consumers and providing a compelling product are the biggest challenges.

There are a few companies within Massachusetts who have access to rate payer funds from utilities, and those include CSG and NSL. Currently CSG and NSL are some of the few acceptable vendors and beneficiaries of funds leveraged through Mass Save and other energy efficiency programs. Next Step Living's business has increased *ten-fold* now that it is an eligible participant in the Mass Save program. There are also other players, both not-for-profits and for-profits in the Massachusetts energy efficiency marketplace, like the Cambridge Energy Alliance, that are looking for new direction and leadership or are open to new ideas to address the challenges of scaling up energy efficiency.

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[40] "EEAC Summary: 2012 Mid-Term modifications (MTMs): Relative Performance of PAs", EEAC Consultants. November 8, 2011.

[41] "Resolution of the Energy Efficiency Advisory Council Regarding the Program Administrators' Proposed 2012 Mid-Term Modifications", EEAC. November 8, 2011.

[42] "Energy in Massachusetts: Energy Efficiency as "First Fuel", Massachusetts Department of Energy Resources. PowerPoint Presentation by Christina Halfpenny, Division Director, Energy Efficiency. 2011

PAs in Massachusetts estimate that the market penetration of Mass Save within their service territories is approximately 25 to 50% of eligible households. While rough estimates of program impact is all that could be offered from the PAs, there is broad acceptance that the residential retrofit programs are still very much in need. Non-participants in the Mass Save program report high consumer interest in free energy assessments with 47% of respondents expressing interest in a free energy audit and 67% of respondents considering themselves knowledgeable or very knowledgeable of residential energy saving options. For participants in the Mass Save program, most households come from structures that were built before 1939 (31%) with 76% of participants living in structures that were built before 1979. Considering these factors and the existing 2.7 million households in Massachusetts, there are still hundreds of thousands of households that qualify for Mass Save and are interested in aspects of the program, but have not yet participated.

Awareness of the Mass Save program varies by demographic and housing characteristics. Those most likely aware of Mass Save could be categorized as being less than 35 years old, a single-family homeowner, and has a college degree or higher. The impact of these characteristics on awareness of Mass Save is illustrated in Figure 18, Figure 19, Figure 20, and Figure 21.[43] The market potential of The Greatest Generation would be broader than that of Mass Save because of the cross-sector suite of services it would provide. Given the current awareness of Mass Save, marketing and products could be tailored to the target populations trying be accessed. However, due to demand by single-family homeowners and program capacity, it is likely that Mass Save will continue to cater to the demographics in which it has already made progress.

[43] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011.

Figure 11: Awareness of Mass Save by Age

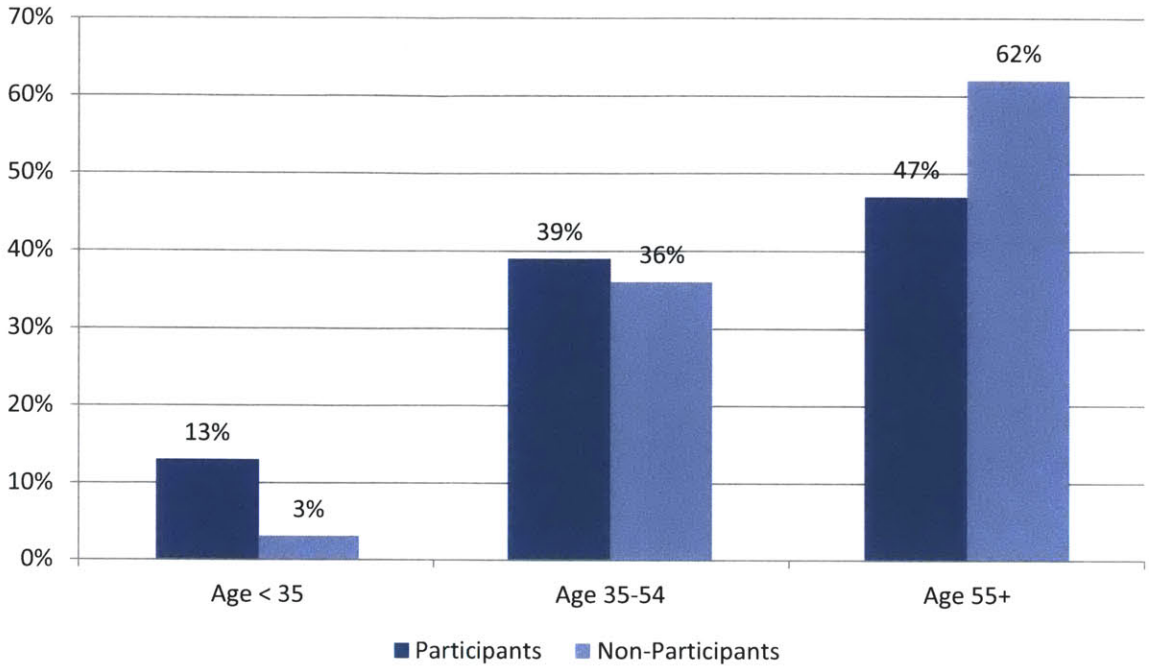


Figure 12: Mass Save Awareness by Housing Tenure

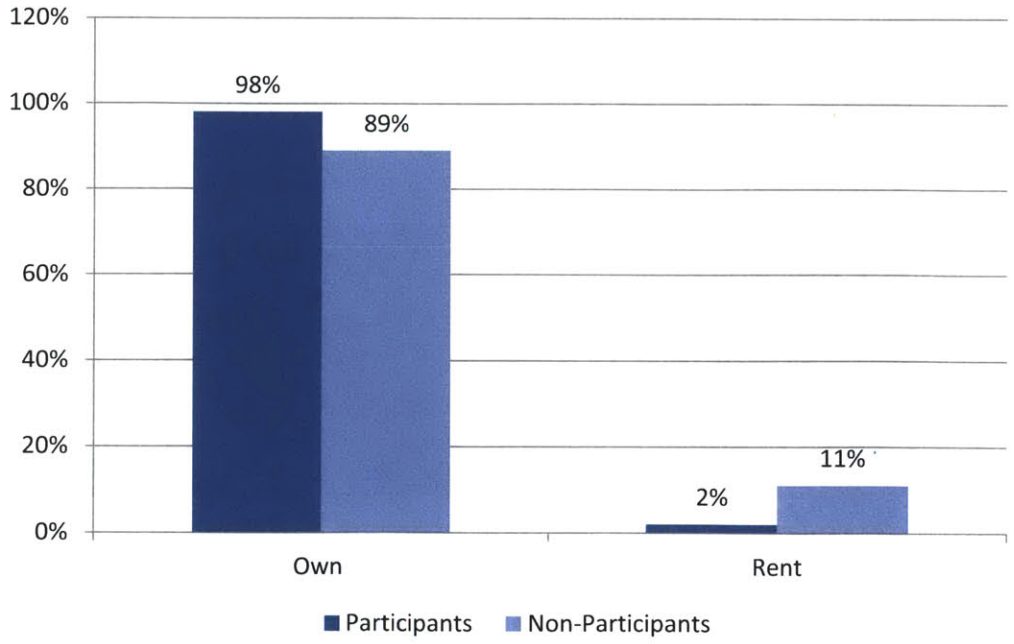


Figure 13: Mass Save Awareness by Education

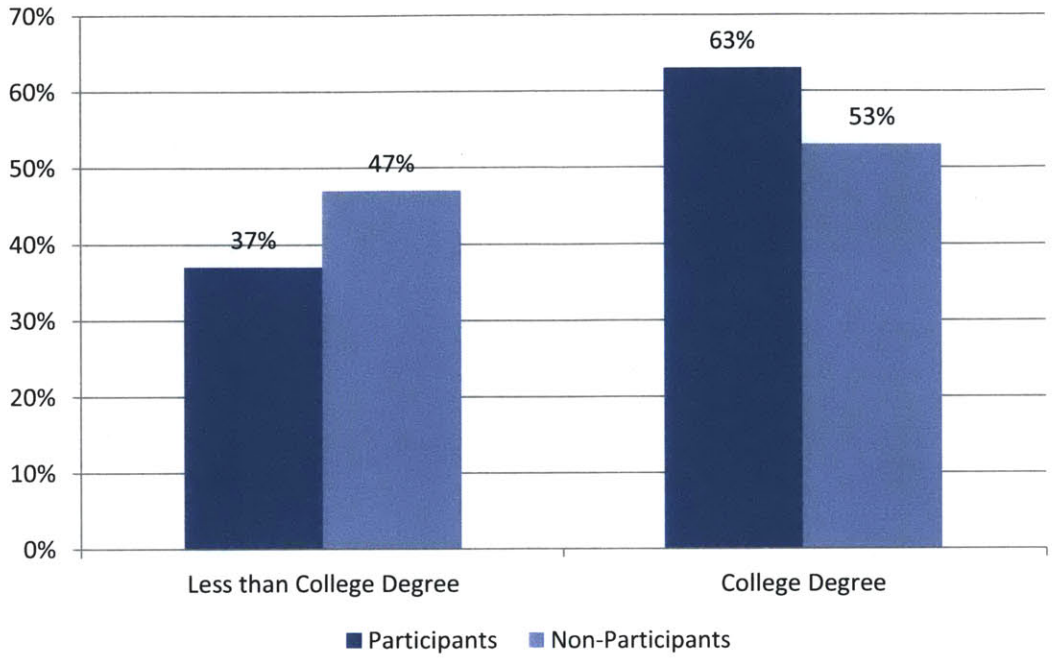
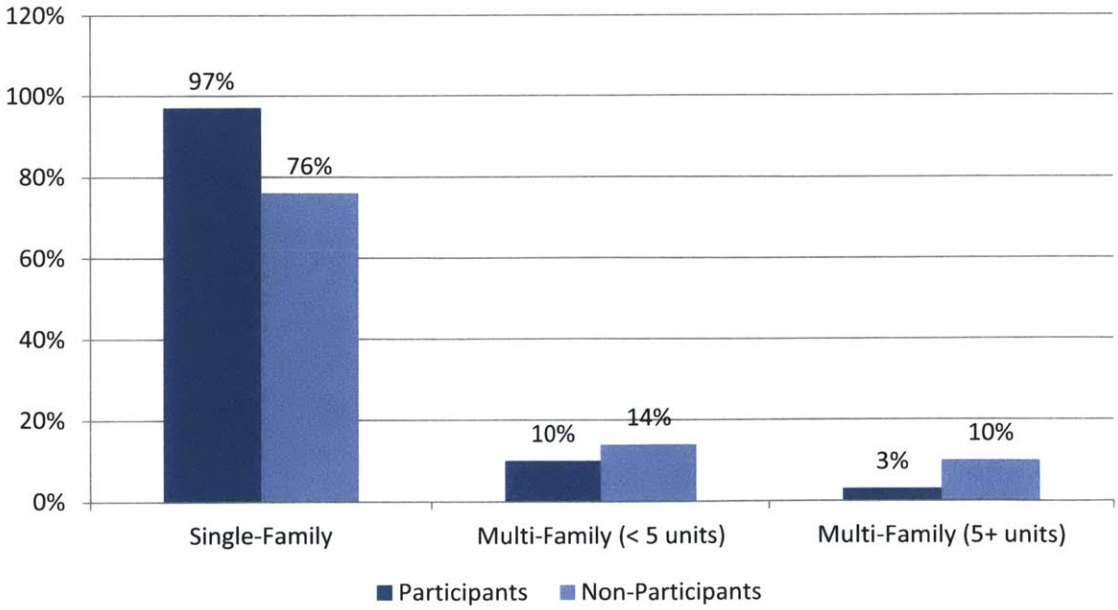


Figure 14: Awareness of Mass Save by Housing Type



Program Barriers

Both Renew Boston and Mass Save have aggressive efficiency goals that need to be met over the next few years. Renew Boston Residential plans to serve 150,000 households through 2020, or about 15,000 households per year. Mass Save plans to average about 47,000 participants per year over the next three years. The midterm review process for these programs includes feedback on program design and alteration recommendations. These reviews were created through interviews with DOER, PAs, EEAC, Home Performance Contractors (HPCs), program vendors (i.e. CSG), and through surveys to program participants or customers as well as non-participants.[44, 45, 46, 47, 48] These barriers are important to keep in mind when designing a new program model.

The following challenges to delivering energy efficiency to customers are synthesized from the aforementioned reports as well as semi-structured interviews and presentations from relevant stakeholders interviewed for this research. A diverse range of perspectives from state policy makers, utilities, community groups, and academics are represented. The structure for evaluation follows the methodology employed by the consultant reports provided to EEAC.

Program Design and Administration

The Mass Save program has operated for decades with its beginnings being rooted in the Home Residential Services (HRS) program of the 1980s. This has resulted in a strong contractor network with most contractors having participated in the residential retrofit/weatherizing programs for over 5 years. Some contractors have participated in the program for over 15 years resulting in strong contractor communication with vendors (i.e. NSL or CSG) through regular

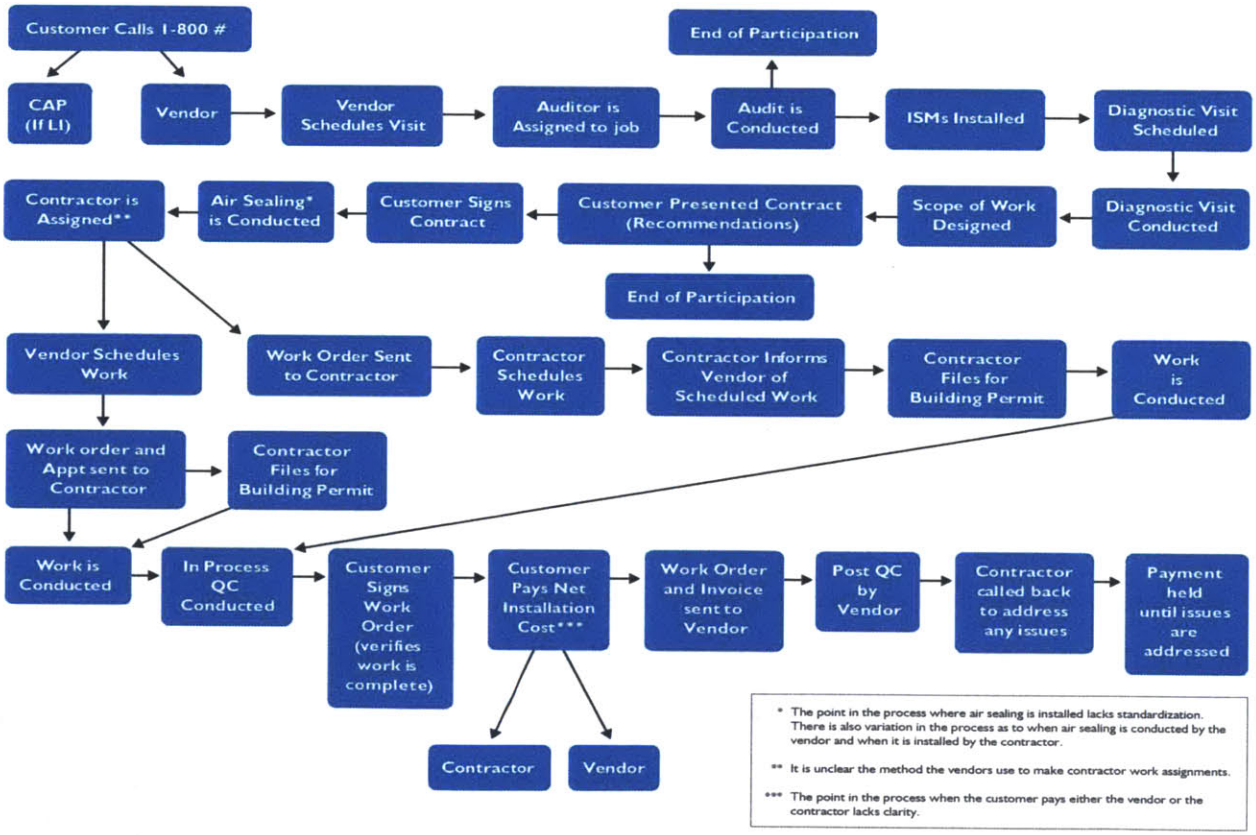
[44] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011.
[45] "Massachusetts Special and Cross-Sector Studies: Community-Based Partnership Interim Process Evaluation Findings", Opinion Dynamics Corporation and Evergreen Economics. July 2010.
[46] "Moving Towards Community Driven Energy Efficiency", Green Justice Coalition. November 2011.
[47] "Community Energy Efficiency Programs: Identifying Challenges and Uncovering Solutions", MIT Energy Efficiency Strategy Project. July, 2010.
[48] "Mass Save Home Energy Services Update", EEAC Presentation. May 10, 2011.

daily emails and meetings. This strong contractor network is a major advantage to the Mass Save program.

The customer relationship to this process however is less defined and usually involves a customer contacting several parties to schedule the first home visit. If a customer is interested in an energy efficiency upgrade, the program delivery process can be quite burdensome and involve several opportunities for leakage from the program, meaning participating contractors do not always benefit from the program's initial investment and participants may not make it to the stage of the program where the scope of work for their energy efficiency upgrade is completed. The Mass Save delivery process articulated by The Cadmus Group Inc. and Energy Services is illustrated in

Figure 15.[49]

Figure 15: Mass Save Delivery Process



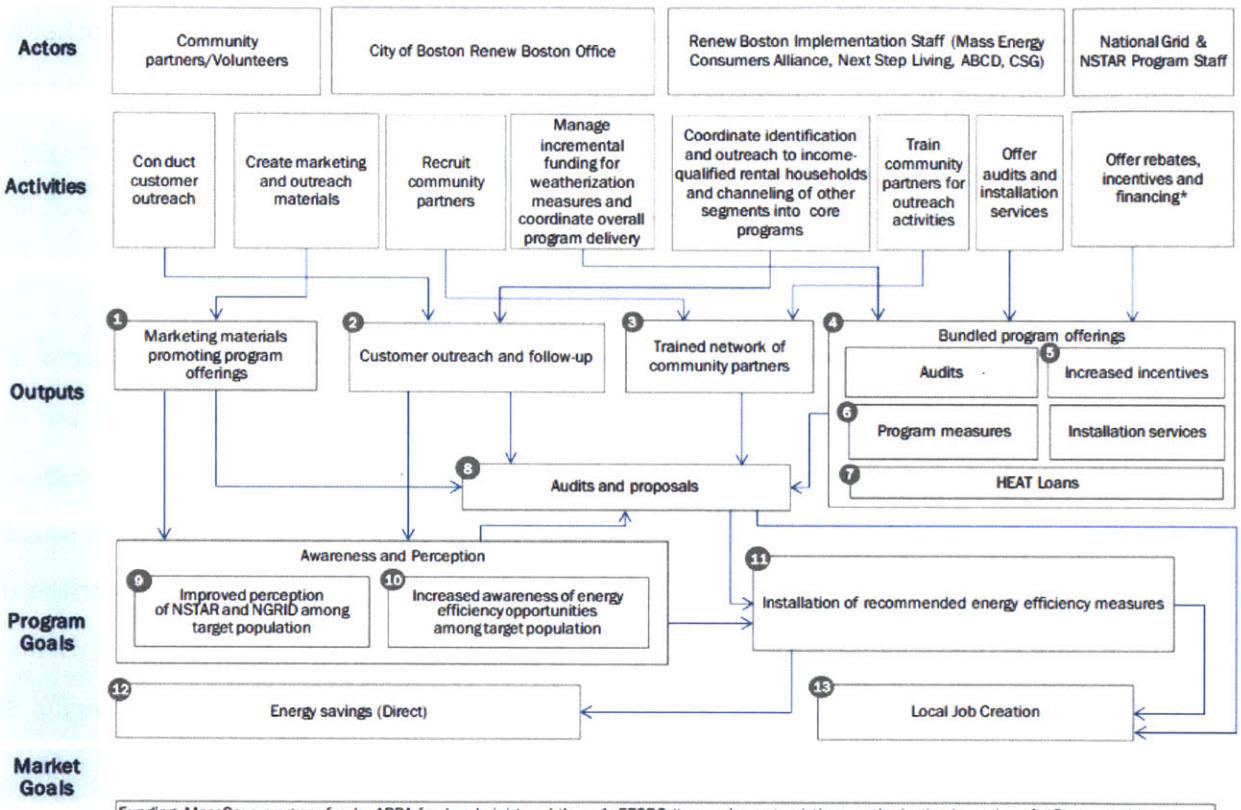
In the Renew Boston program model illustrated in Figure 11, getting from audit to installation of measures is a 14 step process involving several organizations.[50] This basic framework will

[49] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011.

[50] "Massachusetts Special and Cross-Sector Studies: Community-Based Partnership Interim Process Evaluation Findings", Opinion Dynamics Corporation and Evergreen Economics. July 2010.

continue to be incrementally improved as Mass Save evolves, a key goal being a consistent customer interface and a single point of contact.

Figure 16: Renew Boston Residential Program Logic Model



Note: Cells highlighted in gray indicate contributions to Renew Boston from the NSTAR and National Grid existing energy efficiency programs
* Program Administrators noted they provided training to community-based organizations in Chinatown. It is unclear, however, if this training was provided as part of the Chinatown CMI or Renew Boston Residential effort.

Intake

The current customer intake process varies slightly by PA but will likely involve many phone call transfers an information requests. If the customer happens to call the statewide Mass Save 1-800 number first, they are transferred to either a call center established by a program vendor or to their PA. The PA works to verify that the caller is a customer, verifies fuel type, and income level. Another transfer from the PA happens if their heating fuel is provided by another PA. Another transfer may also occur if the caller is income eligible for a Community Action Program (CAP Agency). If a transfer does not occur, the interests and budget of the caller are investigated once demographic, housing conditions, occupancy, and health and safety issues are inquired about from the vendor or PA.

That initial customer interaction is critical for the success of the program. In CMI strategies and in Renew Boston, there is substantial emphasis on community engagement to aid persons through the intake process. Questions regarding income and housing occupancy for example can be intrusive for recent immigrant or hard to reach populations. While the program process for Renew Boston also contains a formidable degree of complexity, the program complexity allows for addressing diverse demographics and ensuring appropriate matches for customer interests and available financing. This complexity is great for increasing program capacity, but there is a trade-off in the ease of intake for the consumer.

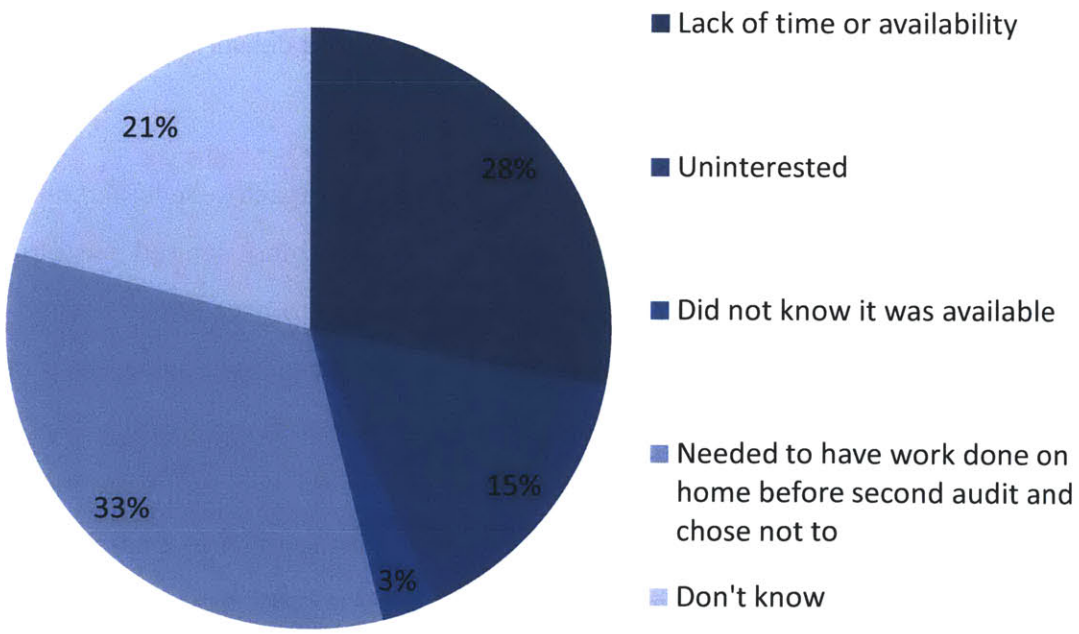
The Audit

The audit in iteself can comprise several steps and can be a sigificant barrier to understanding the potential scope of work. Again, there is variation across PAs, but the mutli-step audit process is in place as it is perceived that it keeps program costs low. However, this is being challenged as some PAs estimate that the total audit process can be completed in one step in an estimated three to four hours, reducing the expenses of multiple visits and increasing implementation rates for installation measures.

The one-step comprehensive vist requiring more staff addresses the logistical and resource concerns of scheduling second visits. According to a survey of participants in the Mass Save

program, 83% of respondants did not receive a second visit. Figure 17 illustrates the reasons persons chose to not schedule a second audit visit.[51] "Lack of time or availabity" was a significant barrier for 28% of respondants, while 33% responded that they did not want to complete additional work that was necessary for them to do before a second audit could be done. These issues can be catagorized as "pre-weatherization" issues and are especially problematic in areas with older housing stock and low-income areas. Reducing the number of visits that could end with no installation measures due to preweatherization issues is important for improving customer satisfaction of the Mass Save program.

Figure 17: Reasons for Not Scheduling a Second Audit Visit



[51] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011. (Reproduced)

Standardization and Program Improvements

Standardization and program improvements through new guidelines and support services is a critical goal for Massachusetts under new state-wide energy policies and reporting requirements. Communication, cooperation, and coordination between PA service territories is strong, with standardization creating many major changes to how PAs execute Mass Save. With increased standardization comes a trade-off with program flexibility and the ability of a vendor or contractor to meet customer needs.

Home Performance Contractors

Recently Mass Save has opened up its program participation model by allowing contractors to become Home Performance Contractors (HPCs). Previously, vendors were responsible for scheduling audits and quality assurance. They functioned as the point of contact for customers once the audit process began. Now, HPC contractors are permitted to be program auditors, market and recruit on behalf of the the Mass Save program, and deliver the Mass Save program from beginning to end.

While this change is being piloted to increase program capacity, several concerns have developed. The first is that customers need to rely on the more limited customer service capacity of contractors. The vendor call centers are considered to have better trained customer support staff who are able to answer a broader range of questions. Having HPCs deliver the program also means vendors conduct a quality control visit to the customer. This is another step for the customer, increases the number of home visits, and adds to the number of entities the customer is exposed to. This raises concerns that allowing HPCs to operate the program increases not only costs, but risks. Vendors, now having less control, essentially police the work of HPCs with an additional follow-up home visit. Finally, some of the capacities of the vendors need to be extended to the contractors causing increased administrative and training burdens for both parties. Increasing contractor capacity to use appropriate software and familiarize themeselves with the technical aspects of program operations takes additional time, but also allows Mass Save to more promptly respond to rising customer demand.

Customer Service

Standardization of the Mass Save program has resulted in reduced flexibility in the program. PAs had more latitude to tailor customer incentives that addressed the unique characteristics of their service area. For example, a program that would have provided renters with a 100 percent rebate for up to $2,000 worth of installation work was dropped with statewide standardization. Program costs and price lists are also being standardized, limiting profits for contractors in high operating cost areas and limiting the ability of a customer to competitively select a contractor. At the same time, many contractor have pushed for standard pricing as it simplified the process for the customer and ensures equal payment for all contractors.

Marketing and Participant Decisions

Marketing for Mass Save happens in many different ways. PAs with wide ranging marketing budgets market through various media modes and contractors sometimes compliment existing marketing with their own marketing strategies. Despite the statewide marketing efforts, 39% of program participants hear about Mass Save through word of mouth. Customers are generally unsure about the right sources for information and are often ill-informed as to what program options are.

Market Barriers

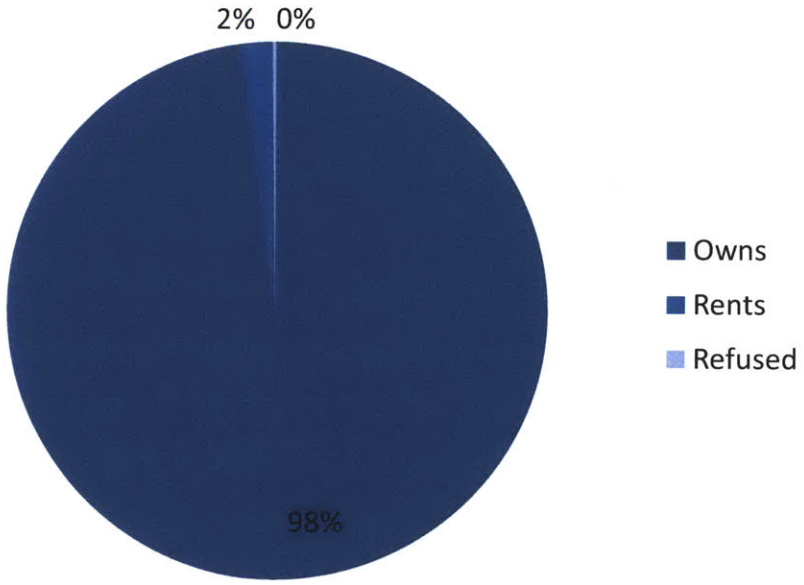
62% of non-participants are aware of the the availability of free energy assessments, but only 32% are aware of available incentives and only 16% know that utility sponsored programs exist. For the 62% who are aware of the free energy assessments, less than half are interested in actually obtaining one. This suggests that market barriers exist beyond program awareness. The respondants that do know that incentives exists do not understand who is sponsoring the incentive or administering programs. This could have an impact of the comfort level customers have with the program as they do not understand the sources of funds or the underlying interests of the program. This can be a significant barrier when decided to let someone work on

your home.

Rental and Multi-Tenanted Properties

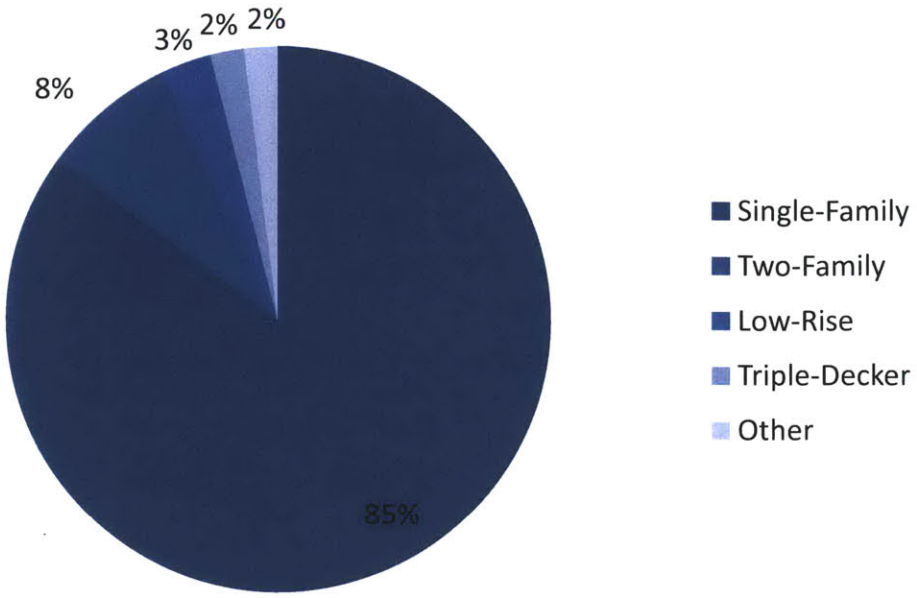
Due to the problem of split incentives between landlords and tenants, energy efficiency upgrades in multi-tenanted properties is not usually an attractive investment from a building owner's perspective. Besides the high liklihood that the owner cannot recoup the cost benefits of energy savings, coordinating audits and retrofits for several households can be difficult whether owner or renter occupied. Owner occupied buildings with more than one unit require the permission of by all homeowners, tenants, and landlord before installation of air-sealing or insulation could proceed for example. These barriers result in the program uptake illustrated in Figure 18 and Figure 19.[52] In Renew Boston, multi-family (2 – 4 unit) properties accouted for 60% of energy assessments, but only 39% of weatherization projects.

Figure 18: Participant Homeowner versus Tenant (Audit-Only and Rebated Participants



[52] "Massachusetts 2010 Residential Retrofit and Low Income Evaluation: Mass Save", The Cadmus Group, Inc. July 6, 2011. (Reproduced)

Figure 19: Participant Housing Type (Audit-Only and Rebated Participants)



Program Satisfaction

Reported overall satisfaction with Mass Save from PAs, vendors, contractors, and customers has been high. In an survey of program satisfaction, 88% of customers rated Mass Save as satisfied or extremely satisfied. Customers primarily enjoy the free energy upgrades and reduced utility bills, but also appreciate the depth of information they receive on the program.

Customer Feedback

The most common complaints about Mass Save are the number of home visits required and disappointment in program performance in achieving energy savings. Getting to a one-vist model should help substantially with customer satisfaction and increase program retention from audit to installation. Customer expectations should also be appropriate and controlled by not overselling expected program benefits and more accuratly assessing the retrofit opportunity. The biggest disappointment is when a contractor cannot work on a home due to preweatherization issues like the presence of knob and tube wiring or the presence of health

and safety violations. These preweatherizations issues are more prevelant in low-income communities and an older, un-revovated housing stock, but are a broad problem for commencing retrofits. It is estimated that in some urban neighborhoods, 40% of the housing stock has preweatherization issues and knob and tube wiring accounts for half of those preweatherization barriers.[53] There is momentum in making ratepayer funds available for addressing preweatherization issues, which would increase the market potential for retrofits substantially.

The lowest customer ratings for program satisfaction were related to the customer learning experience. A quarter of respondance rated their learning experience below a 5 out of a scale of 1 to 10, with 10 being the highest rating. These low ratings were due to customers feeling like they were not exposed to new information, they were dealing with auditors who did not care to explain installation measures, they felt they were already aware of savings opportunities, or they thought they were already energy efficient. These characteristics were displayed across demographic characteristics and are related to the customer service experience. Part of the issue is related to the organizational models used to deliver energy efficiency. These can be confounding to consumers and can lead to relationship management issues with corporate or small business clients, and a "too good to be true" effect for residential consumers.

Distrust for contractors amongst consumers is high leading to hybrid organizations and public-private partnerships like the Cambridge Energy Alliance having goals to help customers trust performance contacting, increase transparency, and offer legitimacy. Rather, end users in the corporate and small business context did not always understand the organizational structure leading to confusion over the person to put in charge to manage the relationship with the hybrid organization. Residential consumers can be hesitant in buying into a program for which they do not understand who is directly benefiting leading to skepticism of program benefits or available subsidy. One of the strengths of the community partnerships in CMI strategies is having a trusted community partner, but there is the downside of a consumer not feeling like the aiding organization has the best interest of the homeowner in mind, does not fully

[53] Schenk, Jeremy. Community Labor United. Discussion with MIT Energy Efficiency Strategy Project. 11.28.2011.

understand how to best execute a home renovation, or will somehow get the government involved in remedying compliance issues in the home. The confusion around who the executing parties are and what their incentives are increases the risk profile of getting involved in potentially costly home renovation project.

Retail and Energy Efficiency Precedents

Energy efficiency retail establishments are growing in popularity in recent years. There is little precedent for a fully integrated utility-funded model for energy efficiency retail, but the following stores and efforts approximate what a full-service energy efficiency retailer may look like. The ingredients of these different delivery models are characterized in Figure 20. What follows is a summary of each approach supported through interviews, primary resources published from these operators, and secondary resource reports.

Figure 20: Existing Energy Efficiency Delivery Models

Business Characteristics and Product Offerings	Current Energy	Smart Living Center	Best Buy	Home Depot	Green Depot	Next Step Living
Current Retail Location	x	.5x	x	x	x	
Investigating Retail Model			x		x	x
Not-for-profit		x				
Specialization in Energy Efficiency	x	x	x		x	x
Utility Relationship		x	x	x		x
Audits Available	x		x	x		x
Home Performance Contractor						x
Development Consultant	x				x	x
Education and Training	x	x	x	x	x	x
Construction Materials	x			x	x	
Home Furnishings	x	x		x	x	
Product Certification				x	x	
Energy Calculator						x
In-House Contractor Network	x			x		x
Presence in Massachusetts			x	x		x
Beyond Efficiency Included	x	x	x	x	x	x

Current Energy

The first store in the United States to offer energy efficiency products and green remodeling services in a retail store was located in Dallas, Texas. Current Energy positioned itself as an "experience store" that it allowed customers to interact with products and provided information rich displays. This store was coupled with an online retailer and there were plans for a second location in Dallas. Recipient of the Department of Energy's Innovator Award in 2001, Current Energy's retail store is now closed and their online store has been discontinued.[54]

Development of the Retail Concept

The founders of Current Energy developed their retail concept from having worked on creating the retail concept for Sharper Image in the 1980s. Later ventures included starting the Restoration Hardware chain and partnering with Steve Jobs for several years to develop the retail concept for Apple. The motivation for developing Current Energy came from a founder's personal frustration of having a home builder not understand the green building process. With over 25 years of experience in developing retail, he realized that there was a dearth of resources for persons who were interested in living an energy efficient lifestyle.

[54] Current Energy. <www.currentenergy.com> Accessed: March 2011.

A watershed moment for the developer was participation in the Texas State Fair. The State Fair is the largest consumer product showcase in the United States and has over 3.5 million visitors during four days in October. The founder was tasked with running the "Home for Tomorrow" exhibit, consisting of three net-zero energy homes. Over 60,000 participants paid $2 per person to walk through the net-zero homes which showcased energy efficient products and other energy-related residential technologies.

Market

About 500 audits would be done annually, and about 80% of those who got an audit did some work on their home. Customer volume was about 100 people during a weekday, 300 to 400 on a weekend, and about 1,000 customers per day during the holidays totally approximately 75,000 walk-in customers per year. About 30,000 customers annually would use computer kiosks located in the store to investigate switching energy providers in a deregulated market. 60 to 70% of customers would purchase lighting upgrades, sometimes requiring installation services. In total, given 3,000 square feet of retail space and 8 staff, annual residential efficiency sales volume was estimated at $6 million, with an additional $2.5 million in revenue coming from contracting services. This was done with virtually no marketing budget but relied heavily on the neighboring customer base of the adjacent Apple Store and guerilla marketing tactics that ranged from offering free hot dogs on days that new Apple products were released to appearances on local news and radio broadcasts as energy experts offering free advice.

Current Energy realized that customers would care much about energy efficiency specifically, but would be interested in things that could save them money. Part of this was a geographical consideration, as the perception was that there were not many environmentally conscious persons in Dallas. Rather, they would target cost-conscious customers who were interested in saving money through reduced utility expenditures. There were two primary housing types in the area: older A-frame homes and newer McMansion-style homes that would have utility bills around $8,000 a month. It was presumed that persons with utility bills that high would be willing to spend $1,000 on an audit that could reduce their electric expenditures by about 50%. With a two-year payback, Current Energy would calculate for homeowners how their Return on

Investment (ROI) for their properties had changed as a result of reduced operations costs. In some cases, Current Energy was able to save up to 75% in energy expenditures.

Another important target demographic was young tech-conscious consumers willing to spend a premium on for comfort gadgets or lifestyle products. As such, Current Energy was located next door to an Apple Store on the Knox Street corridor, which also contained a Restoration Hardware, Banana Republic, and J. Crew. They needed to be perceived as "cool" and fed off like-minded retailers' customer base. For both consumer bases, Current Energy focused on balancing the purchase and installation of long-term energy savings strategies while also catering to impulse buys (i.e. gifts and gadgets). They also targeted young families by providing a kids play areas with the DOE supported "Energy Hog" computer game. This permitted parents to engage with the products, speak to sales representatives, and talk to specialists about their utility bills, remodeling plans, or switching to renewable energy rate plans.

Fee Services (Income)

- Current Energy was on contract from ONCOR, an electric distribution company, to conduct energy audits and provide energy upgrade assessments. Originally ONCOR had their own audit and assessment program, but it found it more cost effective to outsource these services to Current Energy. Under Current Energy, the three to four hour auditing process was more extensive and had higher customer satisfaction. If Current Energy was contracted to execute the scope of work, the audit fee was usually waived and offset by the profits from installation.

- TXU, an electricity distributor, basically "sponsored" the store and "gave [them] a ton of money" to get walk-in customers to switch to TXU distribution. In Texas, the distribution system is deregulated meaning that customers have a range of distributors and rate plans to choose from. Current Energy was able to get a fee for each of the 5,000 customers they were able to switch over to TXU distribution annually. They provided four or five alternative rate plans that included renewable energy sources.

- Current Energy also had a "Bring us your electric bill and we can save you money"

marketing campaign. Customers would meet with in-store representatives and discuss their energy expenditures. This would generate leads for utility-funded programs (without fee), but the contractors for the audits and for some installation including HVAC were all in-house contractors. The home audit package tried as best as it could to predict paybacks for customers.

- Development consultant or remodeling specialists were provided to walk-in customers who brought in their plans and specs. Current Energy engineers would look over the plans for opportunities to green the project based on customer budget. Current Energy would get a fee for this service with the opportunity to include their contractors on the project.

- An additional sub-lease was offered to a third-party company selling water conservation solutions. The application ranged from residential to commercial, but specialized in irrigation systems, rainwater recapture, and sprinkler systems. The third party had a space for product demonstration and dedicated sales representatives.

Non-residential energy efficiency was also part of the model. Current Energy had a commercial product which provided software that automated HVAC and other building systems. Once the store closed in 2008, Current Energy continued selling its commercial product through 2010 when it sold its commercial product line to another business.

Product Offering

One of the most popular sales items were programmable thermostats bought by renters. Renters may have also purchased other energy-related goods, but were not generally patrons of the services Current Energy provided. About 50% of sales were for gifts and gadgets. Sales jumped around Christmas with popular items like outlet additions that monitored energy use, electric bikes, and solar powered charging pads for smart phones and lap tops. They were also an official dealer for Segway. The balance of product sales came mostly from lighting (i.e. CFLs and LEDs) and air quality systems (i.e. air conditioning systems, purifiers, and humidifiers).

Future Potential

Current Energy closed due to an expired sub-lease from the adjacent Apple Store. They were not given an option to renew because the Apple Store had planned an expansion into their space. They closed in 2009 as there was reluctance to open a new store during the financial crisis. The remainder of their inventory was sold to Green Living, a sustainable home-furnishing store hoping to build its "green" cache and by offering a broader range of products. It was speculated that if the financial crisis had not come in 2008 during their lease expiration, they would have franchised to dozens of stores over the past few years. There is still substantial interest in creating another energy efficiency retailer within the next few years, perhaps in closer partnership to utility programs.

Smart Living Center

The SmartLiving Center (SLC) is a 4,000 square foot energy efficiency product and demonstration showcase owned by the United Illuminating Company, a Connecticut-based electricity distributor. It is used primarily as an educational facility for customers, school-aged children, and industry professionals. The SmartLiving Center receives about 3,000 visitors a year and is like a store that does not sell anything. Rather it functions as a community center, museum, training facility, and educational space supported almost exclusively through system benefit charges and managed by the Connecticut Energy Efficiency Fund.

Market

The market for the SmartLiving Center is targeted to homeowners, homebuyers, architects, builders, designers, and trade allies who are interested in adopting energy efficiency products and practices.[55] The first center opened in Newington, Connecticut in 1999 and closed in 2004. The second location opened in 2001 in Orange, Connecticut, and is currently in operation (pictured above). A proposal in 2010 to create multiple SLCs across the state has received the support of the SmartLiving Center Task Force. This expansion will permit the focus of SLC to broaden to renewable energy, green building design, and other energy technologies for older students, businesses, municipalities, and green job firms.

[55] "Energy Efficiency: Investing in Connecticut's Future", Report of the Energy Conservation Management Board Year 2003 Programs and Operations. January 31, 2004.

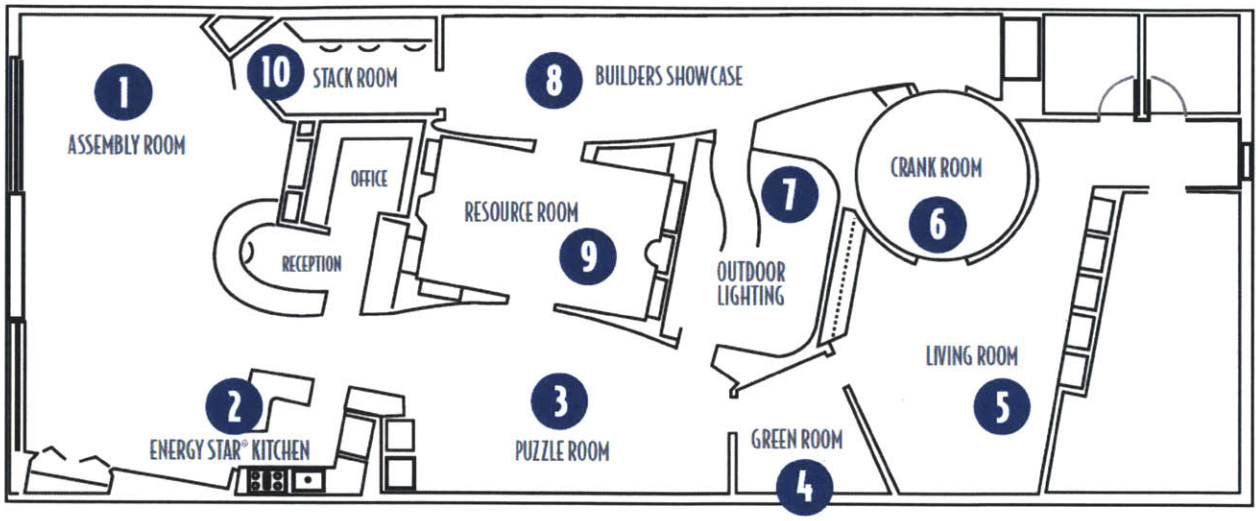
Budget and Operations

The annual budget for SLC has increased 38% to $859,246 in 2011 and is financed through rate payer funds for education and outreach. There are plans to phase out the current facility to expand the scope and provide more technical resource to customers interested in learning more about renewable sources of energy and rebates for existing programs. Rather than having the new facilities staffed directly by utilities, the Connecticut Energy Efficiency Fund is considering putting out an RFP for a third-party operator that could offer broader staffing for technical and educational activities.[56] SLC is complemented by the SmartLiving Catalogue offering buy-down products, or products that already have the rebate taken out of the sales price. The discounted products and the catalogue are provided by the Connecticut Energy Efficiency Fund.[57]

Layout

The layout contains 10 sections of interactive displays and assembly space. The interactive displays periodically change and are created in partnership with local museums. The assembly space is designed for seminars and events hosting a wide range of activities including farmers markets, solar installations, and live entertainment. The spaces that are for product demonstration and education are designed to mimic the environments in which you might see the product used. For example, exterior facades are reproduced with lighting treatments and kitchens built with sustainable materials are reproduced with ENERGY STAR appliances. The exhibits currently learn towards early childhood education and are a popular destination for school trips (part of the budget of SLC provides up to $250 for school bus transportation to the center).

[56] "SLC Options for Board-DPUC", Smart Living Task Force for ECMB. March 10, 2010.
[57] "An Investment in Connecticut Energy Efficiency", Report of the Energy Conservation Management Board Year 2009 Programs and Operations. March 1, 2010.



1. Assembly Room
2. ENERGY STAR® Kitchen
3. Puzzle Room
4. Green Room
5. Living Room
6. Crank Room
7. Outdoor Lighting
8. Builders Showcase
9. Resource Room
10. Stack Room

SMARTLIVING™ CENTER HOME ENERGY INNOVATION

Best Buy: Home Energy Learning Centers

Best Buy as of November, 2011 has begun to pilot Home Energy Learning Centers in three stores in the United States and has built online portal for do it yourself energy assessments, audit scheduling, and energy efficiency product information. Customers will be provided with Best Buy-related product solutions and then get linked with contractors for further upgrades based off information provided by online do it yourself energy assessments or in-store consultations with customer service representatives.

Best Buy is relying on their existing partnership with the technology support company Geek Squad to screen applicants and schedule home energy audits. Geek Squad is dedicating special staff trained in energy efficiency and the audit process, but Geek Squad then contracts the assessments and installations with local area contractors or a contractor of the customers choosing.

Market

Best Buy is hoping to take advantage of the many new technologies that are being brought to market in the energy sector, particularly programmable thermostats and remote home environment controls. As such, they are testing three different value propositions in three different pilots in San Carlos, California, Houston, Texas, and Chicago, Illinois. These pilots will help Best Buy better understand varying value propositions for the market potential of energy efficiency products and services. In the San Carlos pilot, Best Buy is acting as a vendor for utility-sponsored programs. The partnership with PG&E hopes to take full advantage of their rebates and incentives through lead generation for utility programs. The San Carlos pilot is the model most integrated with a partnering utility. In the Houston location, Best Buy is testing energy services in a deregulated market, similar to the Current Energy model of singing up customers

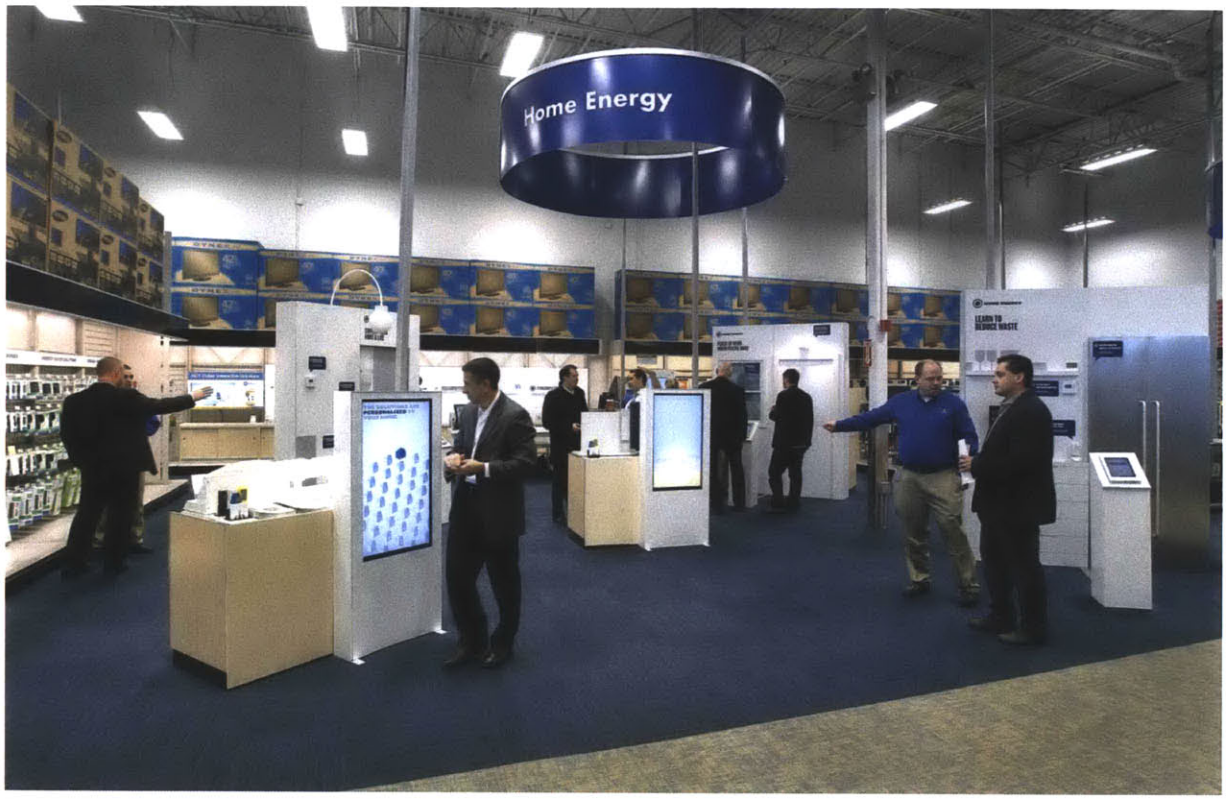
to alternative rate plans for a fee from a utility sponsor. In Chicago the pilot will be testing the impact of the "experience store" on selling energy efficiency. This is trying to understand the consumers' willingness to pay for efficiency, without it necessarily being cost effective and without subsidies being available. Some products like the Learning Thermostat from Next Labs have sold out through early 2012 after being only one week on the market.[58]

Best Buy market research has found that customers are generally not aware of how energy is produced and distributed, and are not aware of energy management options, even though many products are scheduled to come to market. A "Learning Center" that teaches consumers the potential benefits of energy managements with a focus on home comfort and smart energy use would help in technology adoption by assisting customers in developing "efficiency road maps".[59]

Layout

A dedicated Homer Energy Center places emphasis on a few high-selling products with information rich and interactive displays in about 4,000 square feet of space. In addition to displaying consumer electronics, Best Buys' core specialty, Energy Star appliances surround the display floor. The following photographs showing the store layout of the San Marcos location are from the technology blog Gigaom.[60] They illustrate how digital controls can connect to refrigerators, lighting, thermostats, televisions, and other electronics.

[58] "Best Buy Unleashes Geek Squad, Blue Shirts on Home Energy Use", GreenBiz.com. November 4, 2011.
[59] "2011 State of the Consumer Report", Smart Grid Consumer Collaborative. January 31, 2011.
[60] Gigaom. http://gigaom.com/cleantech/photos-best-buys-quiet-home-energy-stores/ Accessed: 12.30.11.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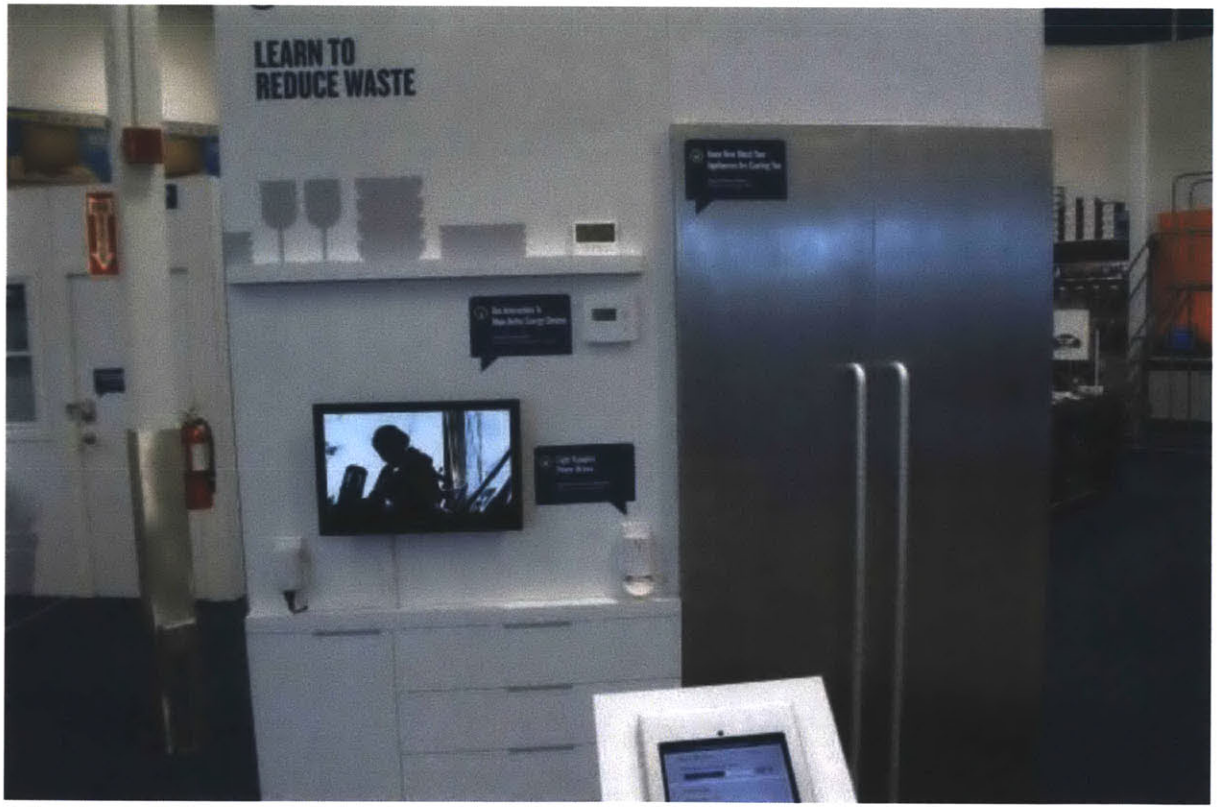
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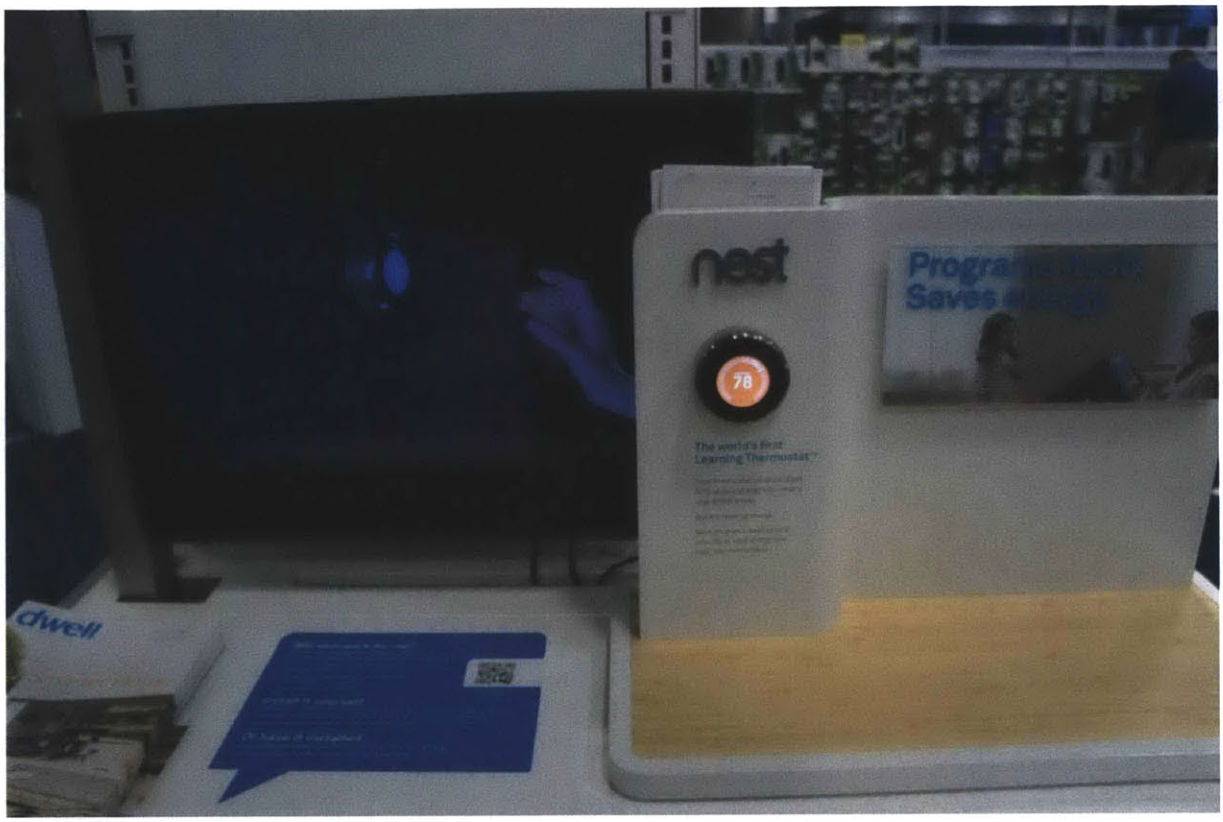
REDUCE WASTE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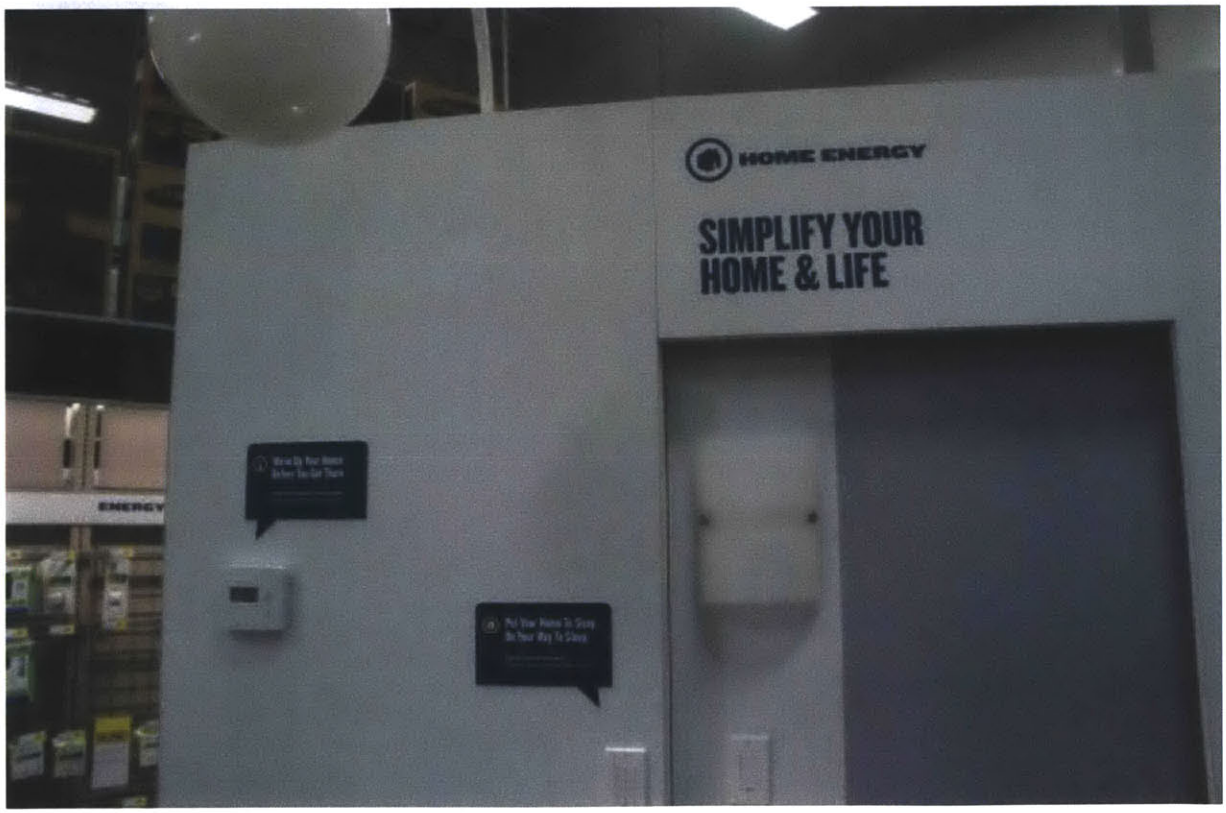
The world's first
Learning Thermostat™
dwell


HOME ENERGY
SIMPLIFY YOUR
HOME & LIFE

Home Depot

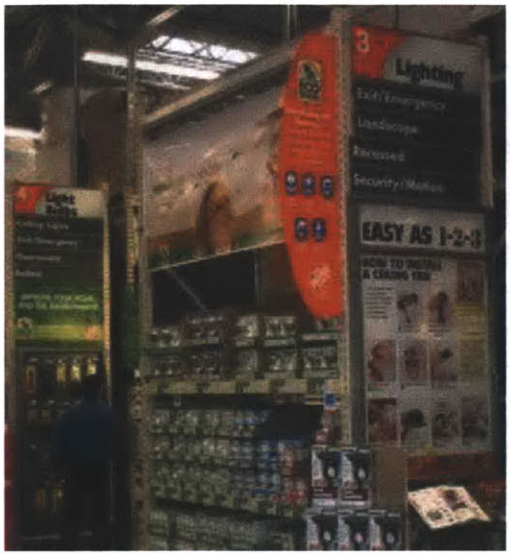
On a similar scale to Best Buy, Home Depot is another international retailer establishing local connections with utilities and product manufactures to expand their business to include energy efficiency. Home Depot currently has almost 2,000 retail outlets in the United States and is the world's largest home improvement retailer, focused mostly on building supplies and home furnishings. They handle 1.3 million customer transaction a year and 12 million credit accounts. In 2009 alone, 2.8 million new credit accounts were opened and 25% of in-store purchases financed through home depot credit. With over 40,000 different products sold, 4,000 are self-certified and branded as "Eco Options" having less of an environmental impact than other competing products on the market. In 2007-2009, over 90 million Eco Options were sold saving customers approximately $740 million on utility bills and an additional 1.8 billion gallons of water.[61] Eco Options have demonstrated energy savings, with in-store credit being a significant financing source. However, they are not a focus here because their relationship to energy efficiency programs is very limited and focused mostly on being vendors for buy-down products.

Layout

Eco Options are not concentrated in one area, but are integrated into the store layout by building material classification. Eco Options also appear is some high-trafficked areas near registers and at the ends of aisles to increase product visibility to consumers that may not have been directly seeking energy efficient or environmentally friendly products. Rather than recreating rooms and creating a visual context for what the products might look like installed, Home Depot tends to stack many products together for more options and easier price

[61] "The Sustainability Strategy", Home Depot Annual Report 2010.

comparisons.



Green Depot

With Green Depot, there exists an arguably successful model of an energy efficiency retailer not relying on subsidy or utility integration for sales volume. They have been scaling up rapidly and now have a bi-coastal market through the acquisition of west-coast energy efficiency retailer and building supplier Ecohaus in 2011. Green Depot has received several awards for innovation and entrepreneurship, as well as sustainability, including the EPA Region 2 Environmental Quality Award, LEED Platinum for Commercial Interiors, Smart Home Green Design Award, and "America's Most Promising Store" from Mindful Metropolis Magazine for social entrepreneurship. Their success is some proof that retail and energy efficiency can work together.

Green Depot is nation's largest green building material supplier with 38 employees, 13 stores, 20 distribution warehouses, and an online store at www.greendepot.com. Founded in Brooklyn, New York in 2005, in 2010 it had a year-on-year revenue growth of 250%. Green Depot has developed a proprietary product filter to certify quality and low-environmental impact. They also provide a "Flip It Green" consulting service to identify and source green building material alternatives for new construction and renovation projects.[62]

Layout

Their flagship store in Manhattan, New York is in a boutique-style setting and has a range of products from green cleaners to recycled art and green gift ideas. That location is unique, costing an estimated $20 million in design and construction.

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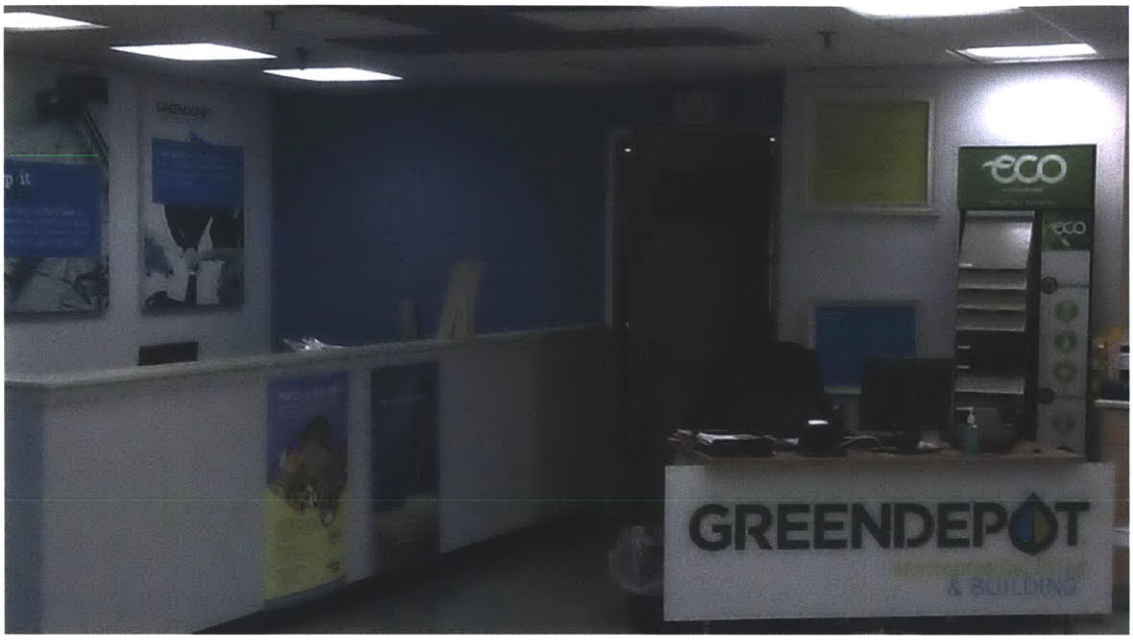
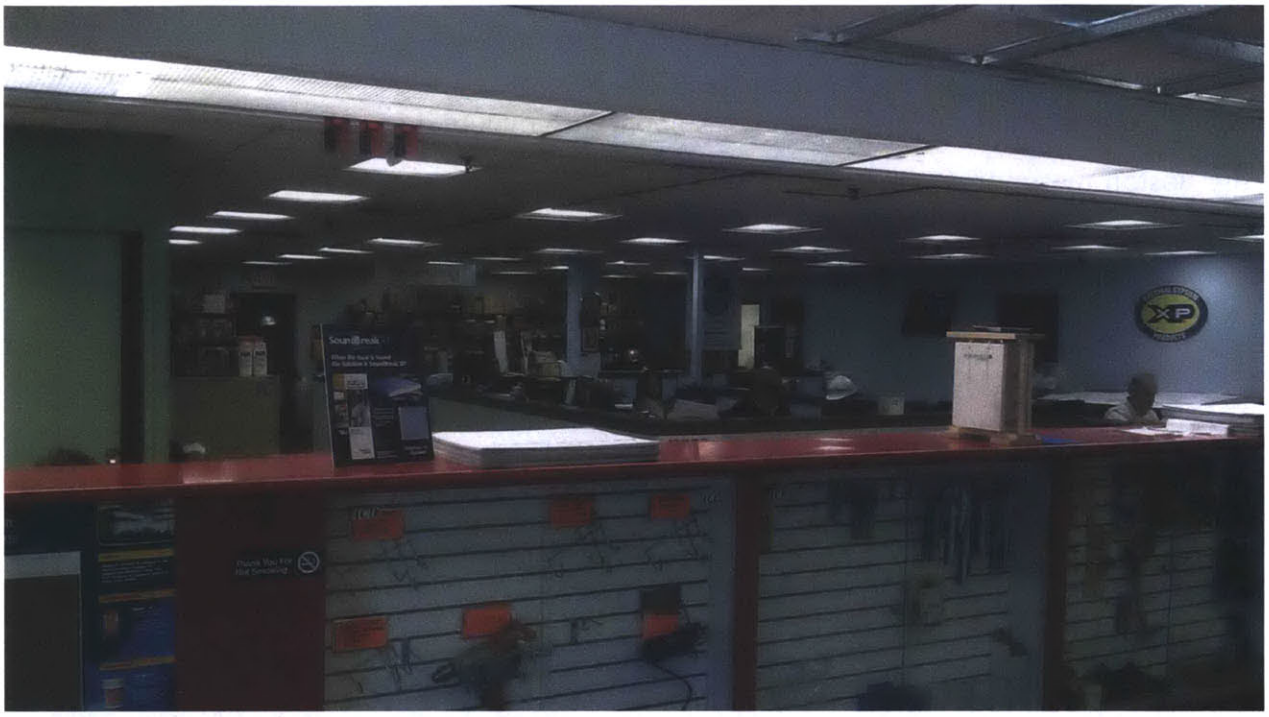
[62] Bloomberg Business Week, <http://images.businessweek.com/ss/10/06/0608_socialentrepreneurs/9.htm> Accessed: August 2011.


FRAGRANCE
FREE
ALL PURPOSE
CLEANER
ALL PURPOSE CLEANER
TUB
AND
TILE
CLEANER
GLASS AND
WINDOW
CLEANER
LIQUID DISH SOAP

The location in Stoneham, Massachusetts, about a 15 minute drive north of Boston and part of the Boston metro area more closely resembles a hardware store that carries green products. That location is approximately 2,000 square feet and in addition is accompanied by a Marjam construction materials supply company.





Operations and Sales

Selling green materials to both commercial and residential customers and assisted through the affiliation with the Marjam contractors, Green Depot in Stoneham has an annual sales volume of approximately $8 million. The location was originally staffed with three employees but now only has one employee to handle customers on the showroom floor. Sales volume has leveled off since first opening but a renovation is expected once the retail outlook improves some so that it could more closely resemble the flagship location. Having no separation between the contractor portion of the store, referred to as "the brown side of the business" and the retail part of the store, referred to as "the green side of the business", has sometimes led to an awkward shopping experience with the back office operations of contractors being fully exposed.

Proposed Model

Energy efficiency and retail stores are coming together to take advantage of the growth in consumer products and the growth in the energy conscious consumer. Retails stores have found that they can play a critical role in educating consumers to further develop the energy efficiency market share. A range of technologies and service offerings in the energy industry have facilitated a range of retail store models from boutique style retailers like Green Depot and Current Energy to more of a department store model like Best Buy. These models are operating with minimal utility integration and with no direct subsidy, yet are yielding their investors profits, yielding customers with energy savings, and are adding to the growing body of knowledge around consumer preferences and energy efficiency. Current utility integration with retail stores is mostly through the supply of discounted buy-down products, but increasing access to this growing customer base can increase participation for existing programs, access hard to reach customers, and integrate a broader range of energy management options to get deeper energy savings. Through segmenting the customer base, targeted marketing, and customer service, purchasing energy efficiency can be made into an enriching and enjoyable experience that can service, for example, both urban residential and small-business commercial clients in addition to traditional program participants.

The question is: How can a retail model create market transformation for energy efficiency products and services in Massachusetts? I propose the development of "The Greatest Generation", a one-stop-shop retail outlet for energy efficient products, energy services, and utility-sponsored programs, where consumers would have readily available and reliable information about product performance, pay-backs from installation measures, educational resources, and the ability to address broader customer energy management and supply needs. Creating a physical space to vend utility programs and demonstrate technological potential is an important part of increasing market penetration. Increased transparency and a customer-focused interface to utility programs that is inviting and exciting will aid in getting customer buy-in to get deeper retrofits. A retail store also provides the opportunity to learn about products

and services beyond energy efficiency and cater to themes that customers care about, like home comfort, energy security, and other social benefits for example.

The Greatest Generation however will have those capacities, while also being a place that directly supports utility-sponsored energy efficiency programs. The value of piloting this approach rests in its environmental impact, scalability, and ability to transform the marketplace for energy efficiency products and services. As a retail store it can be responsive to shifts in consumer preferences, local market demand and demographics, and evolve to take advantage a growing field of technologies and energy services. It is also an approach worth piloting because it could get consumers to make investment and purchasing decisions beyond using just cost-effectiveness as a metric and increasing a customers' willing to spend on efficiency. Through a series of interviews and market research with stakeholders already invested in or interested in the retail store model, as well as stakeholders for residential retrofit programs, a framework for developing a pilot illustrating program and market transformation potential is described. The following are some lessons observed from energy efficiency delivery through interviews, presentation, and secondary sources associated with the Cambridge Energy Alliance,[63] Conservation Services Group[64], Next Step Living,[65] Current Energy, SmartLiving Center, Home Depot, Green Depot, Massachusetts Energy Consumer Alliance,[66] utility representatives, community representatives, academic researched focused on energy efficiency,[67,68] and State, Local, and Federal policy makers: [69]

[63] Interview. Jason Jay, MIT PhD candidate. October, 14, 2010.
[64] Conservation Services Group, Steve Cowell, CEO. Presentation to "MIT 11.379: Enabling an Energy Efficient Society". October 18, 2010.
[65] Geoff Chapin. CEO, Next Step Living. March 4, 2011.
[66] Larry Chretien, Executive Director, Mass Energy Consumer Alliance. November 14, 2010.
[67] Lawrence Berkeley National Laboratory, "Driving Demand for Home Energy Improvements". September, 2010.
[68] "Community Energy Efficiency Programs: Identifying Challenges and Uncovering Solutions", MIT Energy Efficiency Strategy Project. July, 2010.
[69] "Enabling an Energy Efficient Society, Class Presentations. Phil Guidice, Commisioner, Massachusetts Department of Energy Resources; Paul Gromer, CEO, Peregrine Energy; Penni Conner, Customer Care, NSTAR; Steve Cowell, CEO, Conservation Services Group; John Wellinghoff, Chairman, Federal Energy Regulatory Commission.

The Model Defined

The retail model will reach a broader customer base by increasing customer access to existing programs using one-on-one representatives that function similar to an owner's representative or tenant advocate. A key strategy for increasing customer volume and obtaining deep energy savings is to address long-term energy savings through commitments to programs and services in addition to short-term satisfaction through selling consumer electronic energy-related products. With on-site consultation services, product demonstration, education and training, and bundled energy services, The Greatest Generation will take advantage of growing trends in energy efficiency retail and responds to challenges in existing utility programs. Unlike what is currently offered in the market place, this retail model would be structured so that it could be the recipient of system-benefit charges utilities collect to support energy efficiency programming and products. Rate payer funds can support a retail model based on the estimated environmental benefit of products sold or installed measured. In addition, incentive payments can be made to the retail operator based on their ability to increase program participation levels.

Goals

- Increase access to existing programs
- Deeper energy savings
- Inclusion of more demographics
- Integrated Information Resources (Energy Usage & Education/Training)
- Take advantage of evolving product and service offerings in the market

Customer and Market Segmentation

Market segmentation, or the process of dividing a market into smaller groups with distinct needs who may require separate products or marketing mixes, allows for the creation of value for targeted customers.[70] Figure 21 shows the market segmentation for energy efficiency products and services split into generalized customer profiles and their potential engagement

[70] Kotler, Philip. "Marketing Management", 13th edition 2008.

with a retail store. These customer profiles represent who Massachusetts may like to target with a retail strategy and their respective characteristics that would interest them in particular product and service offerings. The offerings and customer targets can change with shifting policy priorities and changes in market demand or local housing characteristics for example. Envisioned in Figure 21 is what a central city urban location may offer to both residential and commercial clients.

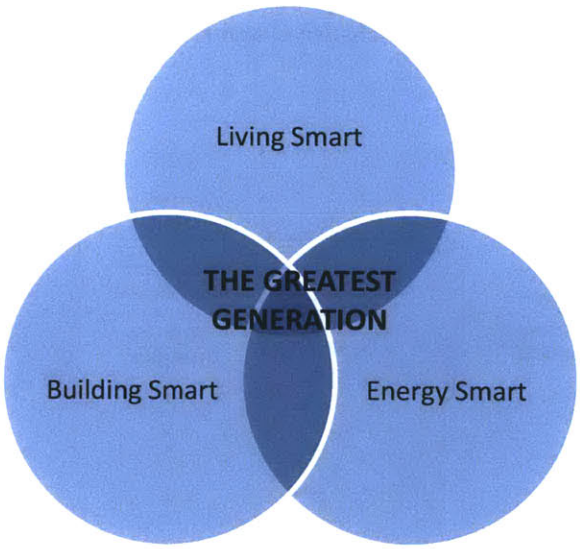
Figure 21: Customer and Market Segmentation

	Customer Category	Residence Profile	Energy Profile	Possible Retail Store Engagement
RESIDENTIAL	Non-City Dweller	Single-Family Home Owner	Energy Hog	Mass Save Retrofit; Development Consultant; Solar Installation
	Urban Dweller	Multi-Unit Rental	Doesn't Know	Energy Dashboard; Lighting; Water Management
	High-Income Urban Dweller	Condo Owner, New Rental Building	Energy Conscious	Eco-Friendly Products; Remote Controls; Appliances
	Low-Income Urban Dweller	Multi-Unit Rental	Expense Conscious	Lighting; Weatherization Information Services
	Low-Income Rent Restricted	Multi-Unit Rental	Subsidized	Education; Gifts & Gadgets Indoor Air Quality
COMM.	Small Business Retail	3,000 SF Mixed-Use Building	Mixed	Deregulation; Refrigeration; Lighting
	Commercial and Industrial	10,000 SF Stand Alone Building	Energy Hog	Demand Response; Solar Installation Supply-Chain/Waste Mgmt
	Office	Multi-Floor, Dense	Energy Hog	Demand Response; HVAC Low-VOC flooring

For marketing purposes, the range of offerings fall into three generalized areas which can be called, "Building Smart", "Energy Smart" and "Living Smart". These simplified categories are the

basis for the retail concept and can be used to target products and service offerings of interest to the EEAC. The greatest efficiency and energy savings can be found at the intersection of the three, as in, getting a retrofit under "Building Smart", plus arranging for a solar contractor under "Energy Smart", and then getting eco-friendly products such environmentally conscious cleansers under "Living Smart". This approach more holistically addresses how someone can live an energy conscious lifestyle, which includes, but is not limited to energy efficiency. The intersection of all three is the greatest energy savings, or "The Greatest Generation" as seen in Figure 22.

Figure 22: Retail Concept and Offering Divisions

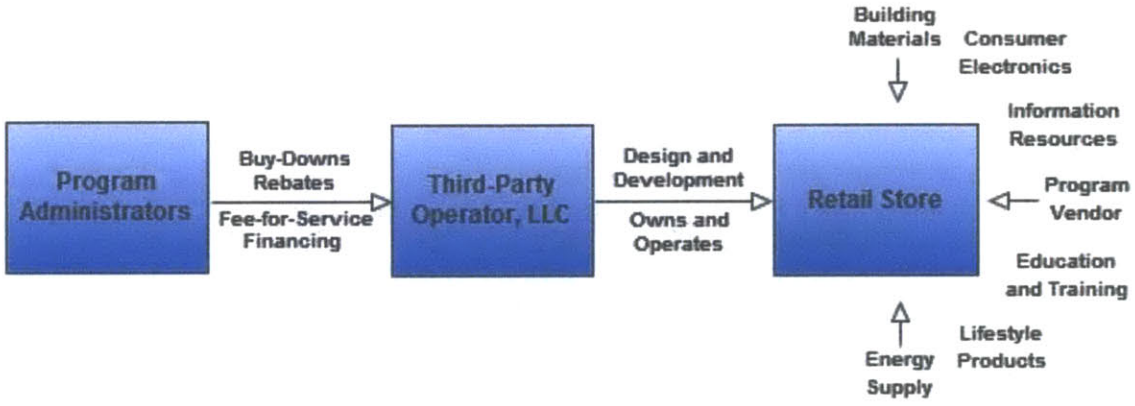


Building Smart	Energy Smart	Living Smart
Mass Save Retrofit	Solar/Renewables	Eco-Friendly Products
Building Materials	Lighting	Gifts & Gadgets
Building Systems	Demand Response	Monitoring and Controls
Development Consultant	Deregulation	Information Services
Audits/Weatherization	Waste Management	Education/Training

Organizational and Ownership Structure

PAs or utilities are rarely the direct owners and operators of retail stores, but there is interest from existing HPCs in the Mass Save program, entrepreneurs, and established retailers who are interested in partnering with utilities to operate a retail store. The EEAC and PAs would put together a Request for Proposals (RFP) for the operation of a retail store by a third party entity, generically labeled "Third-Party Operator, LLC" (TPO) in Figure 23. Once a decision is made by the EEAC to pilot a retail store and the PAs select a TPO, the TPO is then responsible for the development and operations of the retail store in accordance with a framework established by the PAs and EEAC during the RFP process.

Figure 23: Retail Model Ownership and Operations



Possible Product and Service Offerings

Vendor for Mass Save

CSG is the lead vendor the for the two largest administrators of Mass Save, NSTAR and National Grid. Recently, more flexibility in the Mass Save program model has been added permitting qualified Home Performance Contractors to deliver the Mass Save program from audit through installation. Marketing for the Mass Save program can direct people to the retail store, allowing

the intake process to begin at The Greatest Generation before customers are forwarded to the appropriate Vendor, HPC or CAP Agency. In a retail model, "intake" starts when a customer walks into a store and customer representatives can guide customers through which programs and products would address their needs. If an HPC is itself the operator of the retail store, then their contractor can be fully integrated into the retail concept and program delivery model. An HPC or CSG being part of the partnership that operates the retail store could improve the customer service experience and quality assurance by presenting a consistent interface to the customer and limiting the number of steps the customer may have to go through to get an energy assessment and retrofit.

A retail model could help increase participation in the Mass Save program by improving the intake process for harder to reach customers. A retail store provides open access and information sharing in a way that may make hard to reach populations more accessible. A in-person session with a program representative may help in getting the most complete picture of the customers housing and demographic information. It might also aid in getting the potential customer to share sensative information related to income verification, housing occupancy, and available budget for upgrades. With added personal attention earlier in the procees, the program could be tailored so that customers are aware of all available options and installation measures before the contractor visit, maximizing available options. Multi-lingual customer service representatives and language neutral messaging (e.g. IKEA instruction manuals) could appeal to Massachusetts' diverse population. In addition, some of the most popular sales at Best Buy and Current Energy were programmable thermostats, smart outlets, remote home monitoring/security devices, lighting, and alternative charging or power management for consumer electronics—all popular with renters.

Under the Mass Save program 49% of participants who receive rebates have two or more visits from an auditor. One of the biggest complaints from both consumers and contractors is the logistical challenges and costs associated with many home visits and limited windows of time for installation work. Participants often have to take the day off from work in order to schedule an assessment. Flexibility in installation hours, evening and weekend hours, and limiting the

number of home visits will provide benefits that will outweigh the costs (including opportunity costs) of doing the two- to three-visit model is energy audits.

Information Resources

Customers would have the ability to walk in with their bill or account information and receive detailed energy usage data. This is one competitive advantage this store will have as compared to other models that are not more fully integrated with a utility. Using this data, their housing characteristics and their planned budget, a customized plan for saving energy can be developed. A benefit of having this utility-supported model for retail is that its functions can be integrated with utility data on energy usage pre- and post-installation. With a retail format, the customer can instantly permit the vendor to access energy usage information and can even elect to share that information with others. This will not only help with measurement and verification for installed measures, but also help to engage the customer, perhaps even through the use of energy usage visualizations for the customer. Not being able to visualize or sense energy efficiency can make the sale of efficiency challenging. Supported with utility data, the visualization of energy efficiency could take many forms, and be made into an engaging centerpiece of the store that draws in customers.

Buy-Down Products Vendor

Utilities and product distributors already have relationships with building supply retailers like Home Depot, manufacturers, and distributors, where rebates are taken out of the price for a product before the product is on the shelves. The Greatest Generation could be another location where these products are offered, or a policy decision could be made to concentrate buy-down products within this one retail store so as to give the retail store a pricing advantage and cross-expose customers to utility programs and other energy saving ideas.

Energy Service Plans

Massachusetts' deregulated energy market means that consumer can choose to get their energy from a few possible distributors. As was the case in Current Energy, The Greatest

Generation can provide distributors with new customers and customers with new rate plans. These alternative rate plans could include more renewable energy resources or variable pricing mechanisms.

Development Consulting

Development consulting for new building or retrofits involves being a green building specialist able to give recommendations for how to improve the efficiency and comfort for proposed building plans. This is a more thorough engagement with a project sometimes lasting months and ranging from recommending green building materials to being the contracted party for energy services and HVAC installation. Development consultants usually work on behalf of the developer, but have to work closely with architects or engineers on improving an projects overall energy performance.

Sublease Market

The Greatest Generation can sublease part of its retail space to other vendors seeking increased access to a retail customer base. There are several emerging markets within the energy industry, and this flexible space ensures that The Greatest Generation remains relevant to changing technologies and diverse consumer needs. In Boston, an example could be providing a sublease to EnerNoc for meeting with and signing up commerical landlords and building operators for demand-side energy management. These internal store partnerships ensure a full suite of services are being offered. Other examples include Current Energy subleasing with a commerical water management and conservation contractor and Best Buy contracting with Geek Squad to coordinate its energy efficiency services.

Education and Training

There are ways in which other interests could be brought into the space of The Greatest Generation to maximize collaboration and customer outreach. Space could be provided at no cost to not-for-profits in the area that are looking for a forum to demonstrate community energy efficiency practices. Suppliers and other businesses also look for spaces to demonstrate

their products and hold training seminars. Owners with rental units who contract with The Greatest Generation for energy efficiency remodeling could also have their tenants receive an introduction to what's being greened and how it should be cared for, as well as assist in scheduling concerns. This could reduce the "split-incentive" problem for property owners hesitant to upgrade to more expensive, but more efficient, building systems.

Program Costs

Program costs can vary substantially by the exact components of the retail store. Main operating cost drivers are rent, staffing, and inventory. Upfront non-operating costs are mostly driven by outfitting a retail store. Figure 23 breaks out what startup and operating costs may be for the model described.

Figure 24: Startup and Annual Operating Costs

Startup Costs	
Inventory	$400,000
Renovation/Outfitting	$250,000
Contingency at 15%	$140,958
Mortgage or Lease Deposit	$90,000
Professional Fees	$20,000
Store Fixtures, Signs & Equipment	$20,000
Insurance	$5,000
Licenses, Permits & Registration	$5,000
Office Supplies & Store Use Items	$5,000
Website Development	$5,000
Utilities Deposits/Connection	$500
Total	**$941,458**

Annual Operating Expenses	
Rent Payment	$600,000
Wages	$333,760
Inventory	$200,000
Advertising/Marketing	$10,000
Insurance	$10,000
Utilities	$8,000
Web Hosting	$1,000
Total	**$1,162,760**

Almost half of the annual operating expenses are due to rent payments. It is assumed that the store would need to be located on a premier retail stretch with a regional draw and high

customer volume. Independent retailers such as Current Energy and Green Depot cited their location as being key to attracting a customer base that is aware of energy issues, interested in technology, curious to learn more, and owners invested in the long-term energy performance. Being able to feed off the foot traffic from other adjacent retailers seeking similar demographics helped these startups get discovered by new customers. The Newbury-Boylston retail corridor in Boston bordered by Massachusetts Avenue and the Boston Public Gardens is one of the highest trafficked retail corridors in the region attracting a diverse range of high-end to more edgy and independent retailers. The median rental rate in that submarket is approximately $120 per square foot.[71] Assuming 5,000 square feet of retail space, annual rental cost is $600,000.

Wages are another significant source of operating expenses, accounting for almost a third of the annual budget. The smaller independent retailers have between 2 and 8 employees, with those focused on building supplies and larger floor plates having about 25 employees. The Green Depot in Stoneham, Massachusetts currently has only one employee assigned to the retail portion of the store, but about 20 contractors associated mostly with commercial installation services. Assumed in The Greatest Generation model in Figure 24 are wages associated with 7 employees consisting of four sales representatives, two managers, and one administrator at competitive wages. The highest median wage within the retail sector is $11.51 per hour and Genius Bar workers at Apple Stores are paid about $13 per hour. The Greatest Generation assumes an $18 wage for sales staff due to a higher degree of specialization required and $25 per hour for management, which is the median managerial wage in Boston.[72]

Another significant cost driver is layout and space considerations, which is also related to rental expenses. About 5,000 square feet permits a location in an urban retail market and is typical of retail stores located in malls and other shopping districts. Current Energy was 3,000 square feet, Best Buy and the Smart Living Center had about 4,000 square feet dedicated to energy efficiency, and Green Depots range from 2,000 square feet to over 10,000 square feet if building materials are being stocked on site. 5,000 square feet should be an area sufficient to

[71] "CBRE Study Highlights Newbury Street Surge", Boston Business Journal. July 20, 2010.
[72] "Retail Sector Economic Planning Initiative", Boston Redevelopment Authority. Fall 2003.

accommodate product display, program vendors, and subleases to other energy related businesses that may find a synergy with the customers of The Greatest Generation. Experience stores like Sharper Image and the Apple Store for example allow customers to test products and familiarize themselves with technologies. Staged areas, like in the product displays for IKEA, also permit the customer to see how the product would work in a recreated environment. For example, instead of having a wall with different lights that can be adjusted (i.e. experience store), a staged area would recreate a living room or exterior façade to recreate where the lights would actually be installed. Walking through a recreated environment allows a customer to visualize how these products can be integrated into their existing residence or outdoor space. Furthermore, an experience store provides the customer with an engaging and entertaining retail experience.

Market and Program Impact

One way to size the impact of a retail store is to estimate the sales volume, as sales volume would correlate with environmental impact and customer volume. Figure 25 illustrates the sales volume for a sample of existing energy efficiency retailers.[73] Green Depot in Stoneham, Massachusetts in the Boston metro area had about $8 million in sales volume in 2010 for both the commercial and residential sectors. More specifically focusing on the residential sector, Currently Energy earned about $6 million in revenue from retail sales and about $2.5 million in services, $1 million of which was earned from the sale of residential energy audits.

[73] ESRI Business Analyst. ARcGIS 10. Accessed: 12.18.11.

Figure 25: Sales Volume for Energy Efficiency Retailers, 2006

Store Name	City	2006 Sales Volume ($ millions)	Employees
Green Depot	Chicago	4.2	12
Green Depot	Brooklyn	4.2	12
Green Depot	New York	-	-
Green Depot	Newark	2.1	6
Green Depot	Stoneham, MA	8.8	25
Green Depot	Newark	0.2	-
Green Depot	Philadelphia	-	2
Current Energy Services	Dallas	18.8	100
Current Energy Retail	Dallas	2.1	8
Ecohaus	Seattle	17.5	50
Ecohaus	Portland	5.3	15

Of the 500 customers who received an energy audit annually, about 400 had some measures installed. This 80% success rate in getting a customer to install recommended measures is much higher than the estimated 20% success rate for Mass Save. Current Energy's energy savings goals were also a two-year payback for installation measures, with customers saving approximately 50% on their energy expenditures. Under Mass Save, energy savings are more likely to be in the 5% to 20% range.

Considering start-up and operation costs and potential benefits, the value proposition for the customer, utility, and operator would be substantial. Already these stores are selling efficiency at a profit and without much utility support. Current Energy for example had about 75,000 customers enter their store annually and earned $20 million, using less than $1 million in startup capital and with an annual operating budget of less than $1 million. Customers also benefit by saving about 50% on their energy bill. For The Greatest Generation, exactly how the profits are distributed across stakeholders are a point of negotiation and further investigation for the EEAC and the Massachusetts Attorney General charged with protecting consumer interests for GCA. Windfall profits for HPCs' under Mass Save have been prevented through

profit caps on sales. A similar method of consumer protection could be employed for the TPO of a retail store.

If a store located on Newbury street attracted 75,000 customers, and free energy audits and subsidies were available to those earning less than 120% AMI, audit volume could be much greater than the 500 audits Current Energy sold for a median price of about $1,000. If 10% of customers took advantage of audits and subsidies, then 7,500 audits could be completed annually. With an 80% success rate of getting a customer to install some measures from an energy audit, 6,000 energy upgrades could be completed annually through an annual operating investment of about $1 million. That's an annual cost of $167 per customer for participation in the Mass Save program, not to mention the other energy benefits that may be conferred from other energy-related and environmentally conscious product and service purchases. As a comparison, Mass Save costs about $45 million annually to get 45,000 program participants, or a cost of about $1,000 per participant (Figure 26).[74] The benefits in Figure 26 are just for participating in audits and energy upgrades and do not account for the additional energy and environmental benefits of participating in "Living Smart", "Energy Smart", or other aspects of the "Building Smart" business lines. In addition to a simple analysis of energy saved per dollar invested, other non-economic benefits like equity and health for hard to reach customers should also be considered in program evaluation of The Greatest Generation.

[74] Bureau of Labor Statistics. "Table 7. Housing tenure and type of area: Average annual expenditures and characteristics, Consumer Expenditure Survey 2010". http://www.bls.gov/cex/2010/Standard/tenure.pdf. Accessed: 12.30.11.

Figure 26: The Greatest Generation Program Costs and Outcomes

The Greatest Generation	
Annual Store Entrants	75,000
% Sign Up for Audit	10%
# of Audits	7,500
% Install Measures	80%
# Energy Upgrades	6,000
Energy Savings	50%
Annual Energy Expenditures	$2,486
Annual Energy Savings	$1,243
Annual Program Cost	$1,162,760
Cost per Upgrade	$194
Mass Save Program Cost, 2010	$40,480,075
Mass Save Participation, 2010	40,753
Mass Save Cost per Upgrade	$993

Conclusion

With $2.1 billion in investment in energy efficiency over three years, Massachusetts has supported strategic interventions in the market for energy efficiency products and services through utility investment. The Mass Save program model has been the primary means to delivery efficiency to residential consumers, but as the easiest to access consumers pass through the program, new strategies that bring energy efficiency closer to consumers is needed. Growing trends in energy efficiency retail stores and the growing demand for effective utility programs in the broader market suggest that a retail store integrated with utility programs may be a compelling force in the energy efficiency market. After a pilot store better establishes the market opportunity and risks, a retail store model could be franchised and modified as necessary to meet local demands. Franchised across the United States, the climate impacts of a successful retail model could be substantial.

PAs are currently aggressively pursuing how to segment the market and tailor programs to customer and vendor needs. A barrier for many programs is that they are too rigid to address the unique challenges facing each building and owner. To efficiently process customers, programs often set up barriers, pre-qualifications, and threshold requirements so that they can target only those customers that will give the highest payback with the least challenges. As project needs divert from program guidelines, project cost increases, but customers may be willing to pay more to get what they want, how they want it. An important aspect of The Greatest Generation is bundling services together to create something of greater value as a package than if sold as individual components. Such bundling may be more appealing to customers who have interests beyond efficiency, but also to utilities who can implement measures from other programs thus maximizing energy savings per project.

There also exists significant industry and public-sector interest in innovation and entrepreneurship for addressing challenges in scaling energy efficiency. According to state regulators and utilities, there is a willingness to adopt new models that address longstanding barriers to achieving efficiency. One of those barriers is pre-weatherization issues. For the

market to open up more for energy upgrades, issues like knob and tube wiring or health and safety violations need to be addressed. An in-person intake process through a retail store may aid in identifying pre-weatherization issues early on, but funding needs to be available for these properties which tend to be older or in low-income areas. It is estimated that in some urban areas, almost 50% of the homes have some pre-weatherization issues that prevents a home energy assessment. Other barriers for program participation include making energy efficiency into something that is truly exciting to customers. Part of this solution involves messaging and branding that resonates with broader audiences and more simply conveys the benefits of energy upgrades, such as the theme of energy security or healthier homes. These may seem like subtle nuances but make the difference between customers feeling like they are consuming a valued good in the market versus participating in an institutional process. Furthermore, a brick and mortor strategy to increase the understanding of how efficiency works through information rich displays and consumer education could yield an increase in customer participation, greater paybacks through behavior change, and a higher willingness to pay for energy related technology and services.

Structured into GCA is the option for pilot programs to experiment with service delivery. Pilots can account for 1% of the GCA budget and do not have to meet the Total Resource Cost Test. These pilots can even be implemented immediately if it is demonstrated that they can meet savings triggers higher than existing programs. While the concept of operating a retail store for a utility may be too entrepreneurial in nature, other vendors and HPCs may be very interested in participating in the creation of a retail venture. The process for approval is one of negotiation and program refinement with a utility, followed by support from the EEAC. Support for piloting this model with these partners rests in the ability of a pilot to more concretely assess the costs and benefits associated with implementation. The Greatest Generation is an opportunity to address energy efficiency for customers in an unprecedented way, but it requires flexibility from PAs and buy-in from existing vendors to function with the greatest efficacy.

There are dozens of precedents for energy efficiency delivery programs in the United States that have created suppliers of efficiency from the community scale to the federal level. These have

facilitated an ever expanding field of players in the efficiency markets through tremendous government funds, but coordination and a model for effective delivery to scale is lacking. As a tool for market transformation, a utility-sponsored retail model may be an effective means for engaging consumers to adopt wholesale energy efficiency, especially for people who may not be traditional participants in energy efficiency programs. A central challenge to achieving scalable gains in energy efficiency is the lack of centralized information about products, services, and programs that are focused on the needs of the consumer while being cost-effective. Integrated with utilities and a compliment existing programs, The Greatest Generation can be an important tool for delivering energy efficiency in new markets and with deeper energy savings.

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