RAP Energy solutions for a changing world

AFFORDABLE HEAT:

Whole-Building Efficiency Services For Vermont Families and Businesses

The Regulatory Assistance Project

June 2011

- Embargoed until August 1st 2011, 11 A.M. -

This report is an update of "*Affordable Heat: A Whole-Buildings Efficiency Service for Vermont Families and Businesses*" which was published by RAP in 2008. Ajith Rao and Riley Allen were the primary authors of this report. The 2008 report was authored by Richard Cowart, Richard Sedano, Frederick Weston and Brenda Hausauer.

Global
US
China
EU

The Regulatory Assistance Project

Home Office (US)
50 State Street, Suite 3
Montpelier, Vermont 05602

phone: +1 802-223-8199
fax: +1 802-223-8172

www.raponline.org

Acknowledgements

The authors deeply appreciate the thoughtful input that helped to fortify this report. Many people agreed to take time to give their perspective on how best to more completely serve Vermonters' energy efficiency needs and to explain how they can participate in that effort.

Special thanks go to the following people for providing in-depth assistance and interviews: Emily Levin, Chris Burns, Matt Cota, Sara Teachout, Dave Lamont, TJ Poor, Kelly Launder, Aaron Adler, George Twigg, Alyx Lyons, Scott Campbell, Peter Adamczyk, Ludy Biddle, Debra Baslow, Shaun Donahue, Geoff Wilcox, Craig Peltier, Nancy Wasserman, Paul Cillo, Brian Shupe, Johanna Miller, Scott Harrington, Richard Faesy, Mark Zimring and Merrian Fuller.

Finally, we would like to pay a special tribute to the late Blair Hamilton, who was deeply involved in many of the conversations as we developed this report. We dedicate this report to his memory, and hope it inspires new ideas on how we tackle this critical challenge.

TABLE OF CONTENTS

FIGURES AND TABLES

Executive Summary

A. Affordable Heat: The Present Challenge

The average Vermonter and the Vermont economy are facing a fuel affordability challenge of historic proportions. In 2010, Vermonters paid over $600 million to import fossil fuels for use in our homes, businesses, and other buildings. That is almost $300 million more than we were paying in 2000. By any standard, importing fossil fuels imposes a large tax on the Vermont economy. Our annual fuel expenditures for residential and commercial heating alone have been significantly greater than the revenues brought in by the entire agricultural sector[1] and were almost $85 million more in 2009 alone.

This problem will persist. Energy prices over the coming decades will be much higher than they have been in the recent past. World demand for energy continues to rise powerfully, driven in part by the rising economies of countries such as China and India, and new sources of supply are not keeping up. As we move to issue this updated report in early 2011, instability in the Middle East is precipitating yet another round of rising and volatile crude oil prices. Meanwhile, Vermont has a higher than average dependence on unregulated fossil fuels for heat. Dollars for low-income heating assistance are not stretching as far in the tough economy, and prospects for the future do not look better.[2]

In addition to their direct economic costs, fossil fuels used in buildings also represent the second largest source of greenhouse gas emissions in Vermont (after transportation). The buildings sector in Vermont produces a much larger fraction of statewide greenhouse gas emissions (approximately 26%) than does the United States as a whole (approximately 8%),[3] largely due to our state's heavy reliance on these fossil fuels.

The good news: If these costs were unavoidable, we would just have to accept them. But they are not. Analysis of Vermont's building stock and years of experience with the low-income Weatherization Assistance Program, Efficiency Vermont's programs, NeighborWorks® Alliance of Vermont programs, and others all demonstrate that we could reduce fuel consumption in many thousands of individual buildings by 25% or

---

[1] The cash receipts from all Vermont crops and livestock agriculture were approximately $514 million in 2009. (Source: U.S. Department of Agriculture, New England Agricultural Statistics, New England Cash Receipts 2009, September 2010).

[2] Jennifer Reading, WCAX News, "*Will Home Heating Aid Cuts Leave Vermonters Cold?*" February 18, 2011.

[3] *Utility Facts 2008*, Vermont Department of Public Service, Updated July 2008.

more.[4] These efforts represent an opportunity to lower the cost of heat by deciding to invest in Vermont's buildings infrastructure. This report recommends a set of policies and services that would allow us to realize this opportunity, by building upon existing efforts.

B. Legislative Goals and Recent Progress

When this report was first issued in early 2008, Vermont was in the midst of another fuel crisis – heating fuel prices were spiking to unprecedented levels. Based on that 2008 report, which highlighted the successes of Efficiency Vermont, the Weatherization Assistance Program, Vermont Gas Systems, and others, the Vermont General Assembly in 2008 adopted a set of challenging but achievable goals for the buildings efficiency initiative with Act 92 (The Vermont Energy Efficiency and Affordability Act).[5] Those goals aim, among other things, to improve substantially the energy fitness of 25% of the state's housing stock by 2020 (about 80,000 units) and reduce annual fuel needs and fuel bills by an average of 25% in the housing units served.

Based on the programs and goals from Act 92 and also through the various programs funded through the American Recovery and Reinvestment Act of 2009 (ARRA), Vermont made significant strides toward addressing the challenges posed by heating fuel consumption in buildings. ARRA and other sources provided funds to the Weatherization Assistance Program, NeighborWorks® of Western Vermont, the Vermont Fuel Efficiency Partnership, and the Vermont Housing Conservation Board. As a result of this funding, the Weatherization Assistance Program ramped up its capacity and increased the units treated from about 1,430 in 2007 to about 1,830 in 2009.[6] Efficiency Vermont's Home Performance with Energy Star Program grew from a small effort that addressed less than 100 units per year to one that addressed about 530 units in 2009.[7] NeighborWorks® of Western Vermont established a goal to help 1,000 Rutland County residents complete whole-buildings retrofits over three years.[8] The Vermont Fuel Efficiency Partnership was established to provide more whole-building retrofits to multi-family units. In addition, as a requirement for obtaining the ARRA funding, Vermont in 2009 passed legislation establishing building codes for new buildings that meet the requirements of the 2009 International Energy Conservation Code (IECC). Act H.56, which was passed in May 2011, addresses some of the roadblocks facing the

---

[4] Personal communication with Shaun Donahue from the State Office of Economic Opportunity; Emily Levin from Vermont Energy Investment Corporation and Ludy Biddle from NeighborWorks® of Western Vermont, January 2011.

[5] Vermont General Assembly, *The Vermont Energy Efficiency and Affordability Act (Act 92)*, March 19, 2008, http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT092.HTM.

[6] Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011.

[7] *Efficiency Vermont Annual Report 2009*, November 2010.

[8] Personal communication with Ludy Biddle from NeighborWorks® of Western Vermont, January 2011.

implementation of Property Assessed Clean Energy (PACE) programs across the state, which can prove to be an important tool in financing residential energy efficiency improvements.

However, largely due to the temporary nature of the funding through ARRA, limitations associated with the scope of existing programs, a decrease in federal tax credits for residential energy efficiency measures, and the expiration of the Green Mountain Energy Efficiency funds, *Vermont likely will fall short of the Act 92 goals for 2020. The analysis conducted in this report suggests that the shortfall will be 24,000-31,000 homes*, creating continuing losses to the economy and also ensuring that the problems will persist in the years to come. Vermont therefore needs to redouble its efforts in this area, in particular by targeting key impediments to efficiency investments to ensure lasting success. This report lays out a set of recommendations that address these impediments based on a detailed analysis of the current situation.

Job Impacts of the Proposed Recommendations

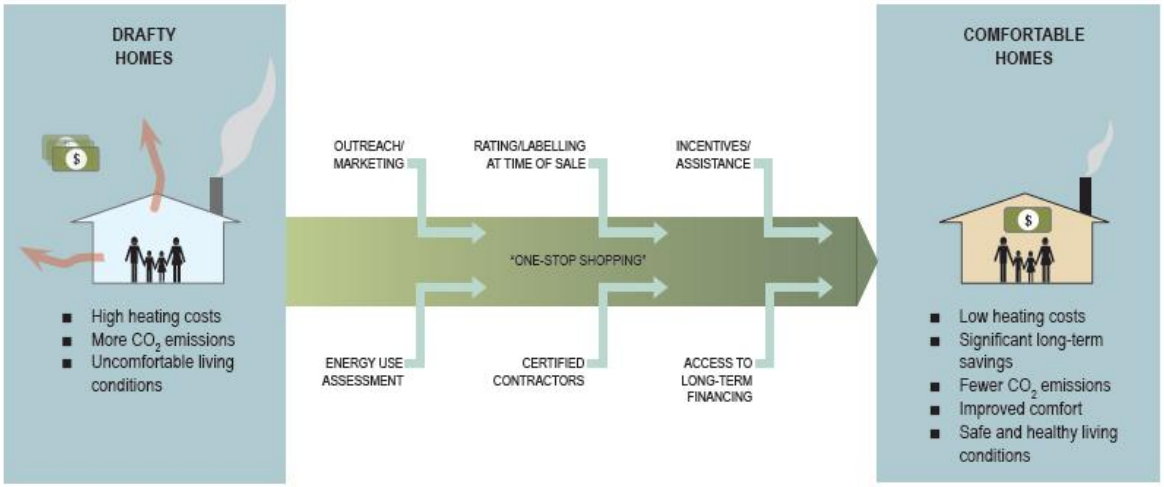
The job impacts of adopting the recommendations of the original 2008 report were positive according to an independent economic analysis conducted in 2008 for the Legislative Joint Fiscal Office. The analysis reported:

- *The expenditures in the first 10 years of the Affordable Heat Program will yield significant immediate and longer term net economic benefits to the state. Ultimately, the reduced energy consumption these investments enable will support real disposable income gains of nearly $2 million per year in constant 2000 dollars.*

- *State stimulus of job growth in the construction, maintenance, and repair sector may be especially timely, with declining construction and real estate markets leaving an increasing number of Vermont workers in this industry unemployed.*

C. What is Needed: Sustained Efforts Encompassing a Comprehensive Approach to Buildings Efficiency

Figure 1: Diagram Illustrating the Different Elements Required for Implementing a Broad-Based Strategy for Driving Whole-Building Energy Retrofits



Vermont's largely rural population resides in widely dispersed buildings that will require more than a single approach to providing whole-building efficiency services. Vermont has more than 240,000 occupied housing units and one of the nation's oldest housing stocks. There are also 21,000 businesses in commercial spaces of widely varying types and over 1,000 new housing units built every year.[9] This report recommends a set of whole-building efficiency services to those buildings, containing seven major elements:

1. Develop effective outreach initiatives for driving demand for home energy retrofits by leveraging entities with direct relationships to the customers, including **town energy committees** and **fuel dealers** (*Section 2*).

2. Initiate a **time-of-sale efficiency review and disclosure** for residential and commercial buildings, coupled with technical and financial assistance for efficiency upgrades (*Section 6*).

3. Steadily increase the number of units served by the low-income **Weatherization Assistance Program** by 7.5% every year to improve efficiency, fuel costs, and life safety in existing low-income housing (*Section 5*).

[9] In recent years (2008 and 2009), the number of new homes built in Vermont has decreased significantly. See Bureau of Census data at http://www.census.gov/const/www/C40/annualhistorybystate.pdf.

4. Continue to focus on multi-family housing units through the **Vermont Fuel Efficiency Partnership** program (*Section 2*).

5. Continue efforts on the **market-based service** of outreach, financial and technical assistance for other existing housing and commercial buildings on a "**whole-building**" basis, through the State's energy efficiency utility: Efficiency Vermont, Vermont Gas Systems and Burlington Electric Department (*Section 6*).

6. Establish an easy-to-access loan program for high-quality upgrades by home and building owners, with capital provided by a **consortium of banks and private lenders**, possibly supported by the state agencies with lending expertise in the buildings sector (*Section 6*).

7. Establish responsibility for a statewide entity such as the **Department of Public Service** to coordinate whole-building efficiency services programs among diverse providers and to meet state goals (*Section 6*).

Implemented together, these recommendations would provide a seamless path, allowing for the implementation of residential energy improvements on the scale required to meet Act 92 goals.

D. Design Principles and Statewide Goals

The recommendations in this report are built on a set of design principles that are based on the experience gained by Vermont efficiency providers over the past three decades. The most important guiding principles are:

- ***Focus on the needs of customers — that is, Vermont families, homeowners, and business building owners.*** Programs must be customer-focused, maximizing easy-to-use services and "one-stop shopping" and minimizing transaction costs.

- ***Address the persistent market barriers to efficiency.*** This requires a combination of information/audit services, technical assistance, and financial assistance to owners.

- ***Build on existing institutions and their current efforts.*** Vermont has long-term and successful experience with efficiency delivery, including the state's efficiency contractor, Efficiency Vermont, the Weatherization Assistance Program, NeighborWorks® Alliance of Vermont, fuel dealers, utilities, and others.

- ***Maximize savings and minimize transaction costs with a "whole-building" approach that considers all energy fuels and uses.*** The best way to serve customers and reduce energy use is to treat buildings as a whole, rather than undertaking piecemeal improvements. Electricity and fossil fuel efficiency services should be delivered in a coordinated program.

- ***Use public funds to leverage private investment capital.*** Improving a large fraction of the building stock will take a great deal of investment capital. Most of this can come from private sources, but public support in the form of marketing, technical assistance, and financial incentives will be required to leverage those private funds.

Overview of units and public costs. *Table 1* provides a quick overview of the major recommendations in this report. It shows:

- The **number of units** of housing (or business installations) that need to be improved per year to meet the Act 92 goals. Because most of the services ramp up in scale over time, the total number of units served annually rises from about 3,600 in 2011 to about 11,000 in 2020.

- The **publicly-supported cost per unit**, on average, for participating units. Of significance, this figure does not include the funds invested by building owners and/or covered by loans to those owners. The public cost per unit is higher for the low-income Weatherization Assistance Program (approximately $5,200 per unit) than it is for the Market Housing service, in which owners are expected to contribute a large fraction of the total costs of upgrades.

- **Funds needed per year** provide a snapshot of the total new revenues that will be needed from public sources to support the expanded activities. That amount rises over time as more units are served (from just $17.1 million in 2011 to $33.6 million in 2020). (New public funds needed are much less than total program budgets.)

Table 1: Expanded Residential Efficiency Services -- Overview and Key Data Points

RESIDENTIAL SERVICES SUMMARY AND FUNDING REQUIREMENTS 2011-2020*				
Initiative/Service	**Units/year**	**Public cost/unit**	**Funds needed/year**	**Total units over 13 years**
Weatherization Assistance Program (WAP)	2,000 rising to 2,800	$5,200	$12.5 million rising to $19 million	31,300
Market Housing retrofits w/incentives	1,300 to 2,900	$2,300 rising to $3,000	$3 million rising to $10.4 million	19,400
Market Housing retrofits addressed through other proposed initiatives	0 to 4,900	*Note 1*	*Note 1*	22,200
Vermont Gas program	100 rising to 470	$2,700 rising to $3,400	$300,000 rising to $1.4 million	4,000
Other programs with transitional funding, including non-WAP ARRA	270 rising to 770 through 2013	An average of $1,300 through 2013	$300,000 rising to $2.8 million through 2013	2,100 through 2013
Other initiatives prior to 2011	530 in 2009 to 600 in 2010			1,100
TOTAL	3,670 rising to 11,040 units per year		$17.1 million rising to $33.6 million (*Note 2*)	80,000

* Total units over 13-year period starting with passage of Act 92 in 2008

Note 1: Public funds required here remain an open question. It is critical that that the recommendations for other proposed non-incentive initiatives are put in place, which would minimize the funding requirements here. Absent this, the incentive levels necessary to achieve the targets may be as high as $2,500 per unit and cost up to $11 million per year by 2020, and may still fall short of the goals.
Note 2: With additional incentives required, we estimate total program costs in 2020 of almost $45 million.

E. Institutional Roles

The proposed recommendations establish an important goal of building on Vermont's existing experience and strengths, including:

- The experience of Vermont's existing efficiency institutions, including Efficiency Vermont, the community-level agencies administering the Weatherization Assistance Program, Vermont Gas Systems, and others.

- The capacity of Vermont's fuel dealers and other private sector actors who can deliver funding, expertise, and on-the-ground installations of insulation, HVAC systems, and other building shell improvements.

- The experience of lending institutions such as the Vermont State Employees' Credit Union, the Opportunities Credit Union, and many others in administering lending programs for home energy efficiency retrofits.

- The presence of over ninety Town Energy Committees across the state, loosely organized under the Vermont Energy and Climate Action Network, formed as a grassroots response to address the energy problems of the state.

The initiatives recommended in this report are intended to build on those existing strengths. All of Vermont's existing efficiency service providers have important roles to play — and for many of them, significant new business opportunities — in the expanded buildings service. The institutional arrangements summarized in the report build consistently on the arrangements and market roles that already characterize work in this domain. For example, in the low-income Weatherization Assistance Program, projects are managed by five regional agencies with assistance from Efficiency Vermont and others. In the Market Housing service recommended in this report, Efficiency Vermont, Burlington Electric Department, and Vermont Gas Systems undertake marketing and "intake," and they provide financial incentives under their whole-building programs.

Expanding on whole-building efficiency services on this scale will require effective coordination and leadership. Given its central role in the oversight of utilities and energy efficiency programs, the Vermont Department of Public Service is well positioned to take on this role.

F. Costs and Benefits of Efficiency Services

Vermont's legislative goal of making efficiency upgrades in 80,000 housing units across the state will require significant investment capital and a highly professional, customer-focused team of program administrators and energy experts. This report (*Section 7*) examines the costs and benefits of expanding whole-building efficiency efforts. Overall, the services will deliver total investments over the next 10 years of approximately $710 million, of which about half is private capital and half will come from a variety of public and utility sources.

The large majority of public expenditures on buildings efficiency services are in the form of direct assistance to property owners, with small fractions for administration and loan guarantees. For low-income weatherization services, the program will continue to pay the full costs of the measures. *Figure 2* shows how the efforts increase over time.

Over their lifetimes, **the efficiency services recommended for the first decade will return $2.26 in overall savings[10] for every public and private dollar invested.** Thus, even after paying back the full cost of building upgrades, for every dollar invested, net savings of $1.26 will remain in the pockets of Vermont's home and business owners, instead of being sent out of state to pay for heating fuels. These services can have wide-sweeping impacts beyond cost savings through reducing heating fuel use. Homeowners may also experience an array of non-energy benefits including greater comfort in the home. In addition, these services can also lead to societal benefits that accrue to those with no direct relationship to these services. These include environmental benefits in the form of emissions reductions, and economic benefits in the form of increased economic activity, job creation, etc.

G. Funding Sources

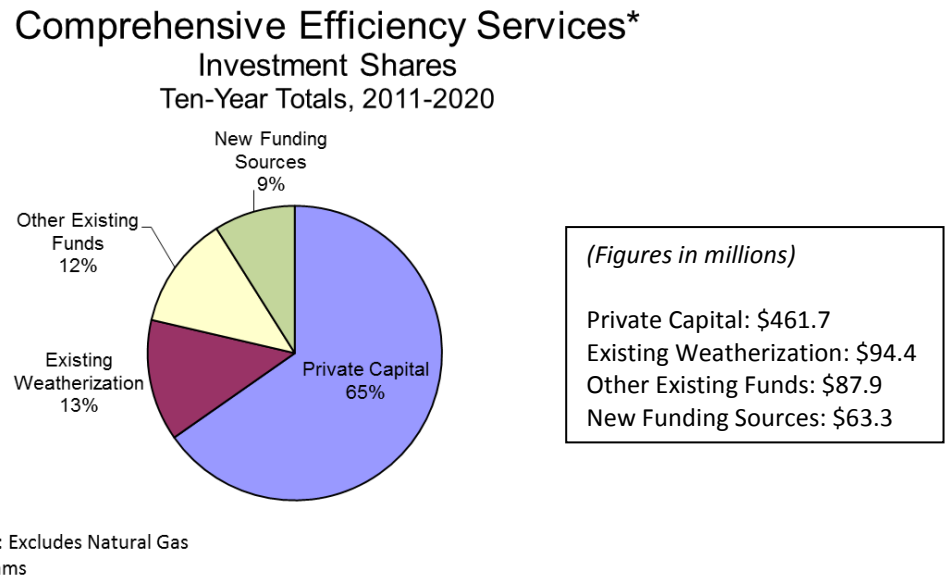
This report (*Section 8*) examines a wide range of funding options for the whole-building efficiency services recommended and concludes that a package of existing and new funding sources is needed to create the savings potential. It is important also to provide stable and predictable funding sources so that enterprises can hire and train the staff they will need and customers can count on services they will need to make major renovations and investments.

By relying on private investment capital and by making use of multiple funding streams, the percentage of new public revenues needed is only 9% of the total investments needed for the entire program (*Figure 2*). Vermont saw a large influx of ARRA funds in

[10] $1.55 on a present value basis

2009 to support different programs, largely centered on low-income weatherization. The ARRA funds have bolstered retrofit activities considerably across the state and helped fill gaps in funding levels. The 2012 sunset date on these funds will result in a dip in funding after this year, which will need to be bridged by other sources.

Figure 2: Expanded Whole-Building Efficiency Services: Investment shares: Ten-Year Totals, 2011-2020



- ***Private capital*.** The most important financial component of the buildings efficiency program is private capital. Approximately three quarters of the investment capital outside of the low-income weatherization program and half of the total spending on efficiency in the first 10 years of the programs comes from private capital — loans to and out-of-pocket expenditures by customers. However, substantial programmatic assistance — including marketing, audits, other activities to drive customer demand for efficiency, technical assistance, and direct financial assistance to borrowers — will be needed to make these private investments a reality. It has to be noted that the *investment of this capital needs to occur in conjunction with various other non-incentive measures prescribed in the recommendations that would address the various barriers that are prevalent*.

  A loan loss reserve fund will be required to support efforts to unlock private capital, thus maintaining the lending capacity of the loan pool and attracting additional funding. A loan loss reserve would help to extend the financing credit to the swath of customers who do not have a credit score sufficient to qualify for conventional home improvement loans. The creation of a loan loss reserve would likely require

either public dollars, funds from philanthropic organizations or donated capital from banks.

This report is accompanied by two companion studies that examine in more detail solutions to reducing financing barriers to carrying out extensive home energy retrofits. The first study, carried out by Efficiency Vermont, describes three case studies that demonstrate the cost-effectiveness of home energy retrofits and the attractive economics of financing these investments. The second study, by the Institute for Energy and the Environment at Vermont Law School, characterizes Vermont's housing stock and homeowners' financial health and identifies opportunities for the financial community and other investors to finance residential energy efficiency improvements.

- ***Increased Support for the Weatherization Trust Fund through the Gross Receipts Tax*.** In this report, the most significant portion of new public sector funding is from increases to the Gross Receipts Tax (GRT) on unregulated fuels. This increase would fund additional efficiency services for low-income housing units. Emphasis on investment in this segment is made for the following reasons:

  First, it is highly unlikely Vermont will hit its legislative targets for improving the overall fitness of the housing stock without significant improvement to the roughly 20% of households that are low income (roughly 49,000 households). This targets the segment of housing that will not be otherwise addressed through private sources, such as banks and traditional lenders. Second, access to capital is a fundamental barrier to this segment that will not be met without direct public investment. Third, investment in energy efficiency for low-income households is a sound investment of tax dollars. By reducing the energy consumption of low-income households, we can reduce the need for ongoing direct fuel assistance (such as Low Income Home Energy Assistance Program (LIHEAP)) to these households. Finally, failure to address the fitness of low-income households ultimately will expose those households to extraordinary health-related risks during periods of fuel pricing volatility, particularly during the winter months, which occurred in early 2011. Even apart from such health and safety concerns, *the greater need to direct energy efficiency funding toward low-income households is compelling*.

  The GRT currently is paid by the electricity and natural gas sectors, as well as the unregulated fuels sectors. During the past two decades, total energy efficiency expenditures by the electricity and natural gas sectors have increased. These sectors now pay much more than the unregulated fuels sectors to support energy efficiency. As a result, this report recommends an increase of the GRT on unregulated fuels only (*Section 8*).

Additional sources of funds may be needed to supplement those already in place. As noted previously, priority should be given to policies and approaches that address the underlying barriers included in the list of design principles. To the extent that additional funds are required, we recommend that the source of funds be broad-based and consideration be given to electric utility fees if taxes are not an option. Taken together, these funding options provide a range of choices for legislators to consider and are adequate and appropriate sources of support for efforts in addressing whole-building efficiency.

In summary, this report sets out a broad-based strategy to improve the energy fitness of Vermont buildings and to lower fuel bills for Vermont families and businesses. The set of policies and services recommended in this report will allow us to:

- *Lower Vermont's overall fuel bill by about $1.6 billion over the lives of the steps taken and measures installed,*
- *Substantially improve the energy fitness of over 78,000 residential and commercial buildings from 2011 to 2020, and*
- *Lower the fuel bills of roughly 72,000 participating families in existing housing by an average of $800 to $1,100 per year for the first 10 years and over 5,000 participating businesses by an average of $4,000 to $6,000 per year for the first 10 years.*

These policies and services will diminish Vermont's continuing dependence on unregulated heating fuels and mitigate the escalating deleterious impacts on both the economy and the environment that this dependence causes. If more of the dollars Vermont families export for fossil fuels stayed in the Vermont economy, they could support our neighbors and our quality of life while buoying savings and local investment. It is therefore critical that immediate action be taken to ensure their implementation.

Section 1: Challenges and Opportunities for Whole-Building Efficiency

Opportunities for Efficiency Gains are Large and Well-Documented

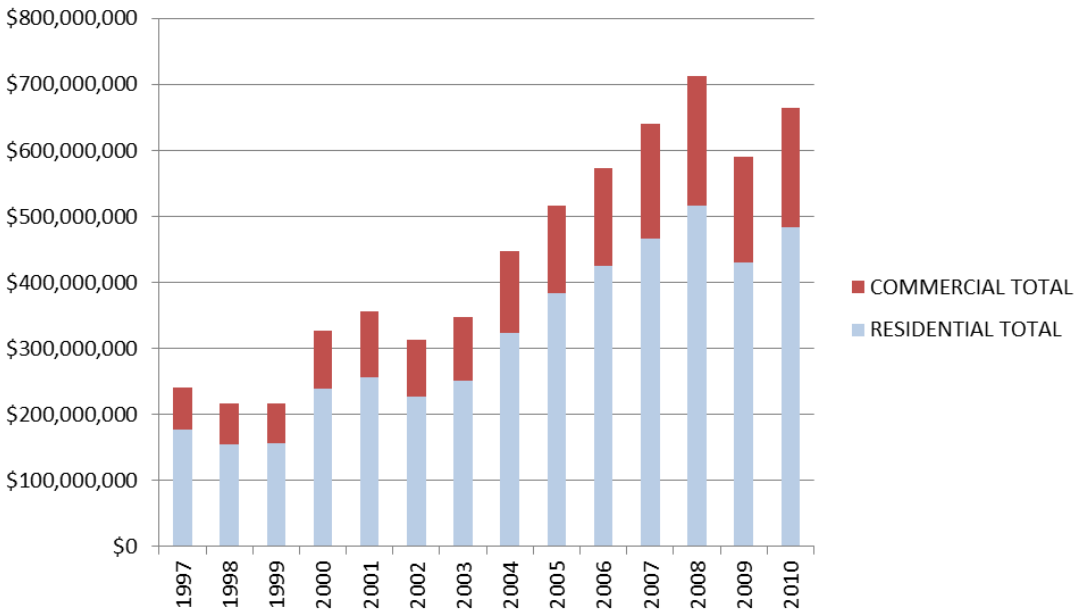
Vermont should build on our current efforts and start realizing and benefiting from more of these potential energy savings. This report indicates that there is no "silver bullet." Savings are achieved in many ways, targeted to specific residential and commercial building types. Fortunately, Vermont can build on excellent existing programs and experience to produce reliable returns, positioning the state as well as possible to face an uncertain energy future.

The average Vermonter and the Vermont economy are facing a fuel affordability challenge of historic proportions. In 2010, Vermonters paid over $600 million to import fossil fuels for use in our homes, businesses, and industries. That's at least *$300 million more* than we were paying in 2000. As a result, Vermont is exporting more and more dollars out of state for fossil fuels. These dollars otherwise could stay in the Vermont economy, supporting our neighbors and our quality of life, while buoying savings and local investment. These annual expenditures on fuel for residential and commercial heating alone have been significantly greater than the revenues brought in by the *entire* agricultural sector and amounted to a difference of almost $85 million in 2009.[11]

The problem does not appear to be abating anytime soon. Energy prices over the coming decades will be much higher than they have been in the recent past. World demand for energy continues to rise powerfully, driven in part by the rising economies of countries like China and India. New sources of supply are not keeping up. As we reissue this report in early 2011, instability in the Middle East is precipitating yet another round of rising and volatile crude oil prices. Meanwhile, Vermont has a higher than average dependence on unregulated fossil fuels for heat. Dollars for low-income heating assistance are not stretching as far in the tough economy, and prospects for the future do not look better. The figure below shows how Vermont's fuel costs for residential and commercial buildings have risen in recent years:

[11] The cash receipts from all Vermont crops and livestock agriculture was approximately $514 million in 2009. (Source: U.S. Department of Agriculture, New England Agricultural Statistics, New England Cash Receipts 2009, September 2010).

*Figure 1-1: Vermont Fuel Bill for Residential and Commercial Buildings: Rising Costs, 1997 to 2010 **

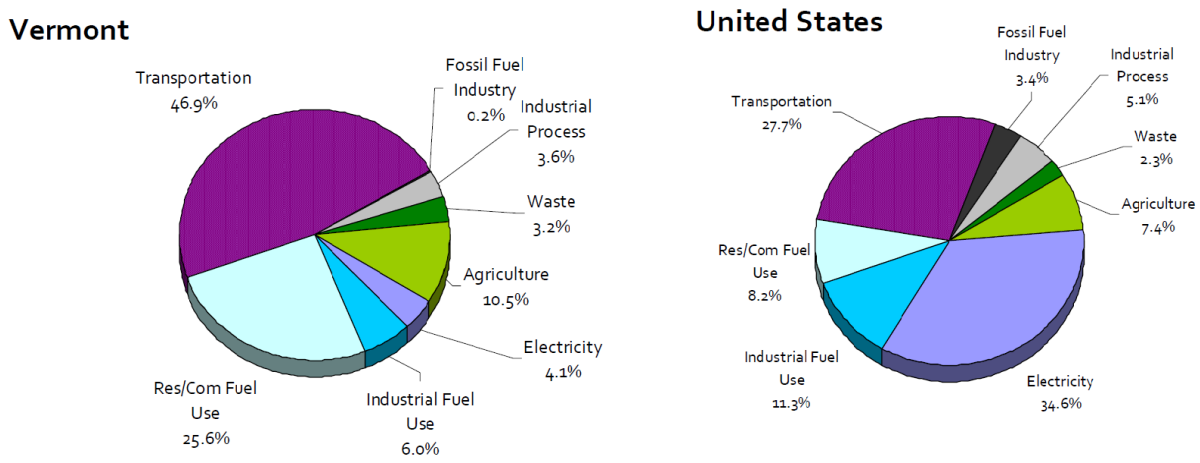


* Expenditures through 2008: Energy Information Administration, *State Energy Price and Expenditure Estimates: 1970 Through 2008*, June 2010; Expenditures in 2009 and 2010: Vermont gross receipts revenues for heating oil, kerosene, LPG, natural gas, coal, from the Vermont Tax Department; these numbers were deflated in order to subtract industrial uses by applying the average percent difference between the revenues and EIA expenditures in previous years; Expenditures in 2010: for the first two quarters of calendar year 2010, the source is the same as 2008 and 2009; estimates were made for the second two quarters of 2010, using statistical projections.

In addition to their direct economic costs, fossil fuels used in buildings also represent the second largest source of greenhouse gas emissions in Vermont. After transportation, the buildings sector in Vermont represents a much larger fraction of statewide greenhouse gas emissions (26% in Vermont) than does the United States as a whole (8%), largely due to our state's heavy reliance on these fossil fuels.[12] (*Figure 1-2*)

[12] Fuel oil, propane, and kerosene heat 70% of Vermont homes but only 12% of homes nationally.

Figure 1-2: Principal Sources of Greenhouse Gas Emissions in 2008, Vermont and U.S.[13]



Any serious attempt to curb greenhouse pollution in Vermont must include efficiency improvements in the building stock. This was one of the principal conclusions of the Governor's Commission on Climate Change, which recognized that making progress on the Governor's goal to reduce greenhouse gas emissions by 25% from 1990 levels by 2012 and 50% by 2028 logically requires that significant reductions be made in fuel use in residential and commercial buildings.[14]

Over the long term, lowering Vermont's fuel bill requires making substantial investments in the energy efficiency of buildings and their heating systems. This represents a great opportunity and a great challenge. The opportunity for savings is quite large because Vermont's building stock is, on average, fairly old, and many improvements can be made at relatively low cost. But these improvements are not easy to come by, for three reasons:

- The existing building stock is large, physically dispersed, and distributed among many owners. There are at least 240,000 occupied housing units in Vermont and about 22,000 non-farm business establishments.
- As numerous studies have documented, there exist a number of substantial market barriers to meaningful investments in energy efficiency in buildings, as outlined in the next chapter. In Vermont, as elsewhere in America, we have learned that market forces alone will not deliver the investments in efficiency that Vermont needs.

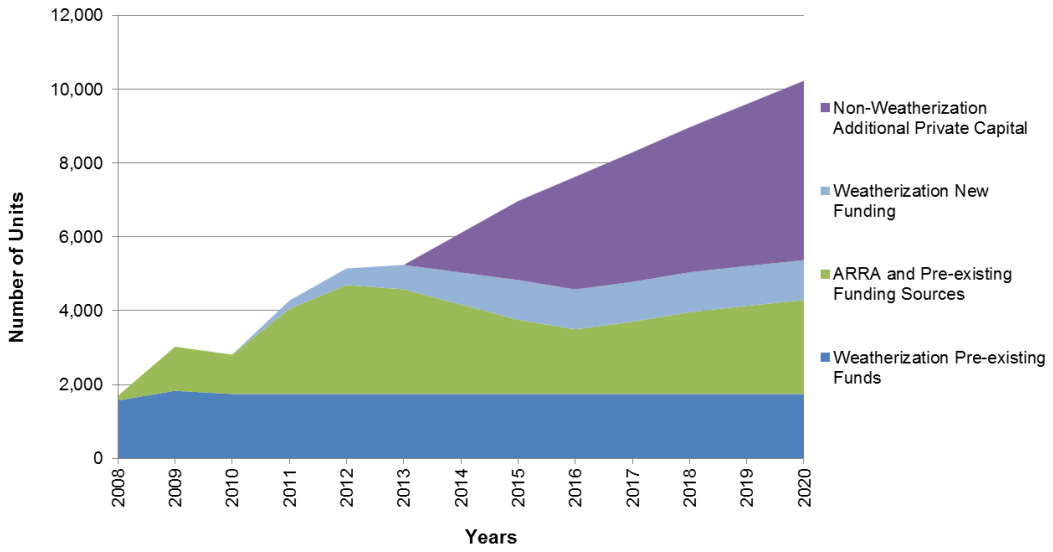
[13] Vermont Agency of Natural Resources, Department of Environmental Conservation & Air Pollution Control Division, *Vermont Greenhouse Gas Emissions Inventory Update 1990-200*8, September 2010.

[14] Vermont Governor's Commission on Climate Change, *Report and Recommendations of the Governor's Commission on Climate Change*, October 2007.

- Since 2008, Vermont has made much progress in growing a statewide delivery system for whole-building efficiency, both for low-income Vermonters through the Weatherization Assistance Program, and for other Vermonters through Efficiency Vermont and others. However, the funding for Efficiency Vermont's efforts is limited (funding comes primarily from RGGI and FCM revenues), and the funding that has allowed the Weatherization Assistance Program to grow was temporary and is near its end. Improving on and building fuller funding for the comprehensive delivery system for whole-building efficiency is a critical and strategic response to the global energy picture facing this state.

While there are many challenges, Vermont is well-positioned to be a leader in whole-building efficiency initiatives. Vermont has an unparalleled history of caring about and investing in energy efficiency through the electric and natural gas sectors and through a strong Weatherization Assistance Program. As a result, Vermont today has some of the most successful programs in those areas in the nation. These efforts have saved energy, reduced greenhouse gases, and saved Vermont businesses and residents money. This diverse set of efforts that is already underway in Vermont can be built on for an expanded and more comprehensive set of services.

Figure 1-3: Increased levels of activity required to meet Act 92 goals +*



* Expenditures through 2008: Energy Information Administration, *State Energy Price and Expenditure Estimates: 1970 Through 2008*, June 2010; Expenditures in 2009 and 2010: Vermont gross receipts revenues for heating oil

\+ The dip in the ARRA and pre-existing funding sources after 2012 occurs from the expiry of the ARRA funds. A slight increase is in seen after 2016, due to projected increases in RGGI and FCM revenues

For example, Vermont's low-income Weatherization Assistance Program (WAP) is highly cost-effective, and has demonstrated that large and valuable savings are possible across a wide variety of physical housing units. The program weatherized about 1,830 low-income housing units in the 2009 program year. Estimates in 2007 established that each WAP program dollar spent on energy efficiency measures returned about $2.00 to the participant in the form of reduced energy costs.[15] When the value of non-energy benefits[16] is included with the above measures, that number is even higher. With about 49,000 households eligible for the Weatherization Assistance Program in 2008, there is clearly many years' worth of weatherization activity ahead to achieve potential savings.

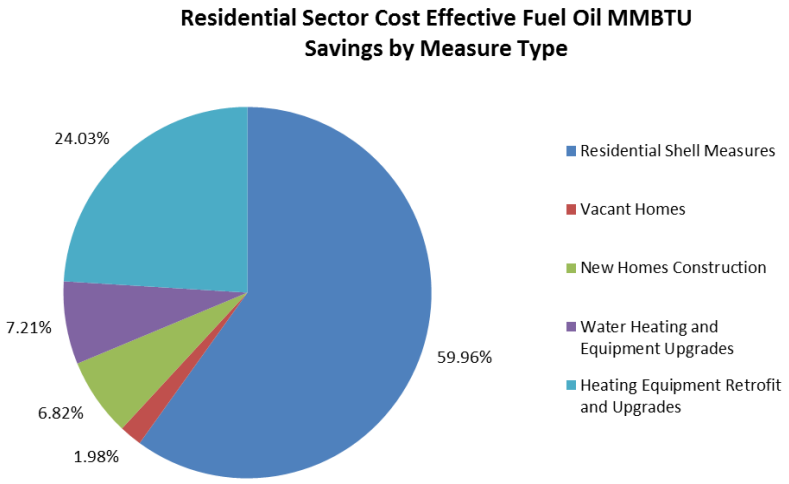
There is also a large, documented, cost-effective potential for energy savings in the buildings sector generally. The Department of Public Service commissioned a detailed study issued in 2007 of the potential for greater fuel efficiency in buildings.[17] The study found that after ten years of achievable, cost-effective program activity on energy efficiency measures for oil, propane, kerosene, and wood, the program would yield an estimated 12% reduction per year in total fuel consumption across those fuel sectors. The savings to Vermonters during ten years of such program activity was estimated to be $486 million (in savings of 2007 dollars). The program budget to achieve the savings ranges from $13 million to $16 million per year over ten years. The following chart from the study characterizes the sources of energy efficiency savings for residential fuel oil-driven end uses. The study found that residential fuel oil usage could cost-effectively be reduced by more than 10% statewide, with savings in treated homes higher.

[15] Dalhoff Associates, *An Update of the Impacts of Vermont's Weatherization Assistance Program*, February 2007. Total returns are higher, but they are spread out over time, since weatherization returns benefits for many years.

[16] Non-energy benefits include increased property values, community economic benefits, fewer illnesses, fewer fire deaths, injuries and property losses, environmental benefits, improvements in utility arrearages, and others.

[17] GDS Associates, *Vermont Energy Efficiency Potential Study for Oil, Propane, Kerosene, and Wood Fuels*, prepared for the Vt. Dept. of Public Service, January 16, 2007 (referred to in this report as "the GDS study").

Figure 1-4: Residential Sector Cost Effective Fuel Oil Savings Potential by Measure Type[18]



Summary

- In 2010, Vermonters paid over $600 million to import fossil fuels to heat our homes and businesses.
- These expenditures represent an increase of $300 million from 2000, and were over $85 million more than the entire revenue of the state agricultural sector.
- Fuel bills have shown an upward trend, and are expected to continue to increase in the future. In addition, they are prone to severe volatility.
- The buildings sector in Vermont represents 26% of our greenhouse gas emissions.
- Vermont's building stock is old and mostly heated by fuel that's delivered in trucks, not by utilities.
- Many studies, including a recent cash flow analysis study by Efficiency Vermont, have demonstrated the potential for saving money from energy efficiency investments in homes.

[18] *Id.*

Section 2: Existing Efforts towards Whole-Building Efficiency and Persistent Market Barriers

Vermont has a variety of programs and initiatives underway related to improving the energy efficiency of heating fuels and other energy sources in buildings, which provide a strong foundation to build up on for scaling energy retrofit efforts. This chapter summarized the efforts that are currently being undertaken, as well as the persistent barriers that exist towards these efforts.

A. Statewide Building Efficiency Goals

In March 2008, legislation passed that set building efficiency goals for Vermont and formally established a whole-building efficiency program. The Vermont Energy Efficiency and Affordability Act (known as Act 92)[19] established the following goals for the state:

- To substantially improve the energy fitness of at least 20% of the state's housing stock by 2017, and 25% of the state's housing stock by 2020;
- To reduce annual fuel needs and fuel bills by an average of 25% in the housing units served;
- To reduce fossil fuel consumption across all buildings by an additional one-half percent each year, leading to a total reduction of 6% annually by 2017 and 10% annually by 2025;
- To save families and businesses a total of $1.5 billion on fuel bills over the lifetimes of the improvements installed between 2008 and 2017;
- To increase weatherization services to low-income Vermonters by expanding the number of units weatherized, or the scope of services provided, or both, as revenue becomes available in the weatherization assistance trust fund.[20]

[19] Vermont General Assembly, The Vermont Energy Efficiency and Affordability Act (Act 92), March 19, 2008, http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT092.HTM

[20] 10 VSA Section 581.

Under the legislation, the Public Service Board is tasked with ensuring that efficiency programs are designed to make continuous and proportional progress toward the above building efficiency goals.[21]

The legislation also established a Heating and Process Fuel Efficiency Program, and a Fuel Efficiency Fund to fund the program. The legislation directed the Department of Public Service to consult with stakeholders and select a service provider(s) to implement the program, and to provide for the independent evaluation of the program. The programs and measures are required to produce whole-building and process heat efficiency, regardless of fuel type; facilitate appropriate fuel-switching; and promote coordination with the electric efficiency programs, utility efficiency programs, and low-income weatherization programs. The Public Service Board is required to review the programs and measures, and may alter or impose conditions on them.[22]

Funding for the Heating and Process Fuel Efficiency Program is to be provided from the Fuel Efficiency Fund. The fund is directed to contain revenues from the sale of credits under the Regional Greenhouse Gas Initiative (RGGI) cap and trade program and may contain other funds.[23] Additionally, revenues from the New England Independent System Operator's Forward Capacity Market for capacity savings resulting from activities of the energy efficiency utility (Efficiency Vermont) are required to be used by Efficiency Vermont to deliver fossil fuel efficiency services to consumers on a whole-building basis.

Subsequent to the 2008 legislation, the Department of Public Service selected Efficiency Vermont to deploy the Heating and Process Fuel Efficiency Program. Efficiency Vermont built on their whole-building efforts already underway (see below).

B. Current Whole-Building Efficiency Efforts in Vermont

a. Home Performance with Energy Star (HPwES)

Home Performance with Energy Star (HPwES) is a service for testing energy efficiency and retrofitting homes on a whole-building basis, and is sponsored nationally by the U.S. EPA and U.S. DOE. Vermont's HPwES program is a project of Efficiency Vermont, which builds a base of certified contractors to perform the work, and offers financial incentives for the home efficiency improvements.

Vermont's HPwES program started in 2005, and treated less than 100 units per year in its early years. When Act 92 passed in 2008, HPwES obtained funding under the Heating

[21] 30 VSA Section 209(e)(15).

[22] 30 VSA Section 235.

[23] 30 VSA Section 203a.

and Process Fuel Efficiency Program and the GMP efficiency fund; as a result, the program grew, and in 2009 treated about 530 units.[24]

The HPwES program relies on trained contractors to perform the work. To participate in the program, contractors must be certified by BPI (Building Performance Institute) to perform whole-building efficiency work. The HPwES program maintains quality assurance with its contractors, and contractors receive incentives for BPI training and HPwES work. EVT serves as a BPI affiliate and offers courses conducted by BPI-approved trainers. The number of contractors serving under this program has steadily increased over the years, and numbered around 60-70 in 2010.

Customers who wish to participate in the program select from the list of contractors participating in HPwES. A typical project begins with an energy audit by a certified HPwES contractor. The audit usually includes a comprehensive home evaluation of building tightness and insulation effectiveness, heating system, lighting, appliances, and windows, and a report and scope of work for recommended energy efficiency home improvements. The cost depends on the work being done, but can range from a thousand dollars to ten thousand dollars or more. A typical HPwES project is in the $5,000 to $8,000 range, and can generate average returns on investment of 10 to 30%.

Efficiency Vermont offers up to $2,500 in incentives per household to help Vermonters pay for energy efficiency home improvements completed by a certified HPwES contractor. Efficiency Vermont incentives are paid upon successful completion of a qualifying project. In 2010, more than 90% of HPwES projects met the minimum requirements to receive incentives. Additional federal tax credits may also be available for HPwES projects. Many Vermont lenders offer low-interest loans that can be used for energy projects like HPwES, and Efficiency Vermont maintains a list of such lenders.[25]

HPwES represents continuous improvement in energy efficiency, improving the quantity and quality of investments with every customer contact, driving down costs in the process. While all Vermonters are eligible for HPwES, those who participate are mostly in the upper-middle and upper income categories. Customers must be able to afford an audit, qualify for the loan, and afford the loan payments.

The companion Efficiency Vermont report "*Case Studies of Home Energy Improvements*" describes multiple case studies of homes that underwent energy efficiency retrofits, along with a detailed energy and financial analysis to highlight the benefits from the retrofits.

---

[24] *Efficiency Vermont Annual Report 2009*, November 2010.

[25] List of lenders offering loans that can be used for energy projects, updated July 2010. http://efficiencyvermont.com/stella/filelib/Energy%20Loan%20Programs_100701.pdf

b. Vermont Fuel Efficiency Partnership (VFEP)

The Vermont Fuel Efficiency Partnership (VFEP)[26] is a joint venture of the five regional organizations that weatherize homes under the state Weatherization Assistance Program, Efficiency Vermont, Home Ownership Centers, Vermont Housing Conservation Board and the local Community Land Trust network, private housing providers, lenders and state agencies. VFEP was formed in 2009, and provides incentives for "deep energy retrofits," primarily in multi-family buildings whose tenants are income-eligible for the Weatherization Assistance Program or are slightly above that income level (up to 80% of the area median income). The energy retrofits are intended to go beyond what the Weatherization Assistance Program and other efficiency programs have incentivized, to achieve savings of 25% or more. Multi-family housing has been identified as a priority because of the investment of both public and private resources in developing critical housing capacity to serve the needs of the state's most vulnerable populations. VFEP is funded by the Regional Greenhouse Gas Initiative, and grants from the American Recovery and Reinvestment Act and federal Energy Efficiency and Conservation Block Grants. The initiative is on track to serve over 750 units by the end of 2011.

c. Weatherization Assistance Program (WAP)

Vermont's Weatherization Assistance Program (WAP) was started in the 1970s to provide free weatherization services to low-income Vermonters who qualify for the program. In 1990, the program was expanded by establishing a permanent funding source: the Weatherization Trust Fund, financed by a gross receipts tax of 0.5% on the sale of electricity, natural gas, oil, propane, kerosene, and coal. The program generally receives between $6 and $8 million per year from the Weatherization Trust Fund. In addition, the program receives between $1 and $2 million from the U.S. Department of Energy per year, and in 2009 received $16.8 million from the American Recovery and Reinvestment Act, which has a sunset date of 2012.

The weatherization program is administered by the State Office of Economic Opportunity, and delivered to low-income households through four of Vermont's regional Community Action Program agencies and the Northeast Employment and Training Organization. These agencies have their own weatherization crews, and rely on private contractors for a small portion of the work. The weatherization program performs its services in partnership with Vermont Gas Systems, Efficiency Vermont, Burlington Electric Department, fuel dealers, and private contractors. The first three entities provide additional funding toward the WAP costs related to electrical and natural gas efficiency measures.

---

[26] For multi-unit residential, the Vermont Fuel Efficiency Partnership (VFEP) reports that while the efficiency improvements in recent years are paid by the Weatherization Assistance Program and other agencies providing assistance, over 80% the costs borne by the customer are for health and safety related aspects of efficiency improvements. Communications with Scott Campbell, VFEP, 2/12/11.

To be eligible for the WAP, Vermonters must earn 60% of the area median income or 60% of the state median income, whichever is less;[27] for example, in 2010 a family of four in most counties would qualify for the weatherization program if it earned $44,100 or less; or in certain counties, if it earned $44,280 or less. There were about 49,000 households eligible for the WAP as of March 2008.

The program has weatherized about 23,000 low-income units since 1993, and currently weatherizes between 1,400 and 1,800 units per year. The total average cost per unit was about $5,200 in 2010. For the 2005 program year, each dollar spent on energy efficiency measures in the program returned $1.98 to customers;[28] WAP officials estimate savings levels are even higher today.

The Weatherization Assistance Program in Vermont is successful in service quality and scope. Yet the number of qualifying residences that remain unaddressed is large, indicating that a great many low-income families are paying more for energy than they should have to.

d. NeighborWorks® of Western Vermont (NWWVT)

NeighborWorks® of Western Vermont (NWWVT) is a not-for-profit housing organization. Among other services, NWWVT conducts energy audits to determine the most effective improvements for homes, helps find reliable contractors to do energy work, and helps customers to manage the project. NWWVT offers incentives and financing for credit-qualified individuals to help bridge out-of-pocket expense.

In June 2010, NWWVT won a $4.5 million grant for its proposal to save energy and create jobs retrofitting homes and municipal buildings[29]. The grant was awarded by U.S. Department of Energy under an energy efficiency block grant program.

Over the three-year grant period, NWWVT plans to serve up to 40 percent of eligible households in Rutland County (an estimated 7,300 customers) with home visits addressing ways to lower energy costs. It also plans to conduct at least 2,000 comprehensive energy audits and help 1,000 residents' complete substantial retrofits.

---

[27] 33 VSA 2502(b)(3)(C).

[28] In 2005 dollars. From Dalhoff Associates, *An Update of Vermont's Weatherization Assistance Program*, February 2007.

[29] NWWVT http://www.nwwvt.org/news.htm

The total energy savings projected to be achieved over the first six years alone total about $8.7 million. The efforts will also create an estimated 352 jobs[30].

Key partners in this project include Central Vermont Public Service, Efficiency Vermont, Green Mountain College, the Rutland Regional Planning Commission, local banks, local retailers, local governments, and community volunteers. The NWWVT efforts represent a laboratory for Vermont in general, to demonstrate how energy efficiency retrofit efforts can be ramped up significantly over time, and hopefully sustained through many years into the future.

e. Vermont Gas Systems

Vermont Gas Systems (VGS), which provides natural gas to about 43,000 customers in Chittenden and Franklin counties, has whole-building retrofit and equipment replacement energy efficiency programs. The programs cover both the residential and commercial/industrial sides, and VGS works closely with Efficiency Vermont, the Weatherization Assistance Program, and Burlington Electric Department on these programs. VGS offers cash rebates, incentives, technical assistance, audits, reduced interest rate financing, and other measures. In 2009, VGS installed whole-building efficiency measures for 239 residential projects and 25 commercial and industrial projects. In addition, VGS's equipment replacement programs had 1,660 residential projects and 41 commercial and industrial projects.[31]

The VGS Residential Retrofit Program is designed to help customers who use natural gas for space heating to improve the efficiency of their homes. VGS customers whose homes use at least 0.6 Ccf per square foot of natural gas per year are eligible for participation in this program.

VGS performs a free energy audit on each participating buildings to identify potential energy saving measures. The audit examines existing insulation levels, evaluates building air-tightness, and tests the heating system efficiency. Building owners are then provided with a report summarizing the audit results, detailing the incentives available, and listing contractors and the specifications needed for contractor bidding. Customers may choose a contractor on their own, or have VGS assign a pre-screened contractor to do the work. Typical measures include insulation for walls and ceilings, air sealing measures, new heating systems, and other measures.

Typically VGS rebates 331/3% of the installed cost of the recommended measures and provides a reduced interest loan through a local credit union for the balance. In 2009,

---

[30] *Id.*

[31] Vermont Gas Systems, 2009 Annual Report: Demand Side Management Programs.

customers were offered loans at 0% interest for up to 3 years, 2% interest for up to 5 years, or 4% interest for up to 7 years.

Low-income customers are referred to the Champlain Valley Office of Economic Opportunity for assistance under the state Weatherization Assistance Program. CVOEO determines the customer's income status and eligibility, performs the energy audit, submits the recommended measures to VGS for screening, and coordinates the installation of the cost-effective energy saving measures. VGS shares the costs of these jobs with CVOEO.

Under VGS's commercial and industrial retrofit program, VGS gives free audits and engineering assistance, and may assist with the cost of outside engineering assistance. VGS also offers financial incentives, usually in the form of rebates; the rebate amounts are project-specific and depend upon the customer's savings and payback, and the avoided cost savings to VGS customers.

f. Burlington Electric Department

Burlington Electric Department (BED) offers a whole-building Home Performance with Energy Star program that is very similar to the program offered by Efficiency Vermont. BED offers the same incentives to contractors and customers as Efficiency Vermont's program. In addition, BED collaborates with the Weatherization Assistance Program on offering electric efficiency measures to low-income consumers, and with Vermont Gas Systems on its whole-building retrofits. For new construction, BED offers promotional support to the Vermont Energy Star Homes (VESH) program. For existing residential buildings, BED offers contractor and customer incentives similar to EVT for the Home Performance with Energy Star program. It also collaborates with the weatherization agencies on offering electric efficiency measures to consumers under the low income Weatherization Assistance Program.

g. Private Contractors and Fuel Dealers

In addition to retrofit projects undertaken through the Weatherization Assistance Program, Home Performance with Energy Star, or VGS, there are many other private contractors performing energy efficient retrofits that are not reported or verified under any program. While some fuel dealers only sell fuel, others are full-service companies that deliver fuel and provide many services. And, there are many companies that perform heating services only, including installations, maintenance, and energy efficiency work. Some private contractors market energy efficiency aggressively, while many don't market it at all. Some companies partner with lending institutions to offer financing for efficiency improvements. Many private contractors work cooperatively as sub-contractors with the other retrofit programs mentioned above. For example, the

Central Vermont Community Action Council (CVCAC) uses private contractors for all of the installation and maintenance work on heating equipment. The Vermont fuel dealers are loosely grouped under the Vermont Fuel Dealers Association (VFDA), which also provides education, training and certification for fuel technicians.

VFDA has been active in efforts to reduce SO2 content in the fuel, which would significantly reduce emissions, and allow for the use of new heating systems with efficiencies that can exceed 95% AFUE (Annual Fuel Utilization Efficiency). Additionally, there has also been a growing interest on the part of VFDA in promoting the use of Biofuel, which is a blend of heating oil and a renewable organic component, such as soybeans. Biofuels emit lesser greenhouse gas emissions, and use a domestically sourced component, which makes them a more desirable alternative to conventional heating oil. The Vermont Energy Act of 2011, which was passed in May 2011, initiates progress on both these fronts, beginning in 2012.

Additionally, VFDA shares a good working relationship with the Community Action agencies, and have collaborated on educational incentives for fuel technicians on home energy efficiency issues. Based on the interest that VFDA has shown in promoting efficient and cleaner heating fuels, as well as their relationships with their customers and the weatherization agencies, they can play a useful, mutually beneficial role in efforts to expand home energy upgrade activities.

h. Town Energy Committees

Town energy committees were established all over the state with the mission of promoting energy conservation and energy self-sufficiency at the grassroots level. Currently, there are over a hundred town energy committees all over Vermont. Select committees are enabled by the state of Vermont to serve as an official resource to town planners, which provide them with the ability to plan for future energy demand and supply as well as energy conservation and renewable energy opportunities[32]. Energy committees can serve the community through helping suggest specific goals and objectives and implementation strategies that can foster sustainable development that benefits the community as a whole[33]. The reach of the town energy committees to the grassroots level makes them a useful conduit to promote and implement home energy efficiency initiatives.

[32] 24 VSA Chapter 117.

[33] VNRC, Vermont Energy and Climate Action Network's Town Energy and Climate Action Guide http://www.vnrc.org/filemanager/download/5371/

i. Lending Institutions

Some lending institutions offer reduced rate financing for energy efficiency home improvements. A summary list of some of these institutions and their products, as of 2010, are shown in Table 2-1 below. The report "Financing Residential Energy Efficiency", prepared by the Institute for Energy and the Environment at Vermont Law School, as a companion to this report, explores some of these products in more detail.

Table 2-1: Existing Loan Products for Home Energy Improvements by Provider (as of 2010)

Provider	Product
Bank of Bennington	Green Loan
Brattleboro Savings and Loan	Energy Loan Program
Opportunities Credit Union	Energy Loan
Passumpsic Savings Bank	Energy Efficiency Loan Program
Union Bank	GreenLend
Vermont State Employees Credit Union	Green Loan

In general, very few of these institutions were actively advertising and marketing the specialized loan products, and it was largely seen that the demand for them has been very low.

j. Energy Service Companies

Energy Service Companies (ESCOs) are businesses that develop designs, install equipment, and arrange financing for comprehensive efficiency projects for buildings. In addition, ESCOs verify the project's energy savings and assume the financial risk that the project will save money through lower energy use. The ESCO concept, called performance-based contracting, guarantees energy savings and allows customers to make debt payments for the efficiency improvements with the money saved from using less energy.

ESCOs are used widely in other states, but there has been limited experience with them in Vermont, possibly because of our smaller scale and smaller projects. In 2003, the legislature authorized school districts to enter into a performance contract under which a district may hire an ESCO to analyze the potential for energy savings and do the work necessary to implement some or all of the savings. Four school districts – Montpelier, Milton, Brattleboro and Brandon – have taken advantage of this law and entered into 10-year contracts with ESCOs. Three contracted with Honeywell Building Solutions and

one with Johnson Controls for the work. In addition, the University of Vermont and Fletcher-Allen Health Care have done a few projects with ESCOs.

k. School Energy Management Program

Vermont's School Energy Management Program (SEMP), working in partnership with the Vermont Superintendents' Association and the Vermont Dept. of Public Service, helps local school officials save energy through efficiency projects. The scope of work under this program can include: identification and implementation of operation and maintenance improvements to increase energy efficiency; identification and implementation of projects to save money through capital intensive retrofits; coordination with the utility DSM programs available; and assistance in preparing applications for funding or financing. The program can provide a range of services to lower energy costs and improve efficiency, and for many years has helped site wood-chip energy systems at schools.

l. Building Codes and Standards

The state of Vermont requires new residential and commercial buildings to meet energy codes, which have been in effect since 1997 and 2007 respectively.[34] The Residential Building Energy Standards and Commercial Building Energy Standards are based on the International Energy Conservation Code (IECC) produced by the International Code Council, a code widely used in many states.

In February 2009, as one of the requirements for obtaining the American Recovery and Reinvestment act (ARRA) funding, Governor Jim Douglas certified to the U.S. DOE that Vermont would implement energy standards equal to or more stringent than the latest national model codes. On May 27, the Vermont Energy Act of 2009 (H446) became law and directed the Commissioner of the Department of Public Service to adopt the 2009 IECC code, as well as develop a plan to achieve compliance with these codes in 90% of new building space within 8 years.[35] H446 also states that beginning three years after January 1, 2011, the Department of Public Service shall update the residential and commercial codes to incorporate the most recent versions of the IECC, with an effective date within three months of final adoption.

While the IECC code establishes a baseline for efficient buildings, there also are other voluntary building rating systems that bring buildings to a higher level of efficiency. For example, the United States Green Building Council developed the LEED (Leadership in

[34] Residential Building Energy Standards: 21 VSA Section 266-267; Commercial Building Energy Standards: 21 VSA Section 268.

[35] 10 VSA Section 6086.

Energy and Environmental Design) Green Building Rating System in 2000, a point-based system for high performance green buildings. The Vermont Green Building Network is the local USGBC Chapter (the parent organization for LEED). As such, the organization conducts workshops and events to advance green building knowledge in Vermont, including training for LEED credentialing. The ECHO Lake Aquarium and Science Center in Burlington was the first building In Vermont to obtain LEED certification, and was awarded LEED status in 2003. In 2006, the University of Vermont adopted a policy that all new buildings and extensive renovation projects will be LEED-certified.

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy offer the Energy Star program to certify efficient new buildings. To earn the Energy Star label, new homes must include additional energy-saving features that typically make them 20–30% more efficient than standard homes. Efficiency Vermont and Vermont Gas Systems offer the Vermont Energy Star Homes (VESH) program for new homes as they are being constructed. Together, they provide design assistance, give financial incentives, and test and rate homes after they're built. As of 2010, 265 contractors have completed more than 6000 Energy Star homes in Vermont.[36] The rate of participation in VESH service was seen to increase in 2009, rising to 30% from 23% in 2008. The number of builders participating in this service has also continued to increase, with 42 new builders added in 2009.

In 2011, the EPA will be implementing a new version of ENERGY STAR for Homes, known as ENERGY STAR Version 3, which incorporates more rigorous standards than the previous versions. Beginning in January 1, 2011, Efficiency Vermont will offer a new program called Energy Code Plus which will assist builders of new and fully gut-rehabbed homes to achieve and verify requirements while supporting their effort to exceed the minimum requirements of the new Vermont Residential Building Codes. This new service is designed for buildings that go beyond the minimum residential energy code in Vermont but do not reach the ENERGY STAR level of efficiency. The Energy Code Plus service guides builders to meet all residential energy code requirements while supporting their effort to increase efficiency by offering technical assistance and incentives to exceed the minimum code requirements.

In addition, Vermont Gas Systems offers a Commercial New Construction Program for efficiency measures, and completed 13 such projects in 2009.[37] VGS collaborates closely with Efficiency Vermont and the Burlington Electric Department on projects under this program.

---

[36] Efficiency Vermont, "Builders who have constructed Energy Star Qualified Homes", http://www.efficiencyvermont.com/stella/filelib/VESH_Builders_List.pdf

[37] Vermont Gas Systems, *2009 Annual Report: Demand Side Management Programs*, 2010.

m. Appliance Standards

The U.S. government has established efficiency standards for many appliances. The U.S. Department of Energy has the authority to update the standards, and for appliances covered under the federal standards, states are pre-empted from enacting their own standards if the standards are more stringent than the federal ones. States may apply to the Department of Energy for a waiver in order to enact stricter standards, but to date no state has received a waiver.

A lack of progress on the part of the DOE in updating some appliance efficiency standards in a timely manner led some states in 2005 and 2006 to propose and adopt new standards that conflict with the federal standards. In 2006, Vermont passed bill H.0253, An Act Relating to Establishing Energy Efficiency Standards For Certain Appliances, which established efficiency standards for medium-voltage dry-type transformers, metal halide lamp fixtures, residential furnaces and boilers, and residential fans[38].

In 2009, President Obama elevated appliance efficiency standards by ordering the Department of Energy to complete five new standards subject to legal deadlines by August 8, 2009. In all, as required by a combination of court orders, Congressional deadlines, and the President's memorandum, over the next four years U.S. DOE is scheduled to complete new standards for twenty-six products. This pace of work far exceeds what DOE has done at any other time in its history[39].

While state-specific appliance standards risk confusion in the marketplace, states are addressing that by enacting consistent standards, and are also helping to accelerate the development of national standards for many products.

n. Energy Efficiency in Act 250

Vermont's Land Use and Development statute (Act 250) provides a quasi-judicial process for reviewing the environmental, social, and fiscal impacts of major subdivisions and developments in Vermont. Developments subject to Act 250 must meet an energy efficiency criterion, which states: "A permit will be granted when it has been demonstrated by the applicant that … the planning and design of the subdivision or development reflect the principles of energy conservation and incorporate the best available technology for efficient use or recovery of energy."[40] "Best available

---

[38] Database of State Incentives for Renewables and Efficiency, Vermont Energy Efficiency Standards for Appliances, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=VT05R&re=0&ee=1

[39] ACEEE, Ka-BOOM! The Power of Appliance Standards: Opportunities for New Federal Appliance and Equipment Standards, July 2009.

[40] 10 VSA Section 6086.

technology" has been interpreted to mean the best of proven design techniques of normally accessible equipment and materials; those using the least amount of energy or having the lowest life-cycle costs. For residential buildings, compliance with Vermont's Residential Building Energy Standards has been treated as complying with the Act 250 criterion. For commercial buildings, compliance with the Commercial Building Energy Standards has been treated as providing strong evidence that the Act 250 criterion is met. The Department of Public Service evaluates projects and may recommend that applicants consider specific energy efficiency measures based on a life-cycle cost approach; the Department can recommend above-code designs for commercial developments. For both commercial and residential projects, electric heat is generally avoided and alternatives to electric water heating are given strong consideration.[41] Because of Act 250, more than a generation of buildings has been built without electric heat and with significant building insulation. Modern building science presents additional savings opportunities that are not yet incorporated into standard practice.

The Act 250 process tends to address developments of significant new buildings and building complexes and it has a high standard for energy efficiency, so it presents an excellent opportunity to assure quality construction and energy systems. The complexity of energy systems in buildings can lead to a lack of understanding by participants and decision-makers on how to interpret the Act 250 energy efficiency standard. Although this is a challenge, Act 250 can be a process that assures continuous improvement in building practices for energy efficiency. Both the Vermont Energy Investment Corporation and Vermont Gas Systems actively assist customers in compliance with Act 250 criteria.

C. Persistent Market Barriers

Even though Vermont has taken meaningful steps to improve fuel efficiency in buildings, and there are some programs in place to assist building owners, many studies have reported that the potential for cost-effective savings far exceeds the rate of investment that is occurring in the market today. For example, a major study prepared for the Vermont Department of Public Service in 2007 found that Vermont's fuel bills could be lowered further by more than 12% per year after 10 years (which would be around $100 million per year at recent fuel prices).[42]

---

[41] Natural Resources Board Land Use Panel, *Act 250 District Commission Training Manual, Criterion 9F*, revised 2006.

[42] GDS Associates, *Vermont Energy Efficiency Potential Study for Oil, Propane, Kerosene, and Wood Fuels*, for the Vt. Dept. of Public Service, 2007. Other recent reports have reached similar conclusions. See e.g., Vermont Council on Rural Development, *Strengthening Vermont's Energy Economy*. (August 2007).

Years of experience and numerous studies have demonstrated that there are a host of reasons for consumer under-investment in energy efficiency, and that public initiatives are needed to surmount these barriers and make real progress. Those barriers persist in Vermont today. Understanding them is crucial to developing effective efficiency services and marketing those services successfully to households and businesses. Major barriers include:

a. Customer Barriers

- Split incentives: One of the biggest problems in delivering the full value of efficiency investments in buildings is the distinction between *who can make the investment now?* and *who will benefit from the investment over the long term?* Builders build buildings that they will never live in. Almost all commercial office space is built by developers who will never pay for power or heat in the building. Many homeowners do not expect to stay in their present home long enough to fully benefit from insulation or other upgrades. Tenants have little opportunity to upgrade their rental units and have little reason to invest in the owner's property. All of these actors may take a short-term view, yet the building stock overall is very long-lived, and will be adding to the state's overall power and fuel demands for decades to come, through changes in owners and tenants.

- Poor understanding of or confidence in realizing benefits: Many efficiency improvements such as insulation and air sealing are largely invisible after installation. Therefore, in contrast to highly visible clean energy additions such as solar panels or wind turbines, building energy efficiency improvements do not attain the same level of interest. Building owners therefore have a limited understanding of the benefits that can result from efficiency retrofit projects, including better comfort, increased safety, increased property value, and lower energy bills. Some homeowners do not believe enough savings can be gained.

- High up-front costs / inability or unwillingness to raise capital or take on debt: Another substantial barrier to consumer investment in energy efficiency lies in the relationship between today's costs and tomorrow's benefits. It is difficult for many families to pay the up-front costs of efficiency improvements that will lower bills over several years. Most consumers discount those future benefits greatly due to their unwillingness to take on what they perceive as more debt, resulting in under-investment in efficiency over the long term. The cost of efficiency audits and upgrades significantly limits the demand for many efficiency retrofits. Even when a relatively short payback period can be demonstrated, the up-front costs often remain a barrier to consumer investment. The majority of Vermonters do not qualify for services under the

Weatherization Assistance Program, and *cannot afford to invest in their homes at a level that would provide meaningful energy savings (even with the reduced interest rate financing available through Home Performance with Energy Star)*. Some cannot qualify for reduced rate financing.

- Lack of information about efficiency and quality contractors: There is limited information from trusted sources about the most cost-effective efficiency measures, what retrofit work needs to be done in homes, and which contractors to hire to perform these services. Most customers have a limited understanding of the connections between various problems in a home, such as discomfort, high maintenance costs, air quality, ice dams on roofs, and energy use. Homeowners also attempt to make efficiency improvements themselves, often to reduce the costs, but limited information exists to help do-it-yourselfers accomplish a high-quality retrofit.

- Piecemeal approach: As a result of the previous three barriers, many homeowners make only partial efficiency improvements instead of more comprehensive ones. For example, a homeowner of an un-insulated house may insulate just the attic instead of both the attic and sidewalls, using a contractor who gave the lowest bid. Such a contractor may not understand that significant air leakage from the home into the attic should be sealed first, before attic insulation is added (once attic insulation is installed, it is much more difficult to fix the air leakage). The greatest energy savings are achieved when homes are treated comprehensively.

- Timing of home improvements: Home improvements and equipment upgrades often take place when a home reaches a certain age, in the first few years after a home has been purchased by a new owner, or when existing equipment fails. Due to the intensive nature of these projects, many homeowners may not be interested in undertaking them unless they fall into the above categories.

- Inconvenience / Inertia: Having an audit and efficiency retrofits on a home can be invasive, time-consuming, and inconvenient for customers. Customers must spend time locating the correct contractors, making decisions about which services to contract for, financing the project, choosing which equipment or materials to purchase, being at home to let contractors in the house, moving furniture and providing contractors with access to specific areas of the house, and sometimes living within a construction zone for a period of time. Given these difficulties, it is often easier for customers to opt not to undertake such a project.

b. Contractor Barriers

- Contractor education: Contractors who have worked for the Weatherization Assistance Program, who are certified by the Building Performance Institute, and who are participating in the Home Performance with Energy Star have the training to retrofit buildings to provide a high level of energy savings and ensure that health and safety issues are minimized. However, many other contractors do not have the expertise to accomplish this.

- Contractor unwillingness: Contractors who want to become certified by the Building Performance Institute or receive other efficiency training must invest time and resources into learning new skills and purchasing new equipment. Many contractors are not willing to undertake this, especially if the demand for efficiency services is not clear.

c. Lender Barriers

- Perceived lack of customer demand: Through the multiple lender interviews carried out by the Institute for Energy and the Environment at the Vermont Law School, a common theme was that there was a major lack of customer demand for home energy efficiency retrofits. This lack of demand can be attributed to multiple factors, many of which are described under the customer barriers above. Additionally, the slow economy has resulted in unwillingness on the part of customers to take on what they perceive as more debt, without a clear understanding of the benefits and payback.

- Unwillingness to take on additional risk: Although most of the lenders indicated in the interviews that there was sufficient capital available in most cases, it is unclear whether they will undertake lending on the scale necessary, without any measures to mitigate risk. Additionally, many lending institutions face increased tightening of lending regulations following the financial crisis. If the loans have to reach the swath of customers that would fall below the qualifying criteria (but still have a reasonably good credit history), then risk mitigation measures in the form of a loan loss reserve would be required to be established as an enabling measure. Also, from a lenders standpoint, a long term loan for the average costs associated with energy efficiency measures may not always be desirable from a profitability viewpoint.

- Lack of a one-stop shop to manage the entire process: Most of the lenders do not have the expertise in-house to understand how the loans will be utilized or what the benefits would be, to create a better awareness with their customers. Lender education about the value of the loans is required; however in the long

term, lenders would like to deal only with the financing aspects of the program, and leave the rest to entity/entities better capable to handling them.

Taken together, the customer, contractor and lender barriers to building fuel efficiency raise substantial bars against the long-term improvement of Vermont's building stock. The fuel efficiency services proposed in this report are designed, as they must be, to overcome these barriers so that long-term improvements in the state's building infrastructure can be achieved, providing very large long-term economic gains to the families and businesses that will be occupying those buildings in the decades ahead.

D. Summary

- In 2008 Vermont established statutory goals to make at least ¼ of its housing stock 25% more energy efficient by 2020, which represented a target of 80,000 homes.

- And, the state has several entities with fairly effective programs working towards that goal including the Home Performance with Energy Star, Vermont Fuel Efficiency Partnership, Weatherization Assistance Programs, NeighborWorks® of Western Vermont, etc.

- Despite the efforts of these programs, Vermonters are not investing in energy efficiency and are losing the opportunity to save money because of many barriers.

- These barriers range from unwillingness or inability to take on debt to a lack of market demand for energy efficiency.

Section 3: Expanding Current Whole-Building Efficiency Services

The current programs and efforts, although substantial, will fall short of the goals set out in Act 92, resulting in continued losses to the Vermont economy. A significant and sustained expansion to the current activities is required to make up for this shortfall. This section recommends a set of basic principles that need to be followed along with the primary recommendations for expanding the current activities.

The need is great, and growing. As previous sections demonstrate, the cost of importing fossil fuels is placing a growing burden on families, businesses, and the state's economy as a whole. The total cost of fuels for buildings in Vermont is at least $300 million more than it was in 2000. Meanwhile, the energy demands of Vermont's building stock are significantly larger than they need to be -- the energy penalty imposed by inadequate building shells, heating systems, and equipment now exceeds $100 million per year.[43]

The building stock is very large, includes many older units, and is widely dispersed among many owners. One of the greatest challenges to improving efficiency is the broad-based ownership pattern of the Vermont building stock. The need for efficiency improvements and services is very broadly spread, both in physical terms, and among many different owners (and thus decision-makers):

- There are more than 240,000 occupied housing units in Vermont, and at least 40,000 unoccupied or seasonal units;
- At least 49,000 units are occupied by low-income families;
- About half of this housing stock, over 125,000 units, was built before Vermont's earliest energy-related building codes were adopted in 1973;[44]

[43] The GDS study found that achievable, cost-effective reductions could equal about 12% per year of total consumption statewide after 10 years, which is about $100 million per year at current fuel costs. This is not an estimate of future savings foregone – it is a conservative view of the size of the energy penalty that Vermont families and businesses *were paying in 2008* by failing to upgrade inefficient buildings and heating systems.

[44] Vermont Public Interest Research Group, *Building Solutions: Energy Efficient Homes Save Money and Reduce Global Warming*, 2006, p. 12.

- New construction adds approximately 1,000 to 3,000 residential units per year;
- There are more than 22,000 business establishments occupying commercial space throughout the state.

This means that efficiency services for buildings must be designed with low barriers to entry and low transaction costs. Broad-based marketing and outreach efforts directed at many owners will be needed, rather than high-impact deals with just a few large market players.

A. Design Principles

Reducing the energy penalty will require effort, but it is well within our grasp to accomplish. To design an effective set of services, we have called on the experience of Vermont's existing energy and efficiency providers, the judgments of experts in state government, and a wealth of national experience on "what works" when seeking to enlist and assist building owners, contractors, and efficiency providers. We have found a surprisingly high degree of consensus on the basic principles to guide program design, summarized below. We recommend the direct delivery of statewide comprehensive energy efficiency services based upon the following design principles:

- **Focus on the needs of customers – that is, Vermont families, homeowners and business building owners. Services must be "customer-focused," not agency-focused.**

  Efficiency services for buildings must be designed to attract enrollment, overcome the market barriers to efficiency, and actually deliver building upgrades – if they do not actually attract and help customers to deliver upgrades, they will not work.

- **Address the persistent market barriers to efficiency.**

  When it comes to energy efficiency, homeowners and businesses face a variety of barriers to action. Customers need high-quality, trusted, impartial audits and recommendations; up-front financial assistance; easy access to "one-stop shopping" and longer-term financing options.

  A major market barrier, described in the prior section is the lack of visibility of building energy efficiency upgrades, which contributes to a general lack of understanding of their benefits and makes it difficult to generate the level of interest as other highly visible measures might have. A time-of-sale efficiency review, coupled with an energy rating system would be an important step in making

energy efficiency upgrades visible, akin to the fuel mileage rating on cars. This would also pave the way towards incorporating the value of the energy upgrades into the building value.

- **Design services to address major market segments differently**.

Experience and common sense both dictate that "one size fits all" will absolutely not work to deliver energy efficiency savings across Vermont's building stock. A customer-focused service will need to separately address the market barriers and financial capabilities.

- **Deliver a broad-based set of services – one with opportunities for Vermonters in all housing and income categories.**

To make a meaningful difference in total fuel consumption in Vermont, and to meet our statutory energy goals, the whole-building efficiency services must upgrade at least 25% of the state's housing stock by 2020. To meet that goal – a total of 80,000 residential units and additional commercial buildings -- a range of opportunity areas must be tapped. In addition, it is important to provide savings opportunities for customers in all types of housing, in all customer classes, and all across the State. Services should cover all major opportunity areas:

  - Building design and new construction;
  - Building shell retrofit opportunities in commercial buildings and all types of housing; and
  - Building systems -- HVAC systems, services and operations.

- **Build on existing institutions.**

As discussed in Chapter 2, Vermont has several whole-building programs underway: the Weatherization Assistance Program (WAP), its regional agencies and fuel dealer partners; the State's energy efficiency utility: Efficiency Vermont, Vermont Gas Systems and Burlington Electric Department; the Home Performance with Energy Star program; Vermont Fuel Efficiency Partnership; NeighborWorks® of Western Vermont; town energy committees; the institutions that support Act 250; and the government agencies that oversee efficiency entities and building codes (including the Department of Public Service, Public Service Board, and Office of Economic Opportunity). Building on these effective delivery mechanisms is the best way to expand performance.

- **Maximize savings and minimize transaction costs with a "whole-building" approach that considers all energy fuels and uses.**

A "whole-building" approach is one where efficiency upgrades are made to multiple components of the building in an integrated way[45]. This approach is important for a variety of reasons. Customers want one-stop shopping for energy efficiency, and should not have to knock on different doors for service on regulated vs. unregulated fuels. Building shells and HVAC systems cut across fuel types (e.g., insulation affects both oil heat consumption and air conditioning electricity demand). Customer contacts and high-quality audits are relatively expensive, so it is important to reduce costs by including both regulated and unregulated fuels in the analysis, recommendations, and funding package. This will help to maximize savings for individual participants and for the effort as a whole, help to minimize "lost opportunities," and will lower administrative costs as a percentage of total costs and savings.

- **Use public funds to leverage private investment capital.**

Upgrading a meaningful fraction of the state's building stock will provide very large benefits, but it will also require a large pool of investment capital. Most of that capital should be privately provided by building owners or lenders. Public funds are needed to provide assistance to low-income families, but beyond that should be used strategically to provide audits and technical assistance, and to leverage private investments to upgrade the building stock.

- **Ensure public oversight for the use of public funds.**

Mechanisms are already in place within State government to supervise program designs and oversee the use of public, utility, and other funds for energy efficiency. The current Heating and Process Fuel Efficiency Program, administered by Efficiency Vermont, is overseen by the Vermont Public Service Board.[46] The Weatherization Assistance Program is overseen by the State Office of Economic Opportunity. The activities recommended in this report should continue and build on those oversight mechanisms.

---

[45] Neme, C., Gottstein, M., and Hamilton, B., 2011. *Residential Efficiency Retrofits: A Roadmap for the Future*, Regulatory Assistance Project.

[46] Vermont Public Service Board, Order of Appointment for Vermont Energy Investment Corporation and Process and Administration Document, Docket 7466, Order on December 20, 2010, http://psb.vermont.gov/docketsandprojects/eeu/7466/orders

- **Invest cost-effectively, and for the long term.**

A principal objective of Vermont's efficiency programs has been to save energy cost-effectively. In the context of the building stock, it is especially important to recognize the power of long-term investment strategies. Vermont has an especially long-lived building stock, and while the ownership of individual buildings will change over time, the building stock persists. Efficient buildings will benefit future owners and the Vermont economy for many years into the future. This means that the investment vehicles, loan arrangements, and cost-benefit analyses for these services should all take a long-term view.

- **Begin capturing savings as soon as possible, but ramp up services predictably over time.**

Vermont's fuel bill is now at a very high level, and the prospects are for high costs to continue over the long-term. The earlier services can begin, the larger the savings will be, so services should be designed to help Vermonters save on fuel costs as soon as possible. At the same time, smart services will need trained workers, marketing and financial support, and other elements that will take time to add carefully. Program designs and financial supports will need to grow over time and should ramp up to capture as much of the achievable saving potential as funding will support.

- **Set funding and administrative mechanisms to achieve long-term goals**.

One important lesson from past efficiency programs are the importance of setting long-term goals at the highest levels of public decision-making. The Legislature in 2008 set whole-building residential efficiency goals and established the Heating and Process Fuel Efficiency Program, and funds from RGGI and the Forward Capacity Market were appointed to fund the program. However, this funding and other existing funding still is not sufficient to achieve the statutory goals. In addition, there is now no entity charged with ensuring that sufficient progress is made toward the goals, and regularly measuring progress toward them. This report recommends that sufficient funding to achieve the statutory goals be set, and continuous assessment and regular reporting by administrators be established, coupled with oversight by the Public Service Department and Board.

Design Principles for Comprehensive Energy Efficiency Services

- Focus on the needs of customers – that is, Vermont families, homeowners and business building owners. Programs must be "customer-focused," not agency-focused.
- Address the persistent market barriers to efficiency.
- Design services to address major market segments differently.
- Deliver a broad-based set of services – one with opportunities for Vermonters in all housing and income categories.
- Build on existing institutions.
- Maximize savings and minimize transaction costs with a "whole-building" approach that considers all energy fuels and uses.
- Use public funds to leverage private investment capital.
- Ensure public oversight for the use of public funds.
- Invest cost-effectively, and for the long term.
- Begin capturing savings as soon as possible, but ramp up programs predictably over time.
- Set funding and administrative mechanisms to achieve long-term goals.

B. Statewide Energy Efficiency Service Goals

The Vermont Energy Efficiency and Affordability Act (known as Act 92)[47] established the following goals for the state:

- To substantially improve the energy fitness of at least 20% of the state's housing stock by 2017, and 25% of the state's housing stock by 2020;
- To reduce annual fuel needs and fuel bills by an average of 25% in the housing units served;
- To reduce fossil fuel consumption across all buildings by an additional one-half percent each year, leading to a total reduction of 6% annually by 2017 and 10% annually by 2025;
- To save families and businesses a total of $1.5 billion on fuel bills over the lifetimes of the improvements installed between 2008 and 2017;
- To increase weatherization services to low-income Vermonters by expanding the number of units weatherized, or the scope of services provided, or both, as revenue becomes available in the weatherization assistance trust fund.[48]

[47] Vermont General Assembly, The Vermont Energy Efficiency and Affordability Act (Act 92), March 19, 2008, http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT092.HTM

[48] 10 VSA Section 581.

This report outlines a set of services and funding requirements that would help meet these statutory goals.

C. Proposed Recommendations to Meet Statutory Goals

Overview: Based on the design principles set out above and the factual setting described in previous sections, we have considered a range of ideas to improve efficiency in buildings in Vermont. In the summary below, and in the sections that follow, we set out a comprehensive, decade-long plan to improve buildings on a whole-building basis.

We conclude that the Vermont Legislature should re-commit itself to achieving the statutory goals of reducing fossil fuel use across all buildings by 10 percent annually by 2025, and improving the energy fitness of 25% of the state's housing units by 2020, by expanding the low-income Weatherization Assistance Program, using public funds to leverage private investments in building shell and furnace upgrades, and replacing the expiring ARRA funds with new sources in the next two years.

This report contains the following major recommendations:

1. Develop effective outreach initiatives for driving demand for home energy retrofits by leveraging entities with direct relationships to the customers, including **town energy committees** and **fuel dealers**;

2. Initiate a **time-of-sale efficiency review and disclosure** for residential and commercial buildings, coupled with technical and financial assistance for efficiency upgrades. Sustain efforts for improving building codes and equipment standards, and continuing efficiency improvements through Act 250;

3. Steadily increase the number of units served by the low-income **Weatherization Assistance Program** by 7.5% every year to improve efficiency, fuel costs and life safety in existing low-income housing;

4. Continue to focus on multi-family housing units through the **Vermont Fuel Efficiency Partnership** program;

5. Continue efforts on the **market-based service** of outreach, financial and technical assistance for other existing housing and commercial buildings on a "**whole-building**" basis, through the State's energy efficiency utilities: Efficiency Vermont, Vermont Gas Systems and Burlington Electric Department;

6. Establish an easy-to-access loan program for high-quality upgrades by home and building owners, with capital provided by a **consortium of banks and private lenders**, possibly supported by the state agencies with lending expertise in the buildings sector;

7. Establish responsibility for coordinating whole-building efficiency services programs among diverse providers and for meeting state goals to a statewide entity such as the **Department of Public Service** (*Section 6*).

D. Funding Requirements

Overview: Table 3-1 below provides a quick overview of the major elements of the recommendations in this report. It shows:

- The **number of units** of housing that would need to be improved to meet the Act 92 goals. Because most of the services ramp up in scale over time, the total number of units served rises from about 3,600 in 2011 to about 11,000 in 2020.

- The **publicly-supported cost per unit**, on average, for participating units. Importantly, this figure does not include the funds invested by building owners and/or covered by loans to those owners. The public cost per unit is higher for the low-income Weatherization Assistance Program (approximately $5,200 per unit) than it is for the Market Housing service, where owners are expected to contribute a large fraction of the total costs of upgrades.

- **Funds needed per year** provide a snapshot of the total new revenues that will be needed from public sources to support the expanded initiatives. That amount rises over time as more units are served (from just $17.1 million in 2012 to $33.6 million in 2020). (New public funds needed are much less than total program budgets.)

Table 3-1: Expanded Residential Efficiency Services -- Overview and Key Data Points

RESIDENTIAL SERVICES SUMMARY AND FUNDING REQUIREMENTS 2011-2020*				
Initiative/Service	**Units/year**	**Public cost/unit**	**Funds needed/year**	**Total units over 13 years**
Weatherization Assistance Program (WAP)	2,000 rising to 2,800	$5,200	$12.5 million rising to $19 million	31,300
Market Housing retrofits w/incentives	1,300 to 2,900	$2,300 rising to $3,000	$3 million rising to $10.4 million	19,400
Market Housing retrofits addressed through other proposed initiatives	0 to 4,900	*Note 1*	*Note 1*	22,200
Vermont Gas program	100 rising to 470	$2,700 rising to $3,400	$300,000 rising to $1.4 million	4,000
Other programs with transitional funding, including non-WAP ARRA	270 rising to 770 through 2013	An average of $1,300 through 2013	$300,000 rising to $2.8 million through 2013	2,100 through 2013
Other initiatives prior to 2011	530 in 2009 to 600 in 2010			1,100
TOTAL	3,670 rising to 11,040 units per year		$17.1 million rising to $33.6 million (*Note 2*)	80,000

* *Total units over 13 year period starting with passage of Act 92 in 2008*

Note 1: Public funds required here remain an open question. It is critical that that the recommendations for other proposed non-incentive initiatives are put in place, which would minimize the funding requirements here. Absent this, the incentive levels necessary to achieve the targets may be as high as $2,500 per unit and cost up to $11 million per year by 2020, and may still fall short of the goals.
Note 2: With additional incentives required, we estimate total program costs in 2020 of almost $45 million.

Institutional Roles: The proposed recommendations in this report build on Vermont's existing experience and strengths, including:

- The experience of Vermont's existing efficiency institutions, including Efficiency Vermont, the community-level agencies administering the Weatherization Assistance Program, Vermont Gas Systems, and others.

- The capacity of Vermont's fuel dealers and other private sector actors who can deliver funding, expertise, and on-the-ground installations of insulation, HVAC systems, and other building shell improvements.

- The experience of lending institutions such as the Vermont State Employees Credit Union, Opportunities Credit Union, and many others in administering lending programs for home energy efficiency retrofits.

- The presence of over ninety Town Energy Committees across the state, loosely organized under the Vermont Energy and Climate Action Network, formed as a grassroots response to address the energy problems of the state.

The initiatives recommended in this report are intended to build on those existing strengths. All of Vermont's existing efficiency service providers have important roles to play – and for many of them, significant new business opportunities – in an expanded buildings service. The institutional arrangements summarized in the report build consistently on the arrangements and market roles that already characterize work in this domain. For example, in the low-income Weatherization Assistance Program, projects are managed by five regional agencies, with assistance from Efficiency Vermont and others. In the market housing service recommended in this report, Efficiency Vermont, Burlington Electric Department, and Vermont Gas Systems undertake marketing, intake, and provide financial incentives under their whole-building programs.

To take two examples from Table 3-2 (acronyms in parentheses correspond to those in the table):

- In the low-income Weatherization Assistance Program, energy audits are performed by WAP-trained auditors (often WAP staff members). Air sealing and other building shell improvements are performed by WAP weatherization crews, while furnace repairs and upgrades are contracted out to trained technicians working for fuel dealers or other HVAC contractors. The cost of these improvements is paid for out of WAP program revenues. Vermont Gas Systems, Burlington Electric Department, and Efficiency Vermont also provide some financial assistance to WAP.

- In the Market Housing service for middle- and upper-income residents, the state's efficiency contractor, Efficiency Vermont (EVT), plays a role through its Home Performance with Energy Star Program, and Vermont Gas Systems and Burlington Electric Department have similar whole-building programs. Energy audits, air sealing, and insulation services are provided by auditors and contractors, while more significant building shell construction work may require other building trades professionals and contractors (PC). Here too, furnace and HVAC system upgrades will be provided by certified technicians working for fuel dealers and other private HVAC contractors. Financial support to building owners is provided by Efficiency Vermont, Vermont Gas Systems, and Burlington Electric Department. Those incentive payments are just a fraction of the total upgrade cost, and will need to be combined with a significant investment by the building owner, who could, if desired, use loan funds made available (CU, NF or B).

The Commercial Buildings service described in this report is not envisioned to focus on government and institutional buildings because of the attractiveness of this subset to Energy Service Companies. As discussed elsewhere, ESCOs are successful in improving the energy efficiency performance of these buildings while profiting from receiving a share of the savings over a period of time. Government and institutional building owners tend to have a tolerance for longer term paybacks that match the ESCO business model.

Expanding whole-building efficiency services, as recommended in this report, also will require effective coordination and leadership. Given its central role in oversight of utilities and energy efficiency programs, the Department of Public Service is well positioned to take on this role.

Table 3-2: Overview of Expanded Activities – Who Performs Which Functions?

	Energy Audits	Air Sealing & Insulation	HVAC & Hot Water Upgrades	Process equipment upgrade	Other Shell Improvements (windows & doors)	Incentives or Assistance	Financing
Single-Family Residential							
Low-income Weatherization Assistance Program	WAP	WAP	WAP hires VFD & PC		WAP	WAP, VGS, BED, EVT	
Market housing	HP, VGS, ED, PC, NWWVT	HP, VGS, BED, PC, NWWVT	VFD, HP, VGS, BED, PC		PC, HP, VGS, BED, NWWVT	EVT, VGS, BED, NWWVT	CU, NF, B, NWWVT
Vermont Gas customer units	VGS, HP	PC	VFD, PC, VGS		PC	VGS	NF, B, CU, VGS
Multi-Family Residential							
Low-income	WAP, VFEP	PC, WAP, VFEP	VFD,PC		PC, WAP, VFEP	WAP, VFEP, VHCB	NF, B, CU
Other	EVT, VGS, VFEP	PC	VFD, PC		PC, VFEP	EVT, VGS, VFEP	NF, B, CU
Other Buildings							
Commercial	EVT, VGS, BED	PC	PC	PC	PC	EVT, VGS, BED	NF, B, CU, ESCO
Government buildings, or other non-profit institutions	EVT, ESCO	PC	PC	PC	PC	NA	B, CU, Bonds, ESCO

B, CU – Commercial Banks, Credit Unions
ESCO – Energy Service Companies
EVT – Efficiency Vermont
HP – Home Performance with Energy Star Contractors
NWWVT – NeighborWorks® of Western Vermont
NF – (New Fund) The pool of private capital made available through a coalition of banks
PC – Private Contractors, including HVAC Contractors
VFD – Vermont Fuel Dealers
VFEP – Vermont Fuel Efficiency Partnership
VGS – Vermont Gas Systems
VHCB – Vermont Housing and Conservation Board
WAP – Weatherization Program

There are two important lessons built into this chart of institutional roles. First, it should be apparent that any serious effort to upgrade the energy fitness of Vermont's building stock will need to employ the services of many existing or new private-sector professionals: auditors, building contractors, HVAC technicians, and banks and other lenders. This is true to some degree in the Weatherization Program, but to a much larger degree in the Market Housing and Commercial programs. In the latter two programs, most of the work is done by qualified contractor lists at the discretion of building owners.

The second lesson is that coordination among these actors will be essential for success. A customer-focused service must minimize confusion and the "hassle factor" for homeowners, and provide a seamless or invisible transition from one step to the next for their benefit. Since Vermont's current whole-building efficiency programs offer many points of entry for customers, it is crucial that each is well-coordinated with the others, so that no matter which program customers are involved with, they are able to benefit from incentives from all the relevant programs in the state appropriate to their situation. This report recommends that an entity such as the Office of Economic Opportunity or the Department of Public Service be charged with overseeing that this coordination takes place.

E. Summary of Recommendations

- Efficiency programs must be customer-focused, and must seek to address the persistent market barriers to efficiency – customer barriers, contractor barriers and lender barriers (*Identified in Section 2*).

- Services must be designed to address major market segments differently, and should provide opportunities for Vermonters in all housing and income categories.

- Build on existing institutions (Weatherization thru CAP agencies, Efficiency Vermont; Vermont Fuel Efficiency Partnership; town energy committees, etc.

- Utilize a "whole-building" approach in order to minimize transaction costs.

- Set funding and administrative mechanisms to achieve long-term goals and measure progress against those goals.

Section 4: Improving the Energy Fitness of New Construction in Vermont

This report largely focuses on existing construction in Vermont for two important reasons: new construction is seen to have experienced a significant slowdown since 2008, and is not expected to increase significantly in the next few years. In addition, the ARRA funds have required an update of building codes and the development of an implementation plan that would significantly improve the energy profiles of new buildings. This section explains some of the developments that have taken place that would impact new construction.

New building construction in Vermont is currently experiencing a slowdown, which is unlikely to change in the next few years, given the current economic climate. This is evidenced by the number of new privately owned units authorized, which stood at approximately 2,600 in 2006, but reduced to approximately 1,500 in 2010. In addition, there are a number of developments that would address improving the energy fitness of new construction, which are described in this section.

A. Building Energy Codes

According to a recent study by Northeast Energy Efficiency Partnerships, a significant amount of energy efficiency is available from adoption and enforcement of building energy codes at low cost.[49]

The state of Vermont requires new residential and commercial buildings to meet energy codes, which have been in effect since 1997 and 2007 respectively.[50] The Residential Building Energy Standards and Commercial Building Energy Standards are based on the International Energy Conservation Code (IECC) produced by the International Code Council, a code widely used in many states. As of December 2010, Vermont's current residential code was based on the 2000 IECC code and the commercial code based on the 2004 IECC code.

[49] Northeast Energy Efficiency Partnerships, *From Potential to Action How New England Can Save Energy, Cut Costs, and Create a Brighter Future with Energy Efficiency*, October 2010, http://neep.org/uploads/policy/Potential%20Study_FINAL.pdf. Codes also promote health and safety of building occupants, notably with respect to indoor air quality and comfort.

[50] Residential Building Energy Standards: 21 VSA Section 266-267; Commercial Building Energy Standards: 21 VSA Section 268.

In February 2009, as one of the requirements for obtaining the American Recovery and Reinvestment act (ARRA) funding, Governor Jim Douglas certified to DOE that Vermont would implement energy standards equal to or more stringent than the latest national model codes. On May 27th 2009, the Vermont Energy Act of 2009 (H446) became law and directed the Commissioner of the Department of Public Service to begin the process of adopting the 2009 IECC code.

As standard building practices improve, state building codes should be updated. H446 also states that beginning in January 2014, the Department of Public Service shall update the residential and commercial codes to incorporate the most recent versions of IECC, with an effective date within three months of final adoption. The IECC itself gets updated every three years.

As in most states, there is some question whether builders pay attention to the energy code. The complexity of the codes and the fact that they address parts of buildings hidden from occupants makes it challenging for most owners to tell whether their building meets the codes. For this reason, enforcement of building energy codes by a trusted third party or government is an issue. Yet enforcement is expensive, and some consider enforcement to be intrusive to the building process, so adherence to building energy codes in most places is unreliable, demonstrated mostly by anecdotal evidence. An exception is in Burlington, where building energy code inspection is an integral part of the multi-family building inspection process, and the city actively enforces the code.

In lieu of a code enforcement mechanism, Vermont legislation established a process in which builders, architects, and engineers can self-certify that they have built buildings to meet the codes, and property owners have the right to take legal action if this does not occur. Vermont law provides for the customer and the building team (builder, contractors, architect, etc.) a "private right of action," or the right to sue, in the event an otherwise acceptable building is later found to have been built to a standard below the code. This can be a deterrent to sub-code practices, but its real influence is unproven.

H446 strengthens code enforcement by specifying that a plan be formulated by the Department of Public Service to achieve compliance with the 2009 IECC codes in 90% of new building space within 8 years. The development of compliance plan is currently underway, and will be in place in late 2011/early 2012.[51]

Building energy codes reflect standard practice, not all cost-effective energy efficiency. From a long-run perspective, spending more on higher quality materials, equipment and practices can save a lot of energy in a cost-effective manner. A standard for energy efficiency programs like Energy Star Homes would provide incentives that produce

[51] Conversation with Kelly Launder at the Department of Public Service, November 2010.

buildings that exceed energy code in energy efficiency performance by 20%-30%. An additional service that can work with codes can call for a certified inspector to deliver a code compliance assessment, which provides confidence to the current owner and assurance to future owners.

B. Act 250

For buildings subject to the Act 250 land use permitting process, there is an opportunity to secure a more energy efficient result than pure reliance on the building energy code. Criterion 9f calls for the use of "best available technology for energy efficiency."[52] While this standard is sometimes consistent with building energy codes, in other instances, best available technology for energy efficiency exceeds the code. As applied in Vermont, these measures would be cost-effective from a long run, societal perspective, and represent building practices already in general use.

Still, these incremental investments add to the first cost of a building, and so despite the benefit to the long run economics of the building, and the fact that retrofitting similar measures later will tend to cost more than to build them into the building at the beginning, these investments are sometimes resisted by Act 250 applicants.

An important way Criterion 9f is applied today is to rule out electric heat and to specify significant building insulation. Owing to Act 250, more than a generation of buildings has been built without electric heat and with significant building insulation.[53] Act 250 proceedings address specific projects, and these decisions present opportunities to determine the meaning of "best available technology" in each case.

As with building energy codes, the meaning of the best available technology for energy efficiency changes over time, and the Act 250 process should reflect these improvements. Compared with building energy codes, best available technology exceeds this standard in many cases, and a customized analysis of a project is often the only way to apply a system perspective to a project.

Applying the Act 250 criterion for best available energy efficiency technology has the added benefit of reducing the burden on energy efficiency programs. As technology and practices improve after a building is finished, however, programs are still valuable to

[52] 10 VSA Section 6086.

[53] This is a good example of addressing the "split incentive barrier," in which the parties responsible for the initial construction of the building may not have a stake in its long term operating cost and may lack a market-based incentive to make the cost-effective investment, illustrating the value of regulation to step in and force that investment to occur.

assist building decision-makers to make new cost-effective investments.[54] It would be unfortunate, however, to expend program resources on measures that should already be required by the Act 250 permitting process.

Is Act 250 delivering best available technology for energy efficiency? It is hard to answer this question because there is no systematic evaluation of results (as there is with energy efficiency programs). There is also no systematic effort for district commissions and the Vermont Natural Resources Board to maintain a current standard to interpret Criterion 9f. This report recommends *a thorough review of the effectiveness of Act 250 to deliver best available energy efficiency technology.* This review should include an assessment of instances where best available technology exceeds the applicable building energy code, and should consider the extent to which this guidance can be published in a manual for use by Act 250 participants. Nor is there a training program for Act 250 applicants on expectations for interpreting Criterion 9f. Such assistance could be cost-effective in improving the quality and consistency of applications, evidentiary records, and decisions. This report recommends that *such a training effort for Act 250 participants be implemented*. Recent developments in the use of Energy Star Homes program will clarify superior building practices and tend to improve the cost-effectiveness of any training programs.

C. Government Buildings and Leadership

Publicly funded buildings can demonstrate leadership by government in energy efficiency. These buildings include state and municipal buildings, including offices, schools, public housing, water, sewer and maintenance facilities. These buildings are often centerpieces in their communities. This report recommends that *Vermont set high energy standards for these newly built public buildings, requiring energy efficiency performances exceeding the applicable code by 20% or more*.

D. Summary of Recommendations

With a solid foundation for energy efficient buildings from building energy codes, Act 250 permitting, time-of-sale requirements, and higher standards for publicly funded buildings, energy efficiency programs can make a meaningful difference at a minimum cost to society by enabling further cost-effective investments. Pressure on programs diminishes if Act 250 and government leadership produce buildings that exceed code.

[54] To illustrate technology progress, the headquarters of the Federal Energy Regulatory Commission in Washington were built in 1994 to state-of-the-art energy specifications. Yet a 2007 retrofit of the lighting in the suite of one commissioner will provide the same or better light for less than half the energy.

In summary, this section recommends that Vermont should:

- Adopt a process to ensure compliance of building codes in all new construction.
- Conduct a review of the effectiveness of Act 250 to deliver best available energy efficiency technology.
- Undertake a training effort for Act 250 participants on expectations for interpreting the energy efficiency criterion of Act 250.
- Set high energy standards for new public buildings, requiring energy efficiency performances exceeding the applicable code by 20% or more.

Section 5: Expanding the Weatherization Assistance Program

The Weatherization Assistance Program in Vermont has proved to be consistently successful and providing cost-effective investments for public dollars. It is critical to continue providing support for this program in order to address home energy efficiency for the income-constrained population, which does not have access to capital. The Weatherization Assistance Program has built up a considerable increase in capacity in the past few years due to additional support from ARRA, but faces a severe risk of backsliding on this progress without additional revenue, after the expiry of the ARRA funds. Hence it is critical to ensure that dedicated revenue mechanisms be developed to ensure that this progress is not lost.

A. Introduction

There has long been a serious problem of energy affordability among Vermont's low-income households, and the impact of rising fuel prices is now most acute in this housing category. This is true for three reasons:

- Energy costs comprise a higher percentage of household budgets for low-income families;
- The low-income housing stock tends to be older and less efficient than housing available to higher-income households; and
- Energy costs have been rising much faster than the average wages or retirement payments for lower-income workers and fixed-income seniors.

For these reasons, the Legislature should expand the state's efficiency programs for low-income households.

Since 1976, Vermont has implemented a very successful program to weatherize homes occupied by low-income families at no cost to them. The Weatherization Assistance Program (WAP) provides several important benefits:

- Lowering household energy use and fuel bills by between 15% and 50% per treated unit;[55]

- Improving comfort and living conditions for low-income families;

- Improving life safety and healthful living conditions both through better insulation and by resolving dangerous heating system risks;

- Reducing the need for fuel assistance and other forms of public assistance;

- Reducing bill arrearages and bad debt problems for fuel dealers and utility companies;

- Providing highly cost-effective investments. The Vermont Weatherization Assistance Program returned $1.98 for each program dollar spent for energy efficiency measures in 2005. When non-energy benefits, including health and life safety benefits are also considered, the total benefit-to-cost ratio is better than 5 to 1.[56] With today's higher fossil fuel costs, the benefit-cost ratio will be even higher; and

- Providing long-lived benefits. The stream of benefits from an upgraded housing unit lowers heating bills and improves comfort and safety to families or tenants over the period of a decade or more.

B. Weatherization Assistance Program Funding and Recent Activity

Since its inception, the WAP has been operated by community-based low-income weatherization agencies, initially funded solely by the U.S. Department of Energy. In 1990, following recommendations growing out of an investigation into low-income

[55] Dalhoff Associates LLC, *An Update of the Impacts of Vermont's Weatherization Assistance Program*, prepared for the Vermont State Office of Economic Opportunity, February 2007; measured savings range from 13% to over 50% depending on building characteristics and heating fuel type, with an average of 20%. US Department of Energy, *WAP Technical Memorandum Background Data and Statistics*, March 2010, quoted in Vermont Agency of Human Services, *Performance Indicators for the Vermont Weatherization Assistance Program*, January 31, 2011 reports the national WAP average savings to be 34%.

[56] Dalhoff Associates LLC, *An Update of the Impacts of Vermont's Weatherization Assistance Program*, prepared for the Vermont State Office of Economic Opportunity, February 2007..

energy issues by the Public Service Board,[57] the Legislature expanded the program with the creation of and funding from the Weatherization Trust Fund. The Weatherization Trust Fund is financed by a small Fuel Gross Receipts Tax (½%) on the sale of most non-transportation energy sources in Vermont: heating oil, kerosene, and other dyed diesel fuel delivered to a residence or business; propane; natural gas; electricity; and coal. The Fuel Gross Receipts Tax is imposed on the sellers of these energy sources at the wholesale level.

In recent years, the existence of the Weatherization Trust Fund has enabled the WAP program to serve many more households than it would have served if it depended on federal weatherization assistance alone. Between 2005 and 2010, the program received between $6.0 to $7.5 million per year from the state Weatherization Trust Fund, and only about $1.2 - $2.1 million per year from the federal Department of Energy funds. Starting in 2009, the Weatherization Assistance Program received funding from a new source: the American Recovery and Reinvestment Act (ARRA). These funds totaled $16.8 million and were slated to be spent through March 2012. As a result, total funding for the WAP increased from $8.5 million in state fiscal year 2008 to $15 million in state fiscal year 2010. However, funding is currently projected to return to the $8 million per year level for state fiscal year 2012 (*Table 5-1*), which would require the program that has been upsizing in the past two years to downsize.[58]

[57] Vermont Public Service Board, Docket 5308, *Board investigation into the adoption and implementation of energy programs for low-income households* (opened July, 1989). –The Board's final Order in that docket contains this summary: "Low-income weatherization program. Evidence introduced in this docket demonstrated that the Weatherization Assistance Program administered by the Vermont State Office of Economic Opportunity was a cost-effective means of reducing energy bills for low-income households, while increasing household comfort and safety. In response to dramatic cuts in program funding by the federal government, the Board worked with legislative leaders, program administrators, low-income advocates and utilities to create a stable, Vermont-based funding source for this program. We recommended a small gross receipts tax on both regulated and non-regulated fuels, coupled with a tax credit option for utility efficiency programs that met the same program goals. The General Assembly adopted those recommendations in Act No. 272, *An Act Relating to a Home Weatherization Assistance Program* (1990), and extended the program in Act No. 262, *An Act Relating to the Fuel Gross Receipts Tax and the Home Weatherization Trust Fund* (1992)."

[58] Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011.

Table 5-1: Weatherization Assistance Program Funding, through 2012

Weatherization Assistance Program Funding, State Fiscal Year 2007 through 2012 (estimated)						
State Fiscal Year	2007	2008	2009	2010	2011 (appropriated)	2012 (estimated)
Weatherization Trust Fund	6,857,743	7,380,027	7,553,733	6,682,352	4,339,133	7,000,000
US Dept. of Energy Funds	1,353,926	1,146,018	2,146,744	1,399,729	1,012,458	1,012,458
ARRA Funds	0	0	1,684,258	6,737,030	8,421,288	0
Total Funding	**8,211,669**	**8,526,045**	**11,384,734**	**14,999,111**	**13,772,879**	**8,012,458**

Note: The State Fiscal Year runs from July 1 through June 30. For example, State Fiscal Year 2011 runs from July 1, 2010 through June 30, 2011.

The WAP has faced another persistent funding challenge during the recent past. Since its inception, the WAP has had to deal with the inherent tension between the long-term bill reductions made possible by investments in weatherization, and the short-term fuel assistance needs of low-income households. The Weatherization Trust Fund was established, as a parallel to LIHEAP and other *fuel assistance* efforts, to promote the fiscal discipline needed to invest in long-term savings rather than short-term bill support, even though there are always pressing short-term needs among low-income households. In recent years, the Legislature has diverted some of the funds available for the WAP from the Weatherization Trust Fund to support short-term needs for fuel assistance through the LIHEAP program. Approximately $1 million was diverted in 2005, $3.5 million in 2006, and $400,000 in 2007 (State Fiscal Years).[59] Additional money was diverted in State Fiscal Years 2010 and 2011.[60] Legislation passed in 2008 added a stipulation that disbursements from the Weatherization Trust Fund may be made only to support Weatherization programs.[61] Diversions from the Weatherization Trust Fund have reduced the ability for WAP to maintain a secure funding base.

The program in recent years has weatherized between 1,400 and 1,800 low-income units per year (*Table 5-2*). Between 1993 and 2010, the program has weatherized an estimated 23,000 units.[62] The average total cost of weatherizing a home under the program was about $5,180 in program year 2010, including the costs of energy audits,

[59] Personal communication, Elizabeth Chant, Champlain Valley OEO, January 8, 2008.

[60] Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011.

[61] Vermont Statutes Annotated, Title 33, Section 2501(c).

[62] Personal communication with Geoff Wilcox, State Office of Economic Opportunity, January 2011

weatherization crews, materials, heating systems, and production support.[63] The WAP also has additional costs, including training and technical assistance for the weatherization workers, capital expenses such as trucks and equipment, and general administration.

Table 5-2: Units under the Weatherization Assistance Program

Units Weatherized through Vermont Weatherization Assistance Program	
Program Year	Units Weatherized
2007 (4/1/07-3/31/08)	1,427
2008 (4/1/08-3/31/09)	1,570
2009 (4/1/09-3/31/10)	1,805
2010 estimate (4/1/10-3/31/11)	1,746

A number of changes have occurred in the Weatherization Assistance Program in the past two or three years. The program always has weatherized both single-family and multi-family homes, but has been increasing its number of multi-family units weatherized in recent years. Due to the program's increased funding starting in 2009 (from the influx of ARRA funds), the program has grown; it now employs about 130 people statewide, compared to about 85 people in 2008. The program has purchased new equipment and instituted new procedures and training. A training center at Vermont Technical College has been established for more frequent and larger group trainings of crew members. As a result of these changes, more funds have been spent on expenses related to increasing the program, such as training and technical assistance and capital expenses, in recent years. [64]

The WAP program has traditionally been limited to serving units occupied by very low-income families. Before 2005, the cut-off level for WAP assistance was 150% of the poverty level income, well below the levels set for access to many other social service programs. To address this problem, and make the program available to more of the working poor, in 2005 the income level for qualifying for the weatherization program changed from 150% of poverty level to 60% of state median income. A further change occurred in 2008, when the qualifying income level changed to 60% of state median income or 60% of area (county) median income, whichever is higher, thus increasing the qualifying income levels for the counties in which the cost-of-living is higher; requirements for multi-family buildings also were set.[65] All these changes significantly increased the numbers of families and housing units that would qualify for participation

[63] Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011.

[64] Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011.

[65] Vermont Statutes Annotated, Title 33, Section 2502.

in the Weatherization Assistance Program. In 2008, an estimated 49,000 housing units were eligible for the WAP.[66]

A further change occurred to the WAP in 2008, when legislation passed that increased the average weatherization amount limit of $3,000 per unit to $6,000 per unit, to be adjusted annually in accordance with fluctuations in the Consumer Price Index.[67] The same legislation added language that the WAP should allow program flexibility to accommodate special circumstances in which greater energy savings can be realized; and added a goal that the program should increase "the number of low income homes weatherized each year, or the scope of services provided, or both, to reflect increased revenues in the home weatherization assistance trust fund."[68]

C. Weatherization Assistance Program Administration

The WAP program is delivered to Vermont households through four regional Community Action Program (CAP) agencies and the Northeast Employment and Training Organization (NETO), as part of a coordinated program under grant agreements supervised by the Vermont State Office of Economic Opportunity (SOEO). The state allocates funds among these organizations based on a formula that includes heating degree days, population, and other factors. The State Office of Economic Opportunity conducts oversight of the program.

Administration through the CAP agencies and NETO provides advantages. Those agencies are involved in the low-income community through a variety of other service and anti-poverty programs, so they are often in direct contact with the families and housing stock most in need of weatherization service. This enables them to identify, reach out to, and enroll those most in need, and to take advantage of other assistance programs that complement the weatherization efforts.[69] They are also able to train and employ members of the community as members of the weatherization assistance teams. Because they are regional agencies, the program has the advantages of local presence and distributed administration.

An important aspect of the program is that it operates on a "whole-building" basis, combining building shell and weatherization services with heating system improvements and electric and gas efficiency programs. The WAP thus leverages resources from a

---

[66] Personal communication with Jules Junker, Vt. Office of Economic Opportunity, January 7, 2008.

[67] Vermont Statutes Annotated, Title 33, Section 2502.

[68] Vermont General Assembly, Act 92, March 19, 2008.

[69] For example, they can find housing assistance to fix a roof before WAP installs insulation in an attic, or to fix a chimney before installing a new furnace.

number of other partners, including Efficiency Vermont, Burlington Electric Department, Vermont Gas Systems, non-profit housing providers, rental unit owners, and clients. For example, these partners together provided about $1.28 million in funds during the program year through March 2007 (*Table 5-3*).[70]

Efficiency Vermont works with WAP providers to install cost-effective electric efficiency measures at no cost or low cost to clients whose homes are being weatherized by WAP. Under this program, Efficiency Vermont installs energy efficient lighting, power strips, water conservation products, refrigerators, freezers, and clothes washers, and converts electric water and space heating equipment to natural gas systems.[71] Burlington Electric Department provides similar electric energy efficient measures to low-income clients whose homes are being weatherized by the WAP within its service territory.

The WAP program also works cooperatively with Vermont Gas Systems (VGS). On WAP projects involving VGS customers, VGS contributes a portion of the costs of income verification, auditing, project management, and energy efficiency measures, and reviews the recommended measures for screening. Vermont Gas Systems participated in 71 projects for low-income customers in 2009.[72]

Table 5-3: Spending on Low-Income Weatherization Efforts, 2009/2010

Weatherization Partners and Funding, 2009	
Vermont Weatherization Assistance Program (FY 2009)	$ 11.4 million
Efficiency Vermont: Low-income single-family (2009)	$ 0.97 million
Efficiency Vermont: Low-income multi-family (2009)	$ 0.35 million
Vermont Gas Systems (FY 2010)	$ 0.06 million
Burlington Electric Department (FY 2010)	$ 0.08 million
Rental Owner Investments and Client Investments (Estimated, 2006 WAP Program Yr.)	$ 0.56 million

Note: Vt WAP funding amount is given for State Fiscal Year 2009

Sources: Personal communication with Shaun Donahue, State Office of Economic Opportunity, January 2011; Personal communication with Emily Levin, Efficiency Vermont, January 2011; Vermont Office of Economic Opportunity, *Vermont Low-Income Weatherization Program Strategic Plan*, January 2008; Personal communication with Scott Harrington, Vermont Gas Systems; Personal communication with Chris Burns, Burlington Electric Department.

[70] Vermont Office of Economic Opportunity, *Vermont Low-Income Weatherization Program Strategic Plan*, January 2008.

[71] Efficiency Vermont, *Annual Plan 2011*, November 1, 2010

[72] Vermont Gas Systems, *2009 Annual Report: Demand Side Management Programs*, 2010.

The WAP program works cooperatively with Vermont's fuel dealers as well. Local fuel dealers know the consumption characteristics of many housing units, and over time are able to identify units that are likely to be in need of weatherization assistance. Local fuel dealers are often the "first call" when a furnace is in bad condition or has failed, and they are aware of the households that are unable to pay their fuel bills as the heating season progresses. Fuel dealers also work closely with the WAP, providing emergency furnace repairs and replacements under agreements with the WAP providers, financed by $450,000 to $750,000 annually in the WAP budget.

Additionally, the WAP agencies are also part of the VFEP program, which provides incentives for "deep energy retrofits," primarily in multi-family buildings whose tenants are income-eligible for the Weatherization Assistance Program or are slightly above that income level (up to 80% of the area median income). VFEP is funded by the Regional Greenhouse Gas Initiative, and grants from the American Recovery and Reinvestment Act and federal Energy Efficiency and Conservation Block Grants. The initiative is on track to serve over 750 units by the end of 2011.

These partners have allowed the WAP to deliver greater savings to low-income households. This is also important from the point of view of the program's clients, who receive a full package of energy savings through a single point of contact and with a minimum of red tape and administrative complexity. A related important lesson is that by lowering the barriers to customer participation, the weatherization and electric and gas efficiency programs improve the cost-effectiveness of both programs by making the most of each substantive customer contact.

D. Need for an Expanded Weatherization Assistance Program

Between 1993 and 2010, about 23,000 living units were weatherized through the WAP, which has lowered the heat bills and improved the lives of thousands of Vermont families. Since federal assistance for weatherization is extremely inadequate, and since the ARRA funds for WAP are expiring soon, it is obvious that state action is necessary if we are to improve the energy fitness of Vermont's low-income housing stock.

Unfortunately, the number of untreated low-income units greatly exceeds the number of units that the existing weatherization program can currently address. To give an idea of the magnitude of the problem:

- Vermont has some of the oldest housing stock in the nation; a large fraction of housing units in the state were built before modern insulation materials and techniques were available. Thirty percent of Vermont's housing units were built

in 1939 or earlier; another 35% were built between 1940 and 1979.[73] Many of these older units have depreciated or deteriorated over time, and require more fuel to heat. It has been estimated that Vermont housing units built in 1939 or earlier consume 45% of the fuel used for heating in Vermont.[74]

- About 29% of Vermont's housing units are rental units,[75] where most low-income families live. These are properties where neither owners nor renters have a strong incentive to improve or maintain energy efficiency.

- Low-income households are more likely to live in poorer quality, energy-inefficient housing, and their share of household income that is used to pay energy bills has risen in recent years as fuel prices have risen.[76]

- There are approximately 252,000 occupied housing units in Vermont; of these households, about 58,000 have annual incomes below $25,000, and likely several thousand more have incomes below 60% of the state median income of $31,000.[77] Excluding units that have already been weatherized, weatherization program managers estimated that there were about 49,000 housing units in Vermont that were eligible for weatherization assistance in 2008.[78] At current program activity rates, the program is treating between 3% and 4% of the eligible units each year, and it would take around 30 years to provide assistance to all of those units.

- However, even if the current program were continued for 30 years, it would not meet the weatherization need since new low-income households would be added to the state, some already-treated homes will merit further investment, and because the entire stock of housing, especially low-income housing, will continue to depreciate over time.

From the data above, and based on the success of Vermont's weatherization program to date, we conclude that the WAP could be greatly expanded, and that it would be both

---

[73] U.S. Census Bureau, 2009 American Community Survey 1-Year Estimates, Vermont Selected Housing Characteristics, 2009.

[74] Vermont Public Interest Research and Education Fund, *Building Solutions*, Fall 2006.

[75] U.S. Census Bureau, 2009 American Community Survey 1-Year Estimates, Vermont Selected Housing Characteristics, 2009

[76] Vermont Office of Economic Opportunity, Vermont Low-Income Weatherization Program Strategic Plan, January 2008.

[77] U.S. Census Bureau, 2009 American Community Survey 1-Year Estimates, Vermont Selected Housing Characteristics, 2009.

[78] Personal communication from Jules Junker, Vermont State Office of Economic Opportunity, January 7, 2008.

cost-effective and equitable to do so. Fortunately, Vermont has good programs to build on, including the Vermont Weatherization Trust Fund, the CAPs and NETO that deliver weatherization services, and the utility-sector efficiency programs and other partners, including Efficiency Vermont, Vermont Gas Systems, Burlington Electric Department, fuel dealers, and others. The increased capacity built by the WAP during the past several years as a result of the ARRA funds should be preserved, by establishing funding that will fill in the gap when the ARRA funds expire.

If Weatherization is not supported by additional revenues as proposed in this report, then according to our calculations, *almost 10,000 units that would be retrofitted under the expanded program will not be addressed*. With no access to other sources of capital, this segment will continue to languish, further setting Vermont back from achieving the Act 92 goals.

E. Summary of Recommendations

The Legislature should establish a goal and stable funding mechanisms to comprehensively improve the energy efficiency of the low-income housing stock over the next decade. Those goals should be specific, and at a minimum should improve the energy efficiency of at least 2,800 qualified low-income housing units per year by 2020. This will capture savings from about 1% of Vermont's existing housing stock, or about 5% of the eligible low-income housing stock per year over the course of the next decade. This will make a significant contribution toward fulfilling Vermont's statutory buildings efficiency goal of treating 25% of housing units by 2020. The Legislature should establish a funding mechanism that will replace the ARRA funds that the WAP program will lose in 2012, so that the new capacity built by the program will not be lost.

a. Administrative Recommendations

This report recommends the following suggestions to continue developing the weatherization program:

- The CAPs and NETO, Efficiency Vermont, Burlington Electric Department, Vermont Gas Systems, fuel dealers, and other partners should continue to work in a coordinated way to provide a single point-of-contact for each owner or family receiving assistance.

- The CAPs and NETO should expand their delivery of weatherization services[79], with implementation success subject to monitoring and verification by independent evaluations under direction of Efficiency Vermont.

b. Funding Recommendations

Funding for the expanded Weatherization Assistance Program should be provided from three sources:

- The principal financial costs of the weatherization program are the major costs of air sealing, insulation, furnace repairs and upgrades. The increase in these costs due to the larger number of units served should be paid for through increased receipts to the Weatherization Trust Fund. *These increases should come from broad-based funding sources, such as an expansion of the Fuel Gross Receipts Tax*.

- The Legislature should recognize, on an on-going basis, that diverting funds from the Weatherization Trust Fund disrupts the WAP, undermines the ability to permanently reduce fuel bills for low-income households, and reduces progress toward meeting the state's Building Efficiency Goals.[80] The Legislature should observe the statutory obligation to permit disbursements from the Weatherization Trust Fund only to support the WAP.[81]

- Low-income *electricity-related efficiency* measures should continue to be assumed by Efficiency Vermont and Burlington Electric Department, and supported through receipts from their energy efficiency charges, under supervision of the Department of Public Service and Public Service Board.

- Vermont Gas Systems should support all cost-effective *natural gas efficiency* measures in the weatherization-eligible units served by natural gas.

---

[79] This report is not intended to address the many detailed issues inherent in expanding the weatherization program, which would need to be dealt with by the regional weatherization agencies and other partners.

[80] The state's Building Efficiency Goals are codified at 10 VSA Section 581.

[81] 33 VSA Section 2501(c).

Section 6: Enhancing Vermont's Whole-Building Programs

Vermont should adopt a number of design criteria for expanding whole-building energy efficiency services that address the different barriers identified in Section 2. Tackling these primary barriers will be critical towards unlocking the capital required for large scale adoption of building retrofits in the state.

Vermont's existing whole-building programs have provided valuable experience and success. Vermont is now well-positioned to take that experience to the next level, and ramp up the programs and improve their coordination and participation. An over-arching objective is a system that is customer-focused, recognizing that it is customers who make the decisions to improve the energy efficiency of their buildings.

A. Design Criteria

Evidence is clear on a number of points important for the design of energy efficiency programs, and these represent important touchstones for making choices about programs and program administration:

- Existing buildings of all sorts in Vermont have a large and cost-effective potential to save energy and lower bills while maintaining or improving the comfort and usefulness of the space;
- These potential savings are in regulated energy forms (electricity and natural gas) and unregulated energy forms (fuel oil, propane, wood, etc.);
- Vermont has a well-developed capacity for energy efficiency administration and service delivery, notably associated with the low-income Weatherization Assistance Program, Efficiency Vermont, Vermont Gas Systems, Vermont Fuel Efficiency Partnership, NeighborWorks® of Western Vermont, and others and infrastructure that can be applied to an expanded mission, though a dramatic increase in services could be limited by the rate at which the trained workforce can grow;
- Consistent with placing the customer first, programs should target the **barriers** to energy efficiency that block routine action by specific segments of customers – in other words, programs should be targeted to specific segments of building owners (residential, stratified by income and location, and commercial by

distinct types) and building decision-makers (builders, owners, renters, permitting authorities);

- Customers should have many familiar ways to access standard energy efficiency programs and services (through retail outlets, energy providers, contractors and architects, the Internet, easy responses to marketing and advertising, etc.), but there should be a coherent organization of these services to assure that customers are getting consistent messages and consistent quality. Efforts incorporating community-based social marketing need to be explored. Grassroots organizations such as town energy committees are well placed to undertake these efforts;

- Fuel dealers are experts in "basement equipment" – furnaces, boilers and water heaters – while others are experts in building envelope design and installation. They are also aware that customers more likely to benefit from energy efficiency investments based on their knowledge of customer usage history. The statewide service should bring these dealers together to increase the rate of installation of more efficient heating and building systems;

- The ways to "sell" customers on energy efficiency and the ways to raise funds for energy efficiency are distinct – the combination of information assistance and incentives should be driven primarily by getting the best savings results from customer actions;

Marketing Language Adopted

Although this report uses the terms 'audit' and 'retrofit' for continuity with the prior version, emerging research[81] has indicated that the use of these terms can carry negative connotations in certain situations. Therefore, we recommend that the language adopted to describe these terms be tailored to different situations, to provide the most appeal to customers. An example of this is the NWWVT initiatives, which refers to them as 'home energy check-up' and 'home energy improvement' respectively.

- It is important to ensure that the financing mechanisms for home energy efficiency improvements result in a positive cash flow or break even for customers. For conventional lending, a tiered system may be required where customers with less than sufficient credit scores are automatically grouped a

[82] Fuller, M., Kunkel, C., Zimring, M., Hoffman, I., Soroye, K.L., and Goldman, C. *Driving Demand for Home Energy Improvements,* LBNL-3960E. September 2010.

higher risk pool that is backed up by loan guarantees. Alternative mechanisms such as PACE or PAYS® will need to be considered;

- There is some critical mass for any energy efficiency program – financial and administrative support should be at least enough to support such a critical mass, or else the program will be wasteful of public funds;

- Services should be designed to be continuously available – implicit in this design is a set of incentives that will create a steady flow of clients throughout a budget year, while avoiding a situation where all incentives available in a year are expended months before year end, and also avoiding a situation where incentives are inadequate to produce a significant reaction by customers;

- Oversight of energy efficiency programs is critical to their long-run success. These programs spend significant monies in a variety of ways in the interest of producing measurable and sustained reductions in energy consumption, and also produce private benefits for participants. Therefore, it is important for society and for public confidence that a system of accountability is in place, as it is for regulated electric and gas energy efficiency programs, to assure that funds are well-spent for real gains;

- Gas Systems successfully delivers energy efficiency services today, with routine coordination among the Weatherization Assistance Program and Efficiency Vermont. These relationships work well and suggest ways to develop participation by fuel dealers;[83]

- Energy efficiency programs will have a beneficial effect on the state's carbon goals – and it is important to set realistic goals for carbon savings that are connected to the financial and program resources available;

- A key element of Vermont's successful experience with energy efficiency is placing the customer first and building a program around maximizing value while minimizing barriers to participation, remembering that **the decision to make energy efficiency investments** (whether as part of a program or not) **rests with the customer** – issues associated with administration, coordination of administrators and contractors, fundraising, oversight, etc. are irrelevant to the consumer;

- Finally, energy efficiency is about getting the same or better service while using less energy, and in the long run paying less money – an efficiency assessment of

[83] This report recommends an increase in Vermont Gas Systems' energy efficiency programs, but no change to the administration associated with those programs.

a building can lead to greater comfort, productivity and satisfaction while also saving cash.

B. Market Segments

To retain simplicity, services should be targeted to serve a few distinct populations or market segments. Homes qualifying for the Weatherization Assistance Program are one obvious segment. Efficiency services must be designed and delivered specifically for households in this category (*Section 5*). For other **residential single-family homes**, program administrators can choose to make a distinct offering to these families, or segment middle- and upper-income families. **Multi-family rental housing** has distinct needs and is such an important population that it will require a distinct set of services. **Commercial property** would be the focus of a distinct service.[84] It is outside the scope of this report to present detailed program designs, which should be left to the implementing entities (and adjusted over time as they gain market experience), but to set out basic policy choices and structural elements. It has to be noted that it would be necessary to further break down these broad categories such as by income ranges, etc., so that a more targeted marketing approach can be designed. This targeted approach would be critical to addressing the specific barriers, which would vary based on the particular segments.

Rental Housing Is a Particular Problem Area

Rental housing presents distinct challenges for energy efficiency program administrators. Occupants in many instances pay their heating bill, but have little or no ability to influence the quality of the building shell or heating system. Rental housing owners in a competitive market often do not welcome costs for efficiency investments that they may not be able to extract in a reasonable time from rent, yet they retain control of the decision to make these investments. This condition is often referred to as a split incentive, and requires distinct program features.

Rental housing serves thousands of Vermont families, including many for whom home heating is a high percentage of household expenses, so it is important that whole-building efficiency initiatives include a program design that addresses rental housing.

[84] Public buildings, as a subset of commercial buildings, may increasingly have the opportunity to work with energy service companies (ESCOs), which profit from performance contracts that split savings produced by their energy efficiency expertise between the ESCO and the customer.

C. Administration

Government must pay attention to the administration of an energy efficiency program to assure the right balance of the many social issues involved. In addition, markets and independent customer action are incompatible with energy efficient investments in many cases.[85] Policymakers are naturally concerned that a system uses public and private funds in an honest, intelligent, and competent way that produces significant energy savings. There may also be concerns about assuring that benefits flow in acceptable proportions to key customer groups, such as low-income customers, or small commercial customers. Investment in administration at the front end pays dividends with smooth operation later.

This report concludes that the *whole-buildings programs currently operated by the Weatherization Assistance Program, Efficiency Vermont, Vermont Gas Systems, and others should be expanded.*

In addition, this report recommends that an entity such as the Vermont Department of Public Service or the Office of Economic Opportunity should take on increased responsibility for coordinating and overseeing these programs, in order to assure continue progress toward the state's buildings efficiency goals. *An expansion of the existing whole-building programs will require effective coordination and leadership*. The effort to retrofit existing homes and businesses is a highly complex undertaking and includes multiple state agencies, utilities, community action agencies, Efficiency Vermont, the Vermont Fuel Efficiency Partnership, Vermont Housing and Conservation Board, town energy teams, contractors, and other non-profits and businesses. Multiple funding streams are contributing to the programs. Given the ambitious statutory goals and the short time-frames, the program will be most effectively pursued if overall responsibility for its success is placed with a single agency or Department with sufficient authority to provide coherent guidance and leadership. Given its central role in oversight of utilities and energy efficiency programs, the Department of Public Service is well positioned to take on this role.

D. Loan Administration

A key objective of an expanded whole-building effort is to maximize the use of customer funds to secure cost-effective efficiency investments. With cost-effective energy efficiency installations costing $5,000 to $10,000 or more, a lack of cash on hand can lead to a lost opportunity. Loans are an important way to draw customer funds to energy efficiency investments by reducing the amount of public funds needed to

[85] This is not a criticism of markets, but simply a reality borne out by decades of experience that gave rise to the energy efficiency programs already in place.

stimulate long-term savings, and by not requiring customers to pay for upgrades all at once. To achieve the savings and financial objectives in this report, consumers will need to pay roughly two-thirds of the cost of energy efficiency services, and a significant share of this can come from loans.

Lessons learned about financial incentives: Cash and Loans

During the past two decades, efficiency programs have used loans and rebates to market to and assist customers to make energy efficient investments. This experience is useful in considering how these tools will be used here.

Cash incentives have many advantages. They soften the financial hit at the moment the customer is feeling it. Cash has a track record of grabbing the attention of customers. Customers are left with the freedom to decide how to manage their funds, and there are no relationships to manage, as there is with a loan.

A loan can have advantages as well. Zero-percent financing can particularly grab the attention of customers, keeping in mind that many customers have home equity loans or other market rate alternatives that they are not using for energy efficiency now. Program experience will lead to more sophisticated ways to set interest rates for routine and promotional purposes. Customers pay for the loan out of the savings, and accrue the benefits of below-market interest rates, if available, over the life of the loan. Loans to residential customers tend to be small, $10,000 or less with an average of $6,000 -- $8,000, so it is critical that they have standard terms to reduce servicing costs. A loan should not be offered as an alternative to a cash incentive, but they can work together. A program can offer a cash incentive, say, $500 toward a new furnace that represents a percentage of the incremental cost. A loan with an attractive interest rate over, say, a four- or five-year period can make the remaining cost of this large purchase more manageable.

Those with direct contact with customers (Fuel dealers, Efficiency Vermont, weatherization contractors, for example) can be trained to be a gateway for the loan process. Loans can be serviced by a state entity, like VHFA, or by a bank or other financial services contractor that could be competitively selected. Alternatively, lenders could be screened by the program administrator for their acceptance of standard loan terms and conditions and their willingness to work with borrowers of lower credit quality and other vital terms.

Our findings indicate that the needed *capital* to support loans is available, provided that major attempts are made to drive demand, and lender risks are moderated or shared through a risk pool. One of the major challenges is to create a loan application and servicing system that is simple for customers, originators, and service organizations. This suggests a process that can be explained by the person dealing with the customer –

that is, the fuel dealer, the weatherization or heating system retailer, the builder, or Efficiency Vermont -- and that can be initiated through a standardized, common application.

Including attractive financing in the package helps to assure that customers act on the audit information (of course, customers can always obtain their own financing). Credit quality for the population that may be seeking loans will range from excellent to poor, so credit counseling will need to be available to minimize defaults and the size of a default reserve. An entity that can stand behind these consumer gateways to administer a loan program would be a good way to support the work of the program administrator and service providers.

Keys to Effective Loan Administration

- Capital Available
- Lender Risk Minimization through Risk Pooling or Other Means
- Consistent Application and Terms to Lower Transaction Costs
- Several Possible Loan Servicers
- Interest Rate Management

There are multiple possible sources of capital for loans. Commercial banks or credit unions may choose to make capital available, either for commercial opportunity, or to address their public service obligation that is part of their charter. Alternatively, or in addition, the state could issue a bond that could be used for energy efficiency loans.

Key Assumptions about Energy Efficiency Loans

- Consumers provide roughly two-thirds the cost of energy efficiency
- Capital is available for loans if conditions for lenders are favorable
- Long-term financing, which generates a positive cash flow or allows customers to break even
- Loans cannot compete with grants or rebates – these must complement each other for loans to be useful

Energy service companies could be drawn to Vermont if bad debt risk could be offloaded (most likely to the state), and aggregation of loans could bring the dollar level into million dollar increments pooling risk while minimizing transaction costs. This last option would be a new model for generally available energy efficiency services.

Energy efficiency loans may need to be below market interest rates to be successful. Additionally, the loan repayment may need to be spread over a long term, especially if it is necessary to try and ensure a positive cash flow for the customer. The next section, Section 7, considers a financial plan to accomplish the savings goals recommended in this report.

A key issue in loan administration is the repayment period offered to the customer. For the size of loan required for home energy improvements, long repayment periods may be required to ensure positive cash flows in many cases. However, long repayment terms may not be acceptable to traditional lenders. Therefore, alternative methods that allow for the repayment amounts to be spread across longer periods need to be explored. This report describes two potential methods that address the issues with traditional loans: Property Assessed Clean Energy (PACE) and Pay as You Save® (PAYS®) (*Table 6-1*).

Table 6-1: Description of the Different Loan Repayment Mechanisms available for Home Energy Efficiency Improvements

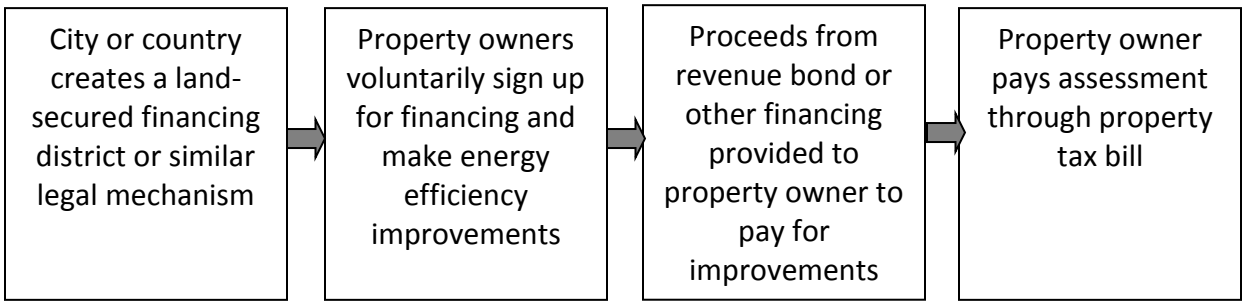
	COLLECTION/REPAYMENT MECHANISMS		
	ON-BILL FINANCING		ADD-ON TO PROPERTY TAXES
	LOAN-BASED SYSTEMS	TARIFF-BASED SYSTEMS	
Assignment of Repayment	Charge is tied to individual	Charge is tied to meter	Charge is tied to property
Financing Term	Shorter	Longer	Longer
	Personal/business loans originated and serviced by a utility	Financing (not loans), attached to meter	Loans or financing originated and serviced by local government. Attached to tax or government charge

a. Property Assessed Clean Energy (PACE)

One barrier to making home energy efficiency investments is a lack of sufficient upfront capital. For property owners who don't have the cash to make these investments in major energy improvements, there are few options available that have the necessary combination of easy qualification, attractive interest rate, and a relatively long repayment term. PACE allows individuals wishing to make eligible energy improvements to opt in to a special assessment district created by their municipality. Energy efficiency improvements are funded by taxable municipal bonds or other municipal debt, repaid over up to 20 years. All improvement work must be performed by appropriately

qualified and licensed contractors and must be approved by an energy efficiency utility. However, it has to be noted that PACE does not directly address the problem of rental properties.

Figure 6-1: Flowchart Describing the PACE Process



The key benefits of PACE are as follows:

- Helps overcome a key financial hurdle for making investments in energy efficiency;
- Provides incremental special assessment payments are low and fixed for up to 20 years, with no upfront cost, and there are no costs to property owners who do not participate;
- Special assessment fees transfer to the new owner when the property is sold, or assessment obligation can be paid in full at transfer;
- Electricity and fuel bills are lower than they would be without the improvements.

The Vermont Energy Act of 2009 includes a provision that allows for the creation of Property Assessed Clean Energy (PACE) programs across the state. PACE has been successfully implemented in California, New York and Colorado, and is being considered in many other locations around the country. Vermont stands to benefit heavily from PACE, which can be a key enabling mechanism for financing home energy efficiency improvements. PACE projects have thus far been stalled due to problems from Fannie Mae and Freddie Mac; however, Act H.56, which was signed into law by the Governor in May 2011, makes the PACE liens in a junior or secondary position to the primary mortgages, thus satisfying a major stumbling block with Fannie Mae and Freddie Mac. Additionally, it establishes a state PACE reserve fund administered by the treasurer, which provides the benefit of diminishing the risk of investment for bond investors.

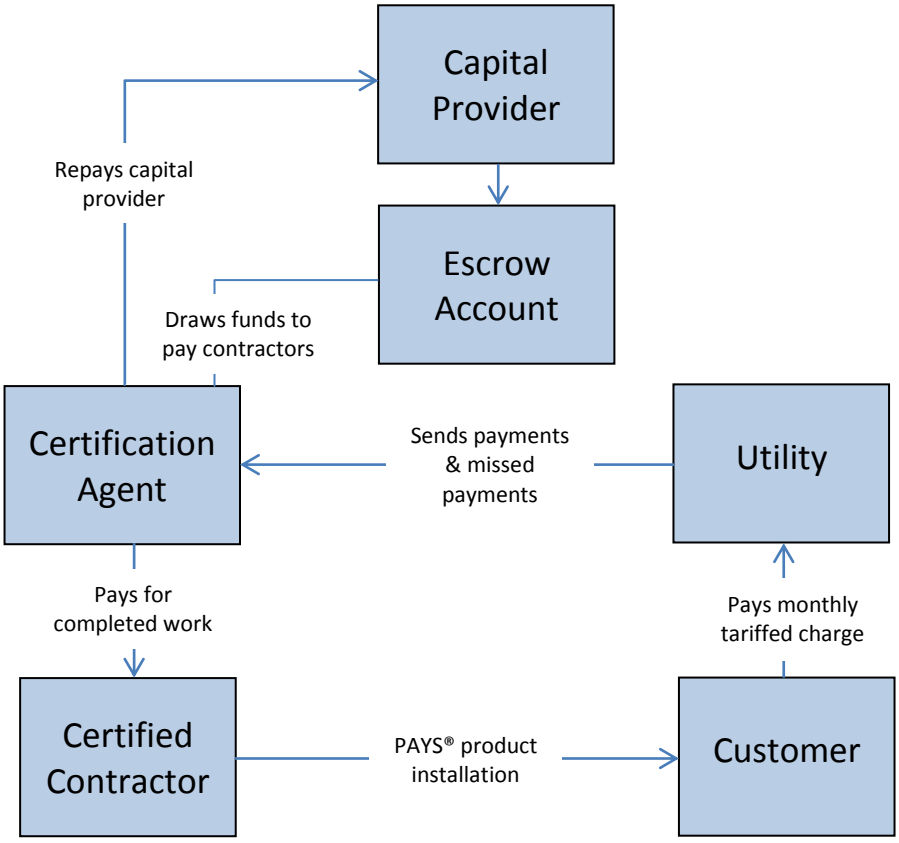
b. PAYS®

Pay As You Save® (PAYS®) is an on-bill tariff based financing system in which customers, vendors, and capital providers, acting in their own interests, can produce resource

efficiency investment that is also in society's interest. PAYS® allows building owners, managers, or tenants to install resource-efficient measures and obtain immediate net savings without upfront investment and without incurring new debt. Vermont has some experience with the PAYS® program, as the first PAYS® study was commissioned at the Burlington Electric Department.

The following chart illustrates the roles and responsibilities of the different players in a typical PAYS® system:

Figure 6-2: Flowchart Describing the PAYS® Process[86]



PAYS® is useful mechanism because it addresses some of the major barriers that were identified earlier in this report, as follows:

[86] Cillo, Paul & Lachman, Harlan. *Introduction to PAYS®*

- PAYS® participants have[87]:
    - No upfront payment, no debt obligation, no credit checks and no liens;
    - A guarantee that their monthly charge is lower than their estimated savings;
    - The assurance that they will pay only while they remain at the location;
    - A promise that failed measures will be repaired or the payment obligation will end;
    - The knowledge that whoever gets the savings pays for the measures; and
    - None of the usual risks associated with dealing with contractors or installing measures.

- PAYS® assigns measure payment responsibility to a meter location rather than to an individual customer. Since customers assume no new debt when they install the measures, the approval process for customers is simplified. Successive customers at that location pay the PAYS® charge and benefit from the savings.

- The tariffed charge is always lower than the estimated savings from the measures and remains on the monthly bill for that location until all costs are recovered. This means tenants or anyone uncertain about their duration of occupancy can install the measures with the assurance that they will receive savings exceeding their payments during their occupancy.

- Third-party capital pays the upfront costs for the certified measures. Because PAYS® offers investment opportunities; it can potentially attract sufficient private capital to meet demand.

- PAYS® can thus be used to enhance current efficiency programs, making them available to more types of customers while producing more efficiency with available funding.

Because the billing mechanism in PAYS® is usually carried out through a utility, it has to be noted that in the case of Vermont it would mean that payments for fuel savings need to be captured through the electric bill. Another potential issue is that the current utility billing system might need to be modified to include the additional financing charges. However, most of the major utilities in Vermont already have some type of additional billing for other programs[88], so this would not be a major barrier to overcome. In addition, Efficiency Vermont can potentially act as a trusted third party entity to certify PAYS® measures before they are installed, and provide a guarantee of savings to the customer.

---

[87] *Id.*

[88] Conversation with Chris Burns at the Burlington Electric Department, March 2011.

In June 2011, New York passed legislation that would enable on-bill tariff-based financing legislation to significantly expand the state's new energy efficiency retrofit program. The New York legislation should be studied closely for lessons to help establish a similar mechanism for Vermont.

E. Upgrading Buildings: Steps in the Process

Users of this report may appreciate a tangible idea of what whole-building efficiency programs are likely to do. Each element below addresses and solves barriers that prevent customers from making cost-effective energy efficient investment on their own. Most people can find at least one hindrance that they can identify with. These barriers are the targets of existing energy efficiency programs, so this is really a refresher on what energy efficiency programs already do as well as an explanation of what expanded whole-building programs would do. Here is a summary of the steps and other components of the process:

a) **Marketing, outreach, customer acquisition** – Without a sufficient body of customers interested in the value of services, these services are doomed. Marketing, outreach and customer acquisition address an important, initial barrier: **awareness**. The program administrator will want to create a statewide buzz about energy efficiency that will promote specific offerings. For specific services, specific populations will be targeted, like builders and architects, or customers actively considering remodeling their building. Staffs with skills at "closing the deal" are useful to assure that development work leads to energy savings.[89]

b) **Building energy audits and analysis –** Because many people do not see their building as a system, or know how that system really works, an energy audit by a professional can be an eye-opening experience.[90] A well-run program will screen audit requests to give highest priority to building owners more likely to take action, but will provide audits for a fee to any eligible owner on request. A whole-building audit will evaluate the use of all energy sources and recommend a suite of improvements with priorities for the owner to consider. The report would have information about the cost-effective improvements that can be done to the building and is an important start to the customer's thinking about making

[89] Market transformation refers to bringing consumers to the point where they are self-motivated to do the rest of the steps themselves and make the investment without the need for incentives. To the extent energy efficiency programs cause this transformation, the resulting savings are known as "Free Driver" savings. Conversely, to the extent that some consumers were already motivated to choose the efficient option, but are also happy to take advantage of information and incentives offered, these savings are known as "Free Rider" savings. Benefit-cost analyses factor in these opposite effects.

[90] With the use of thermal imaging and blower door tests to show the exact locations of heat losses, it can be almost literally eye-opening.

a personal investment in energy efficiency. Audits also generally provide ideas about the most effective investments or changes in the way the customer uses the building, and cost.

Audits cost several hundred dollars, so it is desirable to maximize the number of audits that turn into energy efficient investments. One way to do that is to offer audits to customers who are likely on the verge of investing; "trade allies," such as building contractors or home stores, can refer such customers. Audits are sometimes provided at the customer's cost, which can be rebated if the customer chooses to implement a significant portion of the recommended efficiency upgrades.

Experience indicates that treating the typical house will produce 20-30% in energy savings, and that many older houses can see 40%-50% reductions in consumption and bills. The amount of gain depends a great deal on the condition of insulation and sealing, as well as the efficiency of equipment that might be replaced. Many Vermont buildings are poorly insulated. Additional savings are available from easier-to-use control systems that reduce the amount of time that heating and cooling operations are occurring even when no one is occupying the space.[91]

c) **Owner decisions, with technical assistance from the efficiency service and/or fuel dealer** – Even with information from a thorough energy audit in hand, the building decision-maker may not know how to prioritize their actions, find a skilled contractor and get the needed services, or how to know if the job was done right. Practical knowledge about how the building envelope and the heating system interact can, for example, give insight to the customer that can help lead to a more comprehensive building investment and larger savings. Technical assistance is a helping hand to maintain progress toward the actual investment. The Internet, through the program administrator's website, can provide easy access to successful stories that customers can identify with and seek to replicate.

A key factor of success is making it easy for the building owner to make a decision to do energy efficiency for the entire building, and a key way to do this is to enable a "one-stop" way to delivering a comprehensive menu of efficiency services to the customer following the audit.[92]

---

[91] The GDS study found that efficiency savings in unoccupied buildings were higher, on average, than in occupied buildings.

[92] It will also be important to develop a large and varied base of well-trained energy technicians, builders and installers throughout the State, which will require continuous training but offers an important way to build Vermont's building trades infrastructure. Customers ready to contract for services should have a choice of

d) **Time-of-sale efficiency review –** Building energy codes can apply retroactively to pre-existing buildings. At the time of sale of a building, new financing is generally put in place and work is often done on the property, so there is an opportunity to bring an existing building up to the current energy code. Government can accelerate energy efficiency gains by placing a requirement that buildings be brought up to code at the time of sale, or within a modest period (one year is typical) thereafter. A time-of-sale requirement is most often applied to multi-family residential buildings, but could be applied eventually to all residential buildings or to all buildings. A multi-family time-of-sale code requirement was adopted by Burlington in 1997 and is currently enforced for rental properties; however, it has not been updated since its establishment.

   Establishment of a building labeling and rating system would provide a much needed impetus to a time-of-sale efficiency review by providing a standardized system for comparison of energy performance for different buildings. A rating system would prove critical in quantifying the energy performance of homes, which would otherwise remain an intangible commodity. This would also lay the foundation for moving towards incorporating the value of energy efficiency improvements into the appraised values of homes.

   A less burdensome alternative to requiring time-of-sale code compliance for some or all buildings that this report recommends is for the seller to disclose to the buyer and the Department of Public Service the condition of the building as compared with the energy code. Audits could be provided by the Home Performance with Energy Star Program, and paid for by the seller. This information could lead to energy efficiency investments and would generate information on the condition of buildings that would allow for a study of making time-of-sale code compliance required, and whether the right-of-action is a sufficient motivator for new construction compliance with codes.

e) **Installation by fuel dealer or private contractor –** An important part of any energy efficiency service portfolio is to provide information and referral services to enable the wide array of contractors and service providers to deliver their products to customers. The addition of fuel dealers, who are expert in furnace and boiler replacement and maintenance, and building envelope and HVAC contractors, who are expert in insulation and sealing services and equipment installation, is consistent with the ways contractors are used in existing programs. Many of these contractors are already engaged with Efficiency Vermont and the Weatherization Assistance Program and this role would be expanded.

---

capable builders, insulation contractors, and HVAC professionals to call on, and will be helped by being able to get a list of certified professionals through the auditor or an easily-accessed database.

With the emphasis on whole-building approaches, building commissioning, the process of verifying that the building energy system is working as it should, may be an important service, and there are contractors expert in this field also.

f) **Financial incentives** – The most obvious barrier to energy efficiency investments is often financial, and direct financial incentives may be provided depending on circumstances and co-benefits with electricity and natural gas.[93] Perhaps there is a misperception by the customer that a cheaper device is not significantly different in performance than a more expensive, more efficient one; or the customer does not have the money for the cost difference; or the customer has many uses for a limited budget and chooses investments that are more central to the business or family. In situations like these, absent a program of some kind that offers financial incentives, cost-effective energy efficient investments do not happen.

Prescriptive and Custom Incentives Address Distinct and Important Purposes

Incentives go along with two main types of programs: prescriptive and custom. A **prescriptive** incentive is one where the level of financial incentive is the same for everyone and is applied to mass market items, like a new efficient water heater or furnace. For prescriptive programs, it is wise to monitor the market and the incentive for evidence that the product is being increasingly accepted, signaling that the incentive can be reduced and perhaps ultimately eliminated.

A **custom** incentive addresses the needs and opportunities of specific customers, and the incentive might be based on a negotiation based on a comprehensive package of investments and savings. Some program administrators create a competitive process where customers, usually commercial and industrial customers, will bid to see which ones require the least cash incentive in order to implement a given amount of energy efficiency. In any event, the administrator will not pay more than savings are worth, based on rules established in advance in the oversight process.

Financial incentives can be in the form of **cash**, or can take the form of **reduced rate loans**. Choosing between them should always be driven first by addressing the barrier preventing the investment in the least cost way.

[93] It is often though not always true that the sticker price of a more energy efficiency system is higher. In cases where equipment can be down-sized or eliminated due to efficiencies elsewhere, total initial cost can be less.

While experience shows that financial incentives are often critical to success, it is just as important to design incentives to be no more than they have to be to get the customer to say "yes."

g) **Loan origination** – With information from an energy audit, and with the technical adviser acting as a gateway, the building owner can be declared eligible for low-cost loan and/or customer financial assistance. If a loan makes the difference in an investment, making it easy for the customer to secure and manage the loan is another important function for the energy efficiency program.

Experience will guide loan lengths, which will aim to meet a balance of objectives. Lender risk is moderated by shorter loan lengths, and consumers may resist taking on obligations that last too long. On the other hand, many building shell and heating system investments have very long lives, and it makes sense to spread out their costs over time. A balance point can be found in a loan length that keeps payments manageable, preferably no more than the annual energy savings from the investment, so the customer effectively is saving money from the start, even during the loan payback period.

h) **Loan loss reserves—** A loan loss reserve would be required provide partial risk coverage to motivate lending institutions to finance home energy efficiency improvements. Loan loss reserves are usually calculated as a percentage of the total loan portfolio principal, and can range from 2-10%. The use of a loan loss reserve provides many key benefits such as reduction of the required credit score, increasing the debt to income ratio, allowing for larger unsecured loans and lowering the loan interest rate. Public or philanthropic dollars may be required to capitalize the reserve. For example, the NeighborWorks® of Western Vermont has created a loan loss reserve fund through a portion of the ARRA funds that they received. The companion report by the Vermont Law School on energy efficiency financing describes this aspect in more detail.

i) **Loan servicing and payback** – A system to service loans should be consistent for all customers within a customer class. Credit counseling should be available to avoid unnecessary defaults and a system that promotes deteriorating credit. The interest rate needs to impress customers. Use of zero-percent financing does that, but good management would have program administrators set interest rates at levels that are as high as possible to get desired participation rates at the lowest cost. Mechanisms such as PACE and PAYS® should be considered to generate a positive cash flow, and assure the customer that the cost of improvements do not represent a financial burden.

In some instances loans and cash incentives will work together. Loans and cash can work either in the context of prescriptive or custom incentives, or in situations where the cost of energy efficiency investments exceeds the limits of loan qualification, and cash "financial aid" fills the gap between the price tag and the loan.

Steps in Acquiring Energy Efficiency – The Customer Perspective

Customers are very busy. Even if they are motivated to invest in energy efficiency, in most cases, action is postponed. In many cases, the customer does not know the questions to ask or to whom to ask them. So the first step from the customer perspective is **awareness**, followed by **knowledge**. The energy efficiency service must find ways to get into the consciousness of customers so that when the opportunity to make an energy decision comes along, customers have the wherewithal to respond. Venues such as the print and electronic media, and home and hardware stores are good places to plant opportunities for customers to run into the efficiency message. Many customers are now accustomed to doing their research on the Internet, so information about services and contractors should be available that way. In the long run, a general "buzz" through the population associated with energy efficiency will indicate success.

When customers are motivated to consider energy efficiency investments, reinforcement in various ways is crucial. If the efficient action appears too complicated, business-as-usual will usually suffice. Making the initial call for help should be easy, and **technical assistance** in the form of audit arrangements and other advice should be the norm. Calling should be just one way to access energy efficiency services. Contractors, stores and program administrators represent opportunities to funnel customers interested in more whole-building services. Competent contractors find ways to minimize the personal inconvenience inevitably associated with building shell and heating equipment work.

Once a customer is on the way to a clear idea of what to do, the financial reality sets in. Comprehensive energy efficiency services in a home can cost $7,500 or more in excess of conventional construction practices and equipment. While savings will be twice that or more (*Section 7*), **financial assistance** at the point of decision may be critical. Customers have many uses for cash on hand that can seem more compelling than energy efficiency. Matching the right combination of assistance and incentives with the right customers produces the most cost-effective savings strategy.

A statewide system can hope to develop a customer database that will assure that customer contacts (matching addresses or names) are recorded to inform future customer needs.

F. Readiness and Growth

Vermont's whole-building programs are already in place can begin to grow their potential immediately. As mentioned previously, the expansion of the weatherization program, and efforts by the NeighborWorks® programs through the ARRA funds have built up a significant amount of capacity. This capacity needs to be sustained and gradually increased, if Vermont is to meet its Act 92 goals. This would mean a fast-paced but reasonable expansion of the workforce of building shell experts, furnace installers, energy auditors, efficiency measure installers, and administrators as well the building of new business and customer relationships. An important supporting policy is to continue workforce training in secondary schools and colleges for key energy efficiency skill sets, such as those currently offered by the Vermont Technical College.

G. Summary of Recommendations – Market Residential and Commercial Building Services

This report envisions expanding the whole-building programs for market-based outreach and assistance to building owners that is aimed at the entire range of homeowners and commercial building owners who do not qualify for the low-income Weatherization Assistance Program. It recommends expanding Market Residential, Multi-Family, and Commercial Buildings assistance services. The essential outlines of this initiative are:

- A statewide marketing brand and single point of entry for customers, based on the state's "Efficiency Vermont" brand;
- Oversight and coordination of the plans and work of the whole-building programs by the Public Service Department and Public Service Board;
- A set of lending institutions that will make financing available to building owners on a standardized, simplified basis at the lowest possible interest rates;
- Creation of a loan loss reserve to help mitigate the risks associated with the lending, and extend the financing to customers who would not qualify for conventional loans;
- Initiate a time of sale efficiency review for both residential and commercial buildings, supported by building labeling and rating programs;

- Installation of efficiency measures and building upgrades by private building contractors, fuel dealers, HVAC technicians, and the market-based services of the WAP agencies, together with training and certification programs to ensure high-quality service delivery for customers statewide;

- Enabling long term financing mechanisms such as on-bill tariffed financing;

- Savings verification and program evaluation and regular reports to the Legislature from the Department of Public Service on the progress of the whole-building programs toward the statutory buildings efficiency goals, including reports about what improvements ought to be made.

Section 7: Costs and Benefits of Expanding Whole-Building Efficiency Services

An analysis of the cost-benefit ratio of investing in whole-building energy efficiency improvement programs shows that significant savings can be obtained over the lifetime of these measures, which would stretch beyond the period of investments required to meet the Act 92 goals.

The preceding chapters describe a comprehensive approach to delivering building-envelope and related efficiency services to Vermont's homes and businesses, in order to meet the legislative goals laid out in Act 92. In this chapter we set out the costs of the services and relate them to their benefits. Detailed financial analyses can be found in the spreadsheet at the end of this section.[94]

The bottom line is very clear:

- Over their lifetimes, the efficiency services recommended in this report would yield **fuel cost savings to Vermonters of more than $1.5 billion** on private and public investments totaling roughly $707 million.[95] That is a net savings in present and future fuel costs of $80 million for each year of this projected program.

- Savings to individual families and businesses will also be substantial. **More than 86,000 residential retrofit customers will save on average between $800 and $1,300 per year** (at 2010 prices), depending on fuel type and housing conditions.

[94] The financial analyses are based on information derived from a variety of sources, among them the Department of Public Service, Department of Taxes, the Legislative Joint Fiscal Office, Efficiency Vermont and its contract administrator, and the Office of Economic Opportunity (OEO). The projections of costs and revenues are based on estimates of escalation factors, fuel costs, average investment costs and savings per unit served, and so on, and the effects of changes in those assumptions can be tested. Fuel cost projections are inherently uncertain, and the numbers here are surely not "correct" – but they are conservative and well within the range of reasonable expectations.

[95] In net present value terms (2010 $), gross savings will total $1.57 billion and total costs $707.3 million, yielding a benefit-cost ratio of $2.23. For clarity and ease of analysis we project program costs for 10 years, and show the benefits from those investments over only 20 years in total. Since we count fuel savings out only to 2030, this is a conservative figure. Insulation and other upgrades installed in, say 2016 and 2017, will deliver savings far longer than that.

- Over the first decade of their investment, the efficiency services recommended in this report will return, **for every dollar invested, $2.26 in overall savings**. Put another way, this means that even after paying back the full cost of efficiency upgrades, for every dollar invested, net savings of $1.26 will remain in the pockets of Vermont's home and business owners, instead of being shipped out of state to pay for heating fuels.

- Not included in these numbers is an estimate of the value of the improved health, comfort, life safety, avoided fires, etc. that the building improvements will deliver to Vermont families. Studies done for the Weatherization Assistance Program over the years have found that these benefits are also very high, roughly equal in magnitude to the direct fuel cost savings from weatherization.

Figure 7-1 represents these costs and savings graphically; Figure 7-2 compares the total benefits to only the public share of the investment costs.

Figure 7-1: State Energy Efficiency Services: Total Benefits and Total Costs, 2011-2030

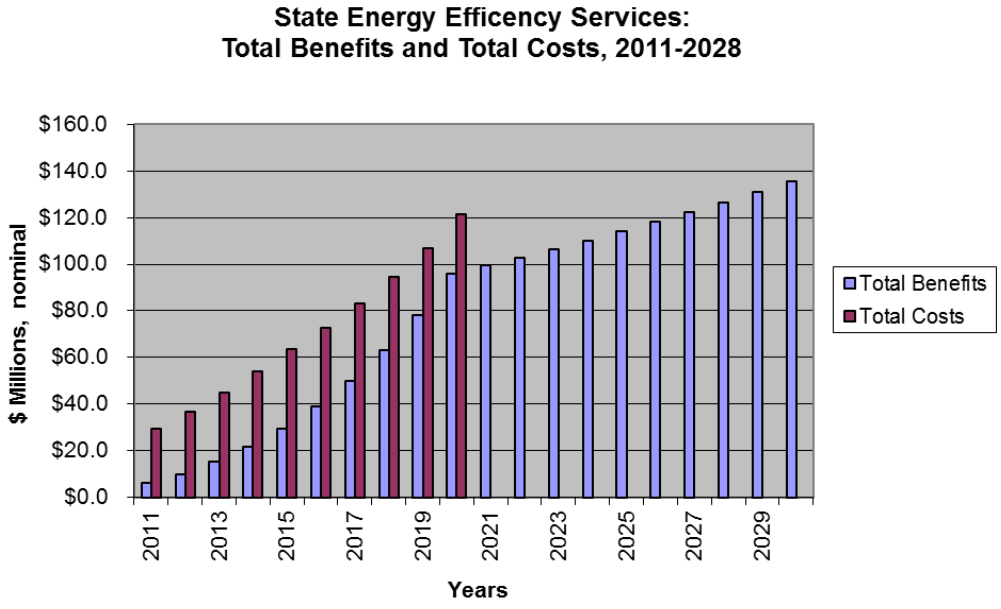


Figure 7-2: State Energy Efficiency Services: Total Benefits and Public Costs, 2011-2030

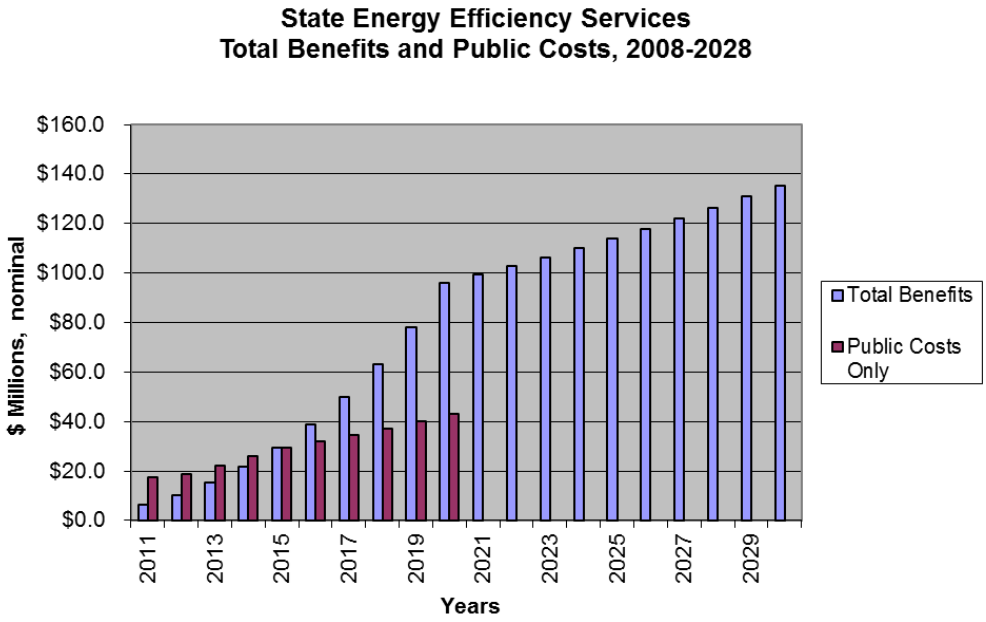


Figure 7-2 shows total fuel cost savings in relation to the public dollars that are needed to provide weatherization assistance to low-income families, and to assist other families and businesses to upgrade their buildings. This chart reminds us that the services outlined in this report are, outside of the low-income program, focused on using limited public services to *leverage substantial private capital investments* in Vermont's buildings infrastructure. From a public point of view, the benefit-to-cost ratio is extremely favorable – yielding $4.97 in direct benefits for each $1.00 of public funds invested.

A. Costs of Services

The analysis of costs is broken out by major service categories: residential low-income weatherization, residential retrofit services (which consist of three parts: residential moderate income, residential upper income, and multi-family), new homes, and businesses.[96] The principal reason that these market segments are treated separately is that builders and owners in these different categories have different needs and interests, and a consumer-oriented, market-based efficiency service must use somewhat different strategies to succeed with each of them. What differentiates these

[96] We have analyzed the non-regulated fuels components of the statewide efficiency services described in this report. Investments (with the exception of low-income weatherization) made by Vermont Gas Systems on the premises of its residential and commercial customers are not included in the analysis here, as they are currently included in the company's regulated cost of service, and we recommend that VGS's expanded efficiency programs continue to be treated as part of its regulated services. VGS does deliver some low-income weatherization services, and is credited for some of its costs through a reduction in its Gross Receipts Tax obligations.

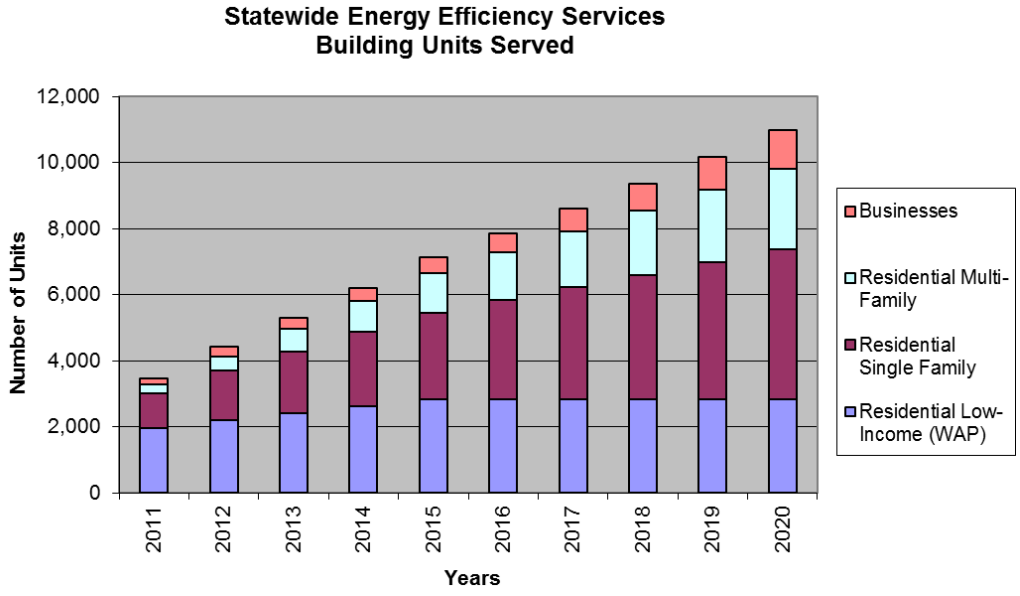
program elements *financially* is the amount of the assistance needed to be paid to the property owner in order to leverage private capital for substantial investments in the energy saving measures. The table below summarizes these design features.

Table 7-1: Whole-Building Efficiency Program Design Assumptions

Program Design	Average Incentive	Average Incremental Cost/Unit for EE Measures	Average Incentive per Unit[97]
Residential Low-Income (WAP)	100%	$ 5,180	$ 5,180
Residential Single Family	25%	$ 7,500	$ 1,875
Residential Multi-family	60%	$ 5,700	$ 3,420
Businesses	146 MMBtu at $6/MMBtu	$ 27,942	$ 878
Annual Cost Escalation Factor	2%		

The programs analyzed here call for a steady increase, over 10 years, of the number of low-income units currently being served (from 1,746/year to approximately 2,826/year), a growth in the existing market residential program to serve some 5,700 units/year by 2017, and a growth in the existing commercial program to serve over 600 businesses each year. Figure 7-3 describes the numbers of units to be treated.

Figure 7-3: Statewide Energy Efficiency Services: Building Units Served



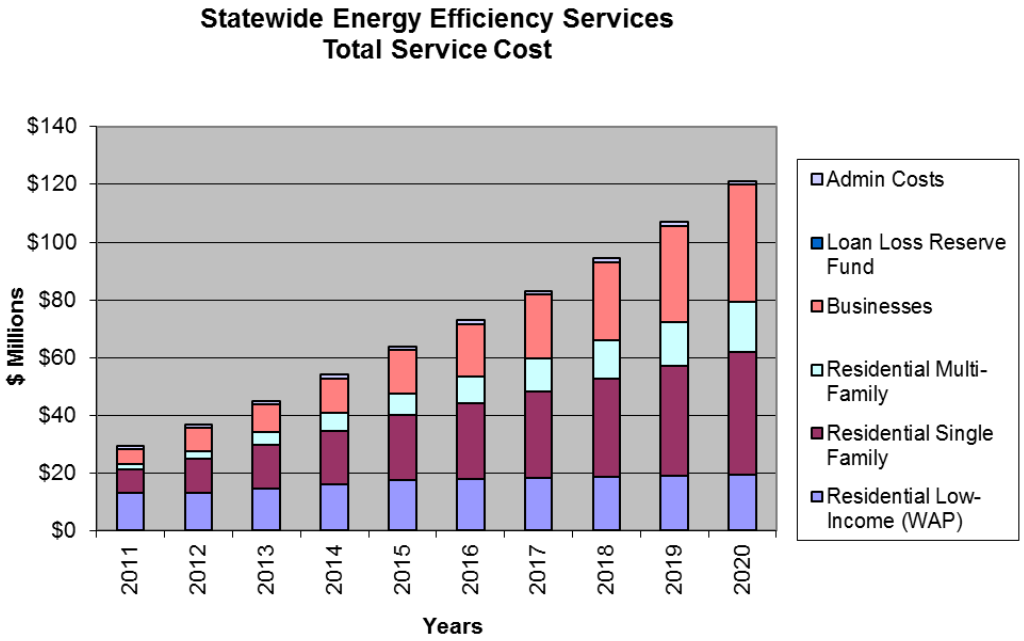
[97] The costs of audits are included in the incentives.

Figure 7-4 below illustrates the total expected expenditures, public and private, under the programs. The lion's share of the costs of the programs is driven by the investment-per-unit and the numbers of units served. A small portion of the costs consists of incremental administration and, for the loan programs, the costs of loan guarantees (to the extent required). In 2010, spending on the Weatherization Assistance Program amounted to approximately $14.9 million dollars, all of which came from public sources (the Weatherization Trust Fund and the federal government in the form of ARRA funds).

The programs detailed in this report call for a steady ramping up of investment, not only in low-income weatherization, but in all market segments, through a combination of public expenditures and substantial private investment. By 2020, some $96 million of annual investments will serve 10,232 homes and about 1,247 businesses each year. Over the ten-year period, more than 60,000 units will have received efficiency measures, which will return savings of approximately $2.23 for every one dollar invested (described in the following subsection).

And the investments will put dollars back into the Vermont economy: all told, more than 95% of the total spending (i.e., the financial assistance provided by the public sector and the loans provided by the private) will go to local private enterprises to pay for the measures and their installation. Less than 5% will be used to cover administration, marketing, and, as needed, loan guarantees.

Figure 7-4: Statewide Energy Efficiency Services: Total Service Cost



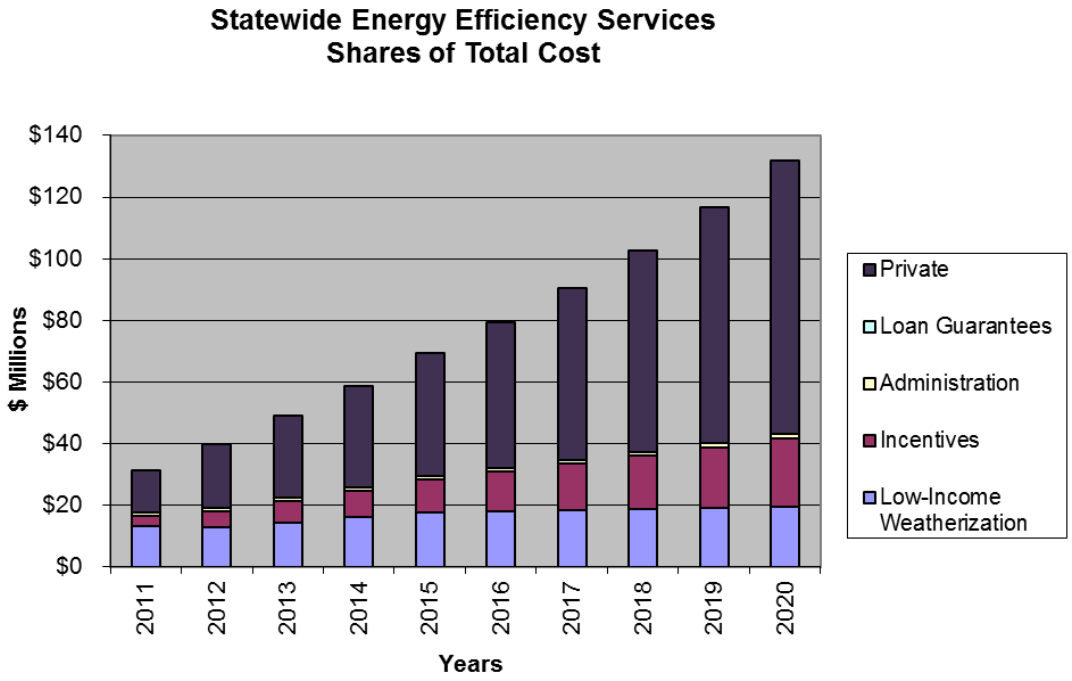
A Note on Vermont Gas Systems

This report recommends a gradual increase in the number of buildings to be upgraded through the efficiency programs of Vermont Gas Systems. The VGS programs have been cost-effective and successful, and could be expanded to benefit additional customers, particularly as the VGS service territory expands over time. However, the financial analysis in this section focuses on unregulated fuels, so we have not included expected investments by Vermont Gas Systems in this financial analysis. Still, it is important to note here their importance and magnitude. Currently, the VGS buildings retrofit program serves approximately 150 units per year, at an average cost of roughly $2,700 per unit. Under the proposed program, the number of units served would increase in stages to 500/year, and will yield annual savings per unit at least equal to the savings that the other efficiency services will generate.*

* A conservative estimate. VGS's most recent DSM filing with the Public Service Board shows that the energy savings per unit served are higher than the average assumed for all units in this report.

Outside of the low-income weatherization program, public investments to secure these savings amount to about 9% of the total cost. The large majority of public expenditures on buildings efficiency services are in the form of direct assistance to property owners, with small fractions for administration and possible loan guarantees. For low-income weatherization services, the program will continue to pay the full costs of the measures. For customers with higher incomes, the amount of the incentive available will fall, and the remainder of the cost will be made up by the customer, either through loans or out-of-pocket. Our analysis is based on average incentive levels for property owners in the various market segments. Actual incentives may vary along a sliding scale, designed to limit the incentive to the minimum amount necessary to induce the customer to make the investment. Figure 7-5 illustrates the shares of public and private spending on these programs. Note the growing proportion of private (customer) spending over time.

Figure 7-5: Statewide Energy Efficiency Services: Shares of Total Cost



B. Benefits

The benefits of the efficiency services are substantial. As shown in Table 7-2, retrofit investments in residential and business building efficiency are expected to reduce fuel usage, on average by 20%-30% every year after installation.

Table 7-2: Statewide Efficiency Services - Energy Benefits per Building Unit

Program Sector	Weighted Avg. Annual Usage/Unit, MMBtu	Savings Ratio	Average Annual MMBtu Savings/Unit
Residential Low-Income (WAP)	110	25	28
Residential Single Family	100	25	28
Residential Multi-family	52	25	13
Businesses	585	25	146

Usage decreases of these magnitudes will result in immediate and substantial savings on customers' annual heating bills. As Table 7-3 shows, residential retrofit customers will save on average between $800 and $1,300 per year (at 2008 prices), depending on fuel type or energy source. The average business will see savings on the order of $10,000 to $13,300 every year.

Table 7-3: Statewide Efficiency Services - Financial Savings per Building Unit

VALUE OF AVERAGE ANNUAL SAVINGS PER UNIT (at 2008 prices, adjusting for end-use efficiency)							
Unit Type	**Average Annual MMBtu Savings/ Unit**		**Value of Average Annual Savings, Fuel Oil**	**Value of Average Annual Savings, Kerosene**	**Value of Average Annual Savings, Propane**	**Value of Average Annual Savings, Natural Gas**	**Value of Average Annual Savings, Electricity**
All Residential Retrofit	28		$ 1,755	$ 1,985	$ 2,635	$ 1,624	$ 2,591
Businesses	146		$ 3,775	$ 4,269	$ 5,668	$ 3,492	$ 5,572
Fuel Statistics	**Btus/gal, kWh, or therm**	**Efficiency**	**Dec 2010 Price/gal, kWh, or therm**				
Fuel Oil	138,000	80%	$ 2.85				
Kerosene	136,000	80%	$ 3.19				
Propane	91,600	80%	$ 2.84				
Natural Gas	100,000	80%	$ 1.91				
Electricity	3,412	100%	$ 0.13				

The aggregate savings for the state and its citizens are likely to be huge. Table 7-4 summarizes the total benefits and costs (public and private) of the programs. The benefits are conservatively estimated, accounting for only 20 years of savings (through 2028), but even so the direct benefits amount to 1.55 times the investments: which means that the net benefits—the fuel dollars that remain in the hands of Vermont's home and business owners—are more than one-and-one-half the outlay.[98]

Over the two decades, Vermonters will save approximately $879 million (net) from the projected level of activities. An additional benefit, also very large in practical effect, is that the investments made in building better buildings, retrofitting existing buildings, and changing out heating systems involve payments made to builders, carpenters, HVAC technicians, and other Vermonters in the local economy—that is, not exported almost immediately from Vermont to import fossil fuels.

[98] Because most of the efficiency measures that these programs will deliver are related to weatherization, insulation, heating, and cooling, they will continue to provide savings for as long as the buildings exist. Our analysis ignores most of these "end effects".

Table 7-4: Statewide Efficiency Services - Aggregate Benefits and Costs

Annual Cumulative Savings		Nominal Savings, $ (20-Yr Horizon)	Net Present Value, 2011 $ (20-Yr Horizon)
2008 Weighted Fuel Price/MMBtu	$ 27		
Fuel Price Escalation Factor	4%		
Discount Factor	6%		
Res. Low-Income (WAP)		$ 556,510,745	$ 280,635,596
Residential Single Family		$ 452,290,279	$ 221,084,142
Residential Multi-family		$ 90,424,892	$ 43,421,915
Businesses		$ 475,000,653	$ 230,955,169
Total Cumulative Savings		***$ 1,574,226,569***	***$ 738,155,889***
Total Costs		***$ 695,457,435***	***$ 476,739,812***
Net Savings		***$ 878,769,134***	***$ 261,416,077***
Ratio, Total Benefits/Total Costs			***1.55***
Total Cost, Public Funds		***$ 206,807,444***	***$ 211,015,968***
Ratio, Total Benefits/Public Costs			***3.50***

Lastly, residential participants in the programs will reduce their emissions of carbon dioxide, on average, by two tons per year and business participants by 11 tons. Overall, the programs will decrease the state's output of CO_2 by roughly 2.2 million tons over the twenty-year horizon.

On the following page is a spreadsheet showing the data and calculations on programs, units receiving energy efficiency services and public and private costs over a ten-year period that led to many of the figures used in this section and elsewhere in this report.

Table 7-5: Whole-Building Efficiency, Non-Regulated Fuels Portion

WHOLE BUILDINGS EFFICIENCY, NON-REGULATED FUELS PORTION

Assumptions in grey.

POTENTIAL PUBLIC REVENUES												
Year	Current - 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Revenues, All Sources	9,831,053	10,798,582	16,362,304	20,650,861	20,245,072	19,858,105	22,926,634	25,196,816	24,946,017	25,310,319	26,629,247

ASSUMPTIONS: PROGRAM DESIGN	Average Incentive		Avg Incr. Cost/Unit for EE Measures	Average Incentive per Unit	Note: Incentives include audit costs.
Res LI (WAP)	100%		5,180	5,180	
Residential Single Family	25%		7,500	1,875	
Res Multi-family	60%		5,700	3,420	
Businesses	$ 6.00	per MMBtu	27,942	878	146 Average Annual MMBtu Savings per Business
Ann. Cost Escalation Factor	2%				

ASSUMPTIONS: UNITS ASSISTED	Add'l Units/Yr, through 2012	Add'l Units/Yr, after 2012	Add'l Units/Yr, after 2016	Current - 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Res LI (WAP)	225	210	0	1,427	1,570	1,832	1,746	1,971	2,196	2,406	2,616	2,826	2,826	2,826
Residential Single Family	450	380	380			528	598	1,048	1,498	1,878	2,258	2,638	3,018	3,398
Res Multi-family	175	250	250					273	448	698	948	1,198	1,448	1,698
Other Transitional						267	267	767	767					
Natural Gas					123	399	200	218	238	260	284	311	340	372
Sub-Total Residential Units				1,427	1,693	3,026	2,811	4,277	5,147	5,242	6,106	6,973	7,632	8,294
Businesses	1.50	1.20	1.20	36	54	81	122	182	273	328	394	472	567	680
VGS Business					23	25	28	30	33	37	40	44	49	54
Sub-Total Business Units					77	106	149	213	307	365	434	517	616	734
Total Units Served				1,463	1,770	3,132	2,960	4,490	5,454	5,607	6,540	7,489	8,247	9,027
								1,321	1,946	2,576	3,206	3,836	4,466	5,096

TOTALPROJECTED INVESTMENT (Public & Private)			Current - 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Res LI (WAP)		107%		8,526,045	11,384,735	14,999,110	13,178,327	12,916,546	14,434,769	16,008,555	17,639,518	17,992,309	18,352,155
Residential Single Family					840,000	4,574,700	8,177,544	11,922,672	15,246,057	18,697,608	22,281,123	26,000,500	29,859,739
Res Multi-family		125%				0	1,618,966	2,709,901	4,306,565	5,966,011	7,690,113	9,480,792	11,340,022
Other Transitional					1,028,000	5,573,455	9,140,121	9,140,121					
Businesses				1,508,868	2,263,302	3,462,852	5,298,164	8,106,190	9,921,977	12,144,500	14,864,868	18,194,598	22,270,188
Total Costs for EE measures (excluding transitional)				10,034,913	14,488,037	23,036,662	28,273,001	35,655,309	43,909,368	52,816,674	62,475,622	71,668,199	81,822,105
Admin Costs	102.0%	inflation multiplier		650,000	1,040,000	1,060,800	1,082,016	1,103,656	1,125,729	1,148,244	1,171,209	1,194,633	1,218,526
Total spent for all-fuels EE measures(except loan Guarantees				***10,684,913***	***15,528,037***	***24,097,462***	***29,355,017***	***36,758,965***	***45,035,097***	***53,964,918***	***63,646,831***	***72,862,832***	***83,040,631***
INCENTIVES (Reliance on Incentives and Other Policies)													
Res LI (WAP)				8,526,045	11,384,735	14,999,110	13,178,327	12,916,546	14,434,769	16,008,555	17,639,518	17,992,309	18,352,155
Residential Single Family					530,000	1,143,675	2,044,386	2,980,668	3,811,514	4,079,020	1,054,400		
Res Multi-family							971,380	1,625,940	2,583,939	3,579,607	4,614,068	5,688,475	6,804,013
Other Temporary Funding*					514,000	2,014,000	4,154,000	4,154,000					
Businesses				47,385	71,078	108,749	166,385	254,570	311,593	381,390	466,821	571,389	699,381
Total Public Investment (excluding transitional)				**8,573,430**	**11,985,813**	**1,143,675**	**14,316,092**	**14,797,056**	**17,330,301**	**19,969,552**	**22,720,407**	**24,252,173**	**25,855,549**
Total Public Investment (partial funding)				**9,223,430**	**13,025,813**	**2,204,475**	**15,398,108**	**15,900,712**	**18,456,031**	**21,117,796**	**23,891,616**	**25,446,806**	**27,074,075**
Total Public Investment (full funding)				**9,223,430**	**13,025,813**	**17,312,334**	**17,442,494**	**18,881,380**	**22,267,545**	**25,792,198**	**29,461,897**	**31,946,931**	**34,539,010**
Share of Program Costs Served by Loans							13,956,909	20,858,253	26,579,067	32,847,123	39,755,215	47,416,026	55,966,556
% of total - public $$				86%	84%	72%	59%	51%	49%	48%	46%	44%	42%
% of total - loan/private $$				14%	16%	28%	41%	49%	51%	52%	54%	56%	58%

C. Summary of Recommendations

- The benefits of a whole-buildings efficiency service significantly outweigh the costs. Over their lifetimes, the efficiency measures recommended in this report would mean Vermonters will save more than $1.5 billion (assuming no increase in fuel prices from 2010 levels), on investments of $707 million. That is a net savings of $80 million for each year of the program.

- Residential customers will save between $800 and $1300 per year, depending on their fuel type and housing conditions.

- After paying back the full cost of efficiency upgrades, Vermonters would have net savings of $1.26 in their pockets, for each $1 they invested.

- Other benefits include improved health, comfort, and safety.

Section 8: Funding: How Should Expanded Whole-Building Efficiency Initiatives Be Supported?

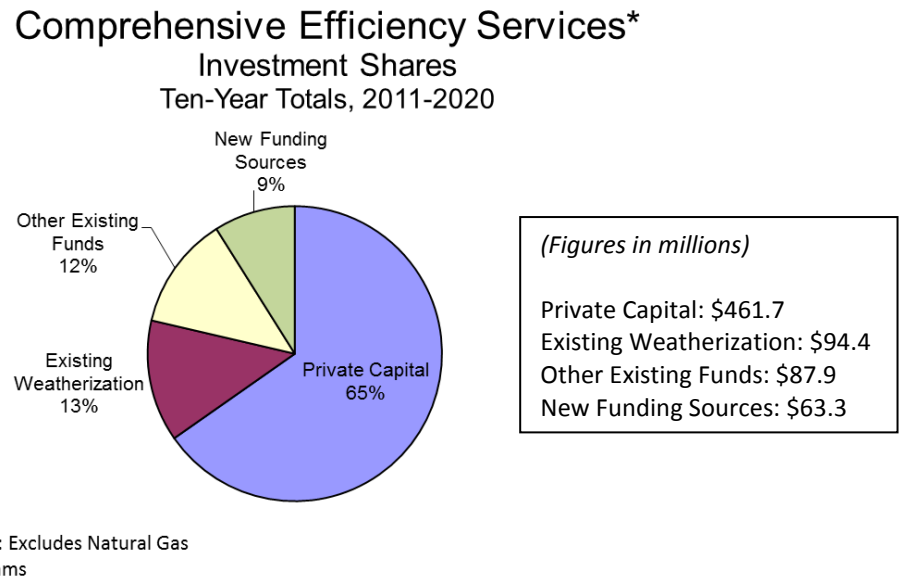
Additional funding streams would be required to ramp up whole-building energy efficiency services in the state to meet the statutory goals, and would largely need to be supplied from private capital. However, not all the measures would be incentive based; this report recommends that more emphasis be placed on non-incentive measures such as building energy labeling and rating, which would more effectively leverage the use of direct incentives.

A. Principal Funding Options

This section examines a wide range of funding options for the broad-based efficiency services required to meet the Legislative goals outlined in Act 92, and concludes that a package of existing and new funding sources is needed to create the savings potential. It also evaluates the pros and cons of the most likely sources. To support a long-term program that grows over time, it will be important to provide stable and predictable revenue sources so that enterprises can hire and train the staff they will need, and customers can count on services they will need to make major renovations and investments.

The most important observation about the recommended funding mix is that, by relying on private investment capital, and by making use of multiple funding streams, the percentage of new public revenues needed for the entire program is only 9% of the total investments needed for the entire program. (*Figure 8-1*)

Figure 8-1: Whole-Building Efficiency Services: Investment shares: Ten-Year Totals, 2011-2020



Act 92 established funding sources through the Regional Greenhouse Gas Initiative and the Forward Capacity Market for the all fuels program. Additionally, various programs were funded through the American Recovery and Reinvestment Act of 2009 (ARRA). ARRA and other sources supported the Weatherization Assistance Program, NeighborWorks® of Western Vermont, the Vermont Fuel Efficiency Partnership and the Vermont Housing Conservation Board. As a result of this funding, retrofit work in various programs has been substantially ramped up.

While the ARRA and other funds have helped Vermont make substantial progress and pursue a path that is consistent with the statutory objectives during the past several years, the former is also temporary (largely ending in 2012 and 2013). Capacity that has been built with these programs will be wasted if the programs do not continue with other funding sources. Consequently, this report provides recommendations for sustainable funding sources that build on the successes of the ARRA initiatives, particularly as it relates to low and lower-income households.

A variety of revenue sources have been proposed for funding an expanded set of building efficiency programs. Of course, whether any of these sources should be chosen is a matter for legislative determination, but we are able to comment on their likely magnitude and on some of the pros and cons of using different approaches. Among the funding options considered are the following:

a. Building on the Existing Weatherization Trust Fund

Vermont's Weatherization Trust Fund receives revenues from two sources, the federal government and a 0.5% Gross Receipts Tax (GRT) on the sale of all non-transportation fuels (except wood). Since weatherization is aimed at Vermont's neediest households, there is a strong logic in this linkage between fuel prices and the size of the fund; and it follows as well that an expansion of the program should be funded largely by a secure revenue stream associated with the fuels in question. The GRT has served Vermont, and particularly the low-income community, very well. If we are to successfully double the weatherization program in an era of declining federal spending for weatherization generally, it is appropriate to examine this revenue source to fund it.

An increase in the GRT could be structured in any of several ways. Leading options are:

- All existing sources: An increase applicable to all fuels (heating oil, propane, kerosene, electricity, natural gas, and coal) presently covered by the GRT. This would require an increase from 0.5% to 0.8% in 2012, to 0.9% in 2013, and eventually to 1% in the later years, to raise the level of revenues that would be required;

- Unregulated fuels only: An increase targeted to those fuels (heating oil, propane, and kerosene) whose sales are not already funding other efficiency programs;[99] or,

- Tiers within the unregulated fuels: A variation on the second option, in which the gross receipts tax on non-regulated fuels would be applied in tiers. The first tier, on sales up to, say, $10 million in annual sales by a single fuel seller, would stay at the existing rate or set at a new first tier rate, while incremental sales over that level would be charged at a higher rate.

  The main purposes of the tiered rate would be to mitigate the effects of a GRT increase on retail prices and to place the tax burden on those portions of the oil industry best able to bear it in an era of very high oil company profits. The intent would be to place more of the GRT burden on very large companies that have greater economies of scale, and often have corporate links to upstream assets and profit centers in the fossil fuel business (e.g., distribution networks, wholesale tank farms, wholesale hedging, and commodity investment programs)

[99] In addition to the 0.5% gross receipts tax for the Weatherization Trust Fund, electricity ratepayers pay a system benefits charge that funds Efficiency Vermont, while Vermont Gas Systems' customers already cover the costs of the company's efficiency efforts (which, as noted earlier, could be increased). An argument can be made that expanded weatherization services, which complement existing programs and which primarily target heating oil, propane, and kerosene end-users, should be funded by an increase in the GRT for those fuels only

and therefore have greater means of absorbing the GRT's small impacts through increased operational and managerial efficiencies.

Table 8-1: Current Charges and Potential Changes in GRT for Supporting Whole-Building Energy Efficiency Services

Current charges for energy efficiency services, including weatherization			
Current Efficiency Charges	**Efficiency in Rates**	**Gross Receipts Tax**	**Total Current**
Electricity	4.7%*	0.5%	5.2%
Natural Gas	2.0%	0.5%	2.5%
Unregulated Fuels		0.5%	0.5%
Potential changes in GRT to support whole-building efficiency services			
Support for	**Efficiency in Rates**	**Gross Receipts Tax**	**Total Program**
Electricity	4.7%*	0.5%	5.2%
Natural Gas	2.0%	0.5%	2.5%
Unregulated Fuels		1.75%	1.75%

* This number does not include the electricity rate contributions to the RGGI and FCM funds, which further increase

The Public Service Board can add energy efficiency costs to regulated rates, but they may consider the issue of competitiveness of VGS compared with fuel dealers, who presently have fewer expenses for comprehensive energy efficiency service built into their costs.[100]

Potential revenues: Increasing the GRT to 1.75% in stages, on unregulated fuels only, would raise adequate funds to almost double the weatherization program from 2008 levels by 2015.

[100] Both VGS and fuel dealers pay the gross receipts tax to fund the Weatherization Assistance Program, while only VGS has the added cost of comprehensive energy efficiency programs.

a. Continued Revenues from the Sale of Carbon Dioxide Allowances under the Regional Greenhouse Gas Initiative (RGGI)

RGGI is a multi-state program aimed at reducing the greenhouse gas emissions from the power sector in the northeast United States. Its central mechanism is a cap on carbon dioxide emissions, the allocation of permits to produce CO_2 under the cap, and the trading of those permits (allowances) among those obligated to meet the cap and others who wish to participate in the market. Act 92 specified that Vermont law provides for the sale at auction of the state's RGGI-based carbon allowances, with auction revenues to be put to energy cost- and carbon-reducing efforts on behalf of customers. Existing legislation emphasizes that these benefits should be focused on electric power customers, but since whole-building efficiency investments will lower energy costs and deliver reductions among one of the largest sources of carbon emissions, RGGI revenues could appropriately be dedicated to the buildings efficiency initiatives.

Potential revenues: RGGI revenues are estimated to stay relatively constant from approximately $1.9 million in 2012, to similar levels in 2020[101].

b. Continued Revenues Generated by Efficiency Vermont's participation in the New England Forward Capacity Market (FCM)

In an effort to assure the availability of sufficient capacity to meet the region's electric demand, the Independent System Operator of New England (which is regulated by the Federal Energy Regulatory Commission) has created the Forward Capacity Market. It is a resource-neutral market: suppliers of both generation and demand reductions can participate, so long as they can demonstrate that their resources will provide capacity benefits to the power grid when required. To the extent that Efficiency Vermont's investments in electric end-use efficiency qualify on reliability terms and clear in the three-year forward market, the FCM program will pay Efficiency Vermont, and those funds could be made available for investment in additional efficiency measures.

Potential revenues: FCM revenues earned by Efficiency Vermont's and BED's programs are estimated to rise from approximately $3.5 million in 2012 to about $5.5 million in 2020[102].

[101] Poor, T.J. Memo to Public Service Board regarding Department of Public Service revenue projections for FCM and RGGI, October 28, 2010.

[102] *Id.*

c. Additional Utility-Based System Benefits Charges (SBC) for Efficiency Vermont and in the Rates of Vermont Gas Systems

Since the state's efficiency contractor performs "clearinghouse" functions for the statewide comprehensive energy efficiency service, it might be argued that a slight increase in the SBC to cover Efficiency Vermont's administration of the buildings/unregulated fuels portion of the work is appropriate. While mildly inconsistent with the general principle that revenue sources should be closely linked to the services to which those revenues will be put, since there is significant overlap between electric customers and the customers of non-regulated fuels and as there are synergies to be captured through the whole-building approach, this may not be a significant concern. On the other hand, a major expansion of the electric sector Energy Efficiency Charge (EEC) to support the direct costs of building shell and furnace upgrades to reduce fuel use would be a departure from the idea that different sectors should bear their own program costs.

Potential revenues: The work of Vermont Gas Systems to expand buildings efficiency services to more customers can be supported in utility rates by order of the Public Service Board. VGS spent about $1.98 million on various energy efficiency programs. Raising the number of households served comprehensively could require an increase in rates. As authorized and historically managed – with a direct nexus between the EEC and efficiency measures for the regulated energy sources – the PSB is unable to charge electricity customers for fossil fuel building shell improvements. However, with legislative direction mandating electric and utility support for unregulated fuels savings, full program funding would be possible from this source.

d. The Clean Energy Fund

The Clean Energy Fund has an enabling charter, an investment plan, and an investments advisory committee in place. Although it is possible to capture some of these funds for buildings efficiency services, *synergies with renewable and distributed energy should be considered carefully*, together with the other funding options suggested in this report.

Recommendation: The Legislature should consult with the Department of Public Service and the members of the CEF investment committee to discuss whether any of the funds now committed to the CEF could appropriately be devoted to the buildings efficiency services outlined in this report.

B. Discussion and Recommendations

We have considered these several revenues sources, their pros and cons, and their potential to provide sustained support for whole-building efficiency services. We have tried to balance program design against potential revenues—with the object of delivering the greatest amount of service for the least cost. Recommendations about funding are influenced by four important practicalities:

- First, a long-term, stable funding stream is needed to deliver investments that will grow predictably and steadily. "On-again/off-again" programs will bedevil implementation, and undermine training, development and marketing efforts.

- Second, it is likely that a combination of resources will be needed to support a program that has many elements and serves a variety of market segments, as well as a range of public policy objectives.

- Third, total funding requirements are extremely modest when compared to Vermont's total energy bills. Total energy bills in Vermont are measured in the billions of dollars. Energy efficiency efforts are funded at very small percentages of the total resources spent on energy supply.

- Finally, programs and funding can be phased in over time. It is important to begin implementation of efficiency initiatives as soon as possible, so that marketing, training, and fuel savings can begin now, capitalizing on capacity that's being built up now, even if decision-makers decide to phase in additional funding over time.

The cost of delay. As seen in the spreadsheet from Section 7, the report recommends rapid escalation rates (which would raise some real implementation challenges) to maintain the level of activity required to reach the goals stated in Act 92. **Unless this escalation is initiated and maintained, total lost savings are likely to be on the order of $409 million in extra fuel costs paid by Vermonters over the next 10 years, according to our forecasts.**

Whether any of the funding options described below should be tapped is, of course, a matter for the Legislature to decide. Additional ideas may well emerge, and as a general matter policymakers will want to take a practical and creative approach to funding choices. It is important to emphasize, however, that "savings" that come from a failure to invest in low-cost efficiency are illusory – they will be paid for two or three times over by the additional fuel and human costs of higher fuel bills and affordability challenges built into an inefficient buildings infrastructure.

One Potential Funding Combination

Although a variety of funding combinations are surely possible, in order to advance discussion of the options and to demonstrate how efficiency goals could be met we set forth here and in the accompanying spreadsheet a funding package that would support the initiatives set out in this report and **lower Vermont's fuel bills by more than $1.6 billion due to measures installed between 2011 and 2030** (see the spreadsheet at the end of this section for funding details. Some of the revenue streams, program needs and funding amounts change over the course of a decade-long program, but for discussion purposes the text below calls out 2015 as an example.) That funding package includes the following elements:

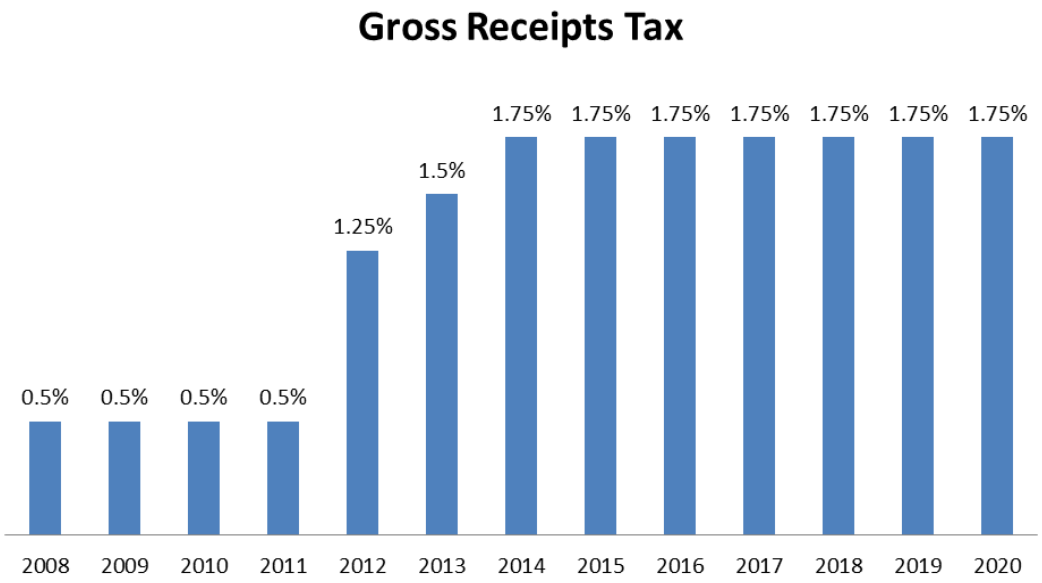
1. ***Private capital***. The most important financial component of the buildings efficiency program is private capital. Over half of the total spending on efficiency in the first 10 years of the programs comes from private capital—loans and out-of-pocket expenditures by customers. Private capital's share of the investments increases over time. The aim of this proposal is to take advantage of markets to the greatest extent possible and to direct public dollars to those segments that that have the most difficulty accessing private funds. In 2015, private capital will underwrite $34 million of these services; over the ten-year period, it will fund $406 million.
   For private capital to be unlocked, *a number of other non-incentive mechanisms described in the recommendations that address some of the persistent market barriers need to be implemented*. Critical among these is a time-of-sale efficiency review and rating, which would help establish the foundation for incorporating the value of energy efficiency features into the appraised value of the homes. A loan-loss reserve would be required for maintaining the lending capacity of the loan pool and attracting additional funding. Additionally, mechanisms that would allow for payments to be spread over longer periods of time to try and ensure a positive cash flow for the customers, such as PACE or PAYS®.

2. ***An increase the gross receipts tax for the Weatherization Trust Fund***. As discussed above, the Fuel Gross Receipts Tax is the most logical source of revenue for an enhanced weatherization program serving low-income households.

   There are several ways in which an appropriate increase can be designed. Because the investments here are aimed at whole-building efficiency, this report recommends ramping-up the GRT on non-utility fuels not now contributing to significant energy efficiency programs supervised by the Public Service Board (heating oil, propane, kerosene, and coal), from 0.5% to 1.75% in three steps over the coming decade. This would raise an average of $7.3 million in additional revenue per year for investments in low-income weatherization over the course of the coming decade, although much less in the early years (*Figure 8-1*). Assuming also

a modest increase in the price of all fuels, this will increase revenues from roughly $7.1 million in 2011 to $9.7 million in 2020.

Figure 8-2: Recommended Gross Receipts Tax Changes for Unregulated Fuels, 2012-2020



When thinking about the GRT, it may be useful for policymakers to understand the relationship between this revenue source and other similar sources. Considering the pervasive impacts of high fuel bills on Vermont, it is ironic, for example, that the sales tax does not apply to residential consumption of heating fuel, but it does apply to the purchase of insulation, efficient windows, air sealing materials, and high-efficiency HVAC systems. In this area, tax policy is not sending efficient price signals to consumers.

More significantly, through the example of the regulated energy industries (electricity and natural gas), we have learned that it is cost-effective to affirmatively invest in energy efficiency and that it is worth adding a small charge to utility rates in order to save even more on utility bills. In addition, since natural gas and the unregulated fuels compete directly in certain markets, the difference between VGS's contributions to efficiency and the current level of the GRT is a matter of discussion.

Table 8-2: Summary of Funding Options for the Expanded Whole-Building Efficiency Services - Potential Dollars for Investments (millions), New Money for Energy Efficiency is in Italics

Source	Amount in 2011		Amount in 2015	
	Existing or Leveraged Money	*New Money*	Existing or Leveraged Money	*New Money*
Private capital & loans	12.0		20.0	*12.8*
Federal weatherization	1.0		1.0	
Weatherization Trust Fund	7.1		8.2	
Weatherization Trust Fund new				*7.5*
EEC -- Efficiency Vermont	1.0		1.0	
Vermont Gas EE program	0.6		0.6	
Vermont Gas EE Program new				*0.3*
RGGI carbon credit sales	2.9		4.1	
Forward capacity market	3.5		4.0	
General Fund new		*0.5 +*		*1.3 +*
Other Temporary Funding [103]	$8.75		0	
Clean Energy Fund	(study)		(study)	
TOTAL	$37.35 million		$60.8 million	

For additional detail on a year-by-year basis, see the spreadsheet below.

[103] Includes NeighborWorks® of Western Vermont, GMP Energy Efficiency Fund, and ARRA Funds for Weatherization Assistance Program

Figure 8-3: Potential Sources of Funds and Estimations of Fund Levels for Whole-Building Efficiency Activities

Potential Sources Funds and Estimates of Fund Levels for Whole Buildings Efficiency

Cells in grey hightlights are variables.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross Receipts														
Escalation Factor 3.50%														
GRT Rates for HO, K & P	0.5%	0.50%	0.50%	0.50%	0.50%	1.25%	1.50%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
Heating Oil & Kerosene		2,297,060	1,913,244	1,814,927	1,878,450	4,860,488	6,036,726	7,289,347	7,544,474	7,808,531	8,081,829	8,364,693	8,657,457	8,960,468
Propane		849,802	734,220	711,788	736,700	1,906,212	2,367,516	2,858,775	2,958,832	3,062,392	3,169,575	3,280,510	3,395,328	3,514,165
Coal		2,555	1,813	1,824	1,888	4,885	6,067	7,326	7,582	7,848	8,122	8,406	8,701	9,005
GRT Rates for NG & E	0.5%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
Natural Gas		500,744	518,270	536,409	555,184	574,615	594,727	615,542	637,086	659,384	682,463	706,349	731,071	756,659
Electricity		3,857,243	3,807,934	3,875,631	4,011,278	4,151,673	4,296,981	4,447,375	4,603,034	4,764,140	4,930,885	5,103,466	5,282,087	5,466,960
Weatherization Reported	6,857,743	7,380,027	7,553,733	6,862,352	4,339,133	7,000,000								
Subtotals, GRT	6,992,953	7,507,404	6,975,481	6,940,579	7,183,499	11,497,873	13,302,017	15,218,366	15,751,008	16,302,294	16,872,874	17,463,425	18,074,644	18,707,257
Weatherization Trust	6,992,953	7,380,027	7,553,733	6,862,352	4,339,133	11,497,873	13,302,017	15,218,366	15,751,008	16,302,294	16,872,874	17,463,425	18,074,644	18,707,257
Federal Weatherization Assistance														
Escalation Factor -4.40%	1,353,926	1,146,018	2,146,744	1,399,729	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458	1,012,458
FCM Auction Revenues														
Allocation Factor 90%														
FCM Participation Costs														
EVT					272,000	272,000	272,000	272,000	272,000	272,000	272,000	272000	272000	272000
BED	1,401,404	2,140,058	2,565,316	2,798,594	3,343,747	3,901,075	4,582,603	4,232,244	3,820,357	4,084,411	4,556,303	4978301.88	5347770.111	5771438.607
	82,770	132,479	139,716	148,125	181,728	193,225	207,257	215,889	186,060	176,739	198,462	223092.739	249992.398	277595.422
EVT/BED Capacity Revenues	1,484,174	2,272,537	2,705,032	2,946,719	3,525,475	4,094,300	4,789,859	4,448,133	4,006,417	4,261,150	4,754,765	5,201,395	5,597,763	6,049,034
RGGI Auction Revenues														
Tons	0	0	1,225,830	1,225,830	1,225,830	1,225,830	1,225,830	1,225,830	1,195,184	1,164,539	1,133,893	1,133,893	1,133,893	1,133,893
Price/Ton	-	-	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86
RGGI Revenues	-	-	2,272,537	2,705,032	2,946,719	3,253,475	3,822,300	4,517,859	4,176,133	3,734,417	3,989,150	4,482,765	4,929,395	5,325,763
FCM Participation Costs						$272,000	$272,000	$272,000	$272,000	$272,000	$272,000	$272,000	$272,000	$272,000
EVT		1,401,404	2,140,058	2,565,316	$2,798,594	$3,343,747	$3,901,075	$4,582,603	$4,232,244	$3,820,357	$4,084,411	$4,556,303	$4,978,302	$5,347,770
BED		82,770	132,479	139,716	$ 148,125	$ 181,728	$ 193,225	$ 207,257	$ 215,889	$ 186,060	$ 176,739	$ 198,462	$ 223,093	$ 249,992
					458,174	4,750,551	6,482,548	8,337,458	8,822,583	9,344,238	9,907,966	10,520,461	11,189,830	11,925,898

Other Potential Funding Sources

	Special Funds Related to ARRA Related to Thermal Efficiency													
Residential														
Ruland Neighborworks ARRA				1,500,000	1,500,000	1,500,000								
GMP Energy Efficiency Fund			514,000	514,000	514,000	514,000								
Contract with CVCAC (VFEP)					1,140,000	1,140,000								
VHCB					1,000,000	1,000,000								
ARRA (over 3 years)			1,684,258	6,737,030	8,421,288									
DPS Schools, Universities, Hospitals and Municipal					1,255,000	1,255,000								
DPS State buildings					500,000	500,000								
TOTALS	9,831,053	10,798,582	16,362,304	20,650,861	20,245,072	19,858,105	22,926,634	25,196,816	24,946,017	25,310,319	26,629,247	28,160,042	29,614,260	31,094,512

C. Summary of Recommendations

- It will require $707 million to fund these energy efficiency services over the ten years between 2011 and 2020. Approximately 65% of this needs to come from private capital; but for that capital to be engaged, the recommendations in this report need to be set in motion.

- Existing federal weatherization, RGGI and forward capacity market dollars should continue to fund the energy efficiency services in the state.

- Options for additional funding to expand services include:
    - Private investments
    - A graduated increase in the Gross Receipts Tax for funding low-income weatherization efforts.

- Funding needs to be steady, predictable and reliable in order to mobilize market responses that the report is recommending. Fluctuations in funding streams will not lead contractors and lenders to have confidence in investing in this market.

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts focused on the long-term economic and environmental sustainability of the power and natural gas sectors. We provide technical and policy assistance on regulatory and market policies that promote economic efficiency, environmental protection, system reliability and the fair allocation of system benefits among consumers. We have worked extensively in the US since 1992 and in China since 1999. We added programs and offices in the European Union in 2009 and plan to offer similar services in India in the near future. Visit our website at www.raponline.org to learn more about our work.