

Thermal Efficiency Task Force
Analysis and Recommendations

A Report to the Vermont General Assembly

**Meeting the Thermal Efficiency Goals for
Vermont Buildings**

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Executive Summary

Vermonters have a significant opportunity to save on their heating costs by weatherizing their homes and businesses. In 2010, Vermonters paid over \$600 million to import and use fossil-based heating fuels. Most of this money left the Vermont economy. Despite the fact that the average Vermont home today uses approximately half as much heating oil as it consumed in the early 1970s, Vermonters' 2010 fuel bills were nearly twice as much as those of a decade earlier. Further, prices are expected to continue to rise.¹ These price increases will affect both homes and businesses. Although weather conditions have always been a factor in Vermont heating, volatile weather effects play an important role in how buildings can cost-effectively be heated. Comprehensive and rapid weatherization of Vermont's buildings will bring two significant benefits to homes and businesses: (1) Vermont ratepayers will be less vulnerable to volatility in the fuel market and to effects from dramatic weather fluctuations, and (2) more money will stay within the Vermont economy.

Investing in thermal efficiency improvements—primarily air sealing, insulation, and heating system replacements—can dramatically reduce heating energy use in a building.² At current fuel prices, thermal efficiency investments in a home can bring savings of approximately **\$1,000 per year** over the lifetime of the investment. The value of these savings increases as fuel prices rise.³ As each year passes in which investments in thermal efficiency are not made, cost burdens must be borne by individual Vermonters, businesses, and property owners—collectively burdening the Vermont economy as a whole.

These cost burdens—which result in thermal efficiency *lost opportunities*, as they are known in the efficiency industry—are not trivial in scope. Beyond the direct economic savings that accrue to households and businesses that become more energy efficient, efficiency affects economic security by stabilizing energy demand and thus, reducing volatility in pricing. In addition, the Vermont economy can benefit from the development of a green workforce needed to install thermal efficiency measures, and from the development of a durable supply chain necessary to get this work done.

The Public Service Department (PSD) has modeled the job impacts from this report's recommendations for expanded (incremental) investments in thermal efficiency—that is, investments that are over and above current thermal efficiency investments—and found that nearly 800 job-years can be created over

¹ The Energy Information Administration's most recent long-term price forecast indicated a 1% real increase (that is, after inflation is factored in) in fossil fuel prices.

² *Thermal* and *thermal efficiency* are used throughout this report to refer to efficiency services for space heat and hot water; *electrical efficiency* refers throughout to lighting, appliances, cooling, and commercial and industrial processes.

³ Current fuel prices are presented in the Vermont Fuel Price Report, Department of Public Service. Savings estimates are derived from the information presented in the Residential Market section of this report. Current savings for a residential fuel oil customer are approximately \$965; kerosene, \$1,074; propane, \$1,135; natural gas, \$550.

the life of the measures. Further, the value of incremental efficiency programs described in this report, cast in terms of benefits to costs, is well over 2 to 1. That is, for every dollar spent on thermal efficiency programs, Vermonters have more than two dollars to spend on something other than heating their homes and businesses.

Significant gaps exist between the amount of available resources and the State's ability to fulfill the opportunity for advancing thermal efficiency in its buildings:

- Financial resources to help Vermont's most vulnerable families are declining. Last year, federal support for Vermont's Weatherization Assistance Program (WAP) was zeroed out, leaving the program entirely dependent on State support through the Gross Receipts Tax. One-time funding through the American Reinvestment and Recovery Act of 2009 has also come to an end. Under current conditions, it would take the WAP more than 50 years to weatherize its targeted population. Delaying weatherization for this population places more pressure on other public resources such as the Low-Income Heating Assistance Program (LIHEAP).
- For Vermont families not eligible for WAP, as well as for Vermont businesses, thermal efficiency offerings from Efficiency Vermont are constrained by funding structures and allocations for thermal efficiency. Moreover, the existing funding sources in Vermont, directed to thermal efficiency (the Regional Greenhouse Gas Initiative [RGGI] and the New England Forward Capacity Market [FCM]) rely on auction revenues that are subject to annual fluctuations.
- Regulated thermal efficiency programs offered by Vermont Gas Systems (VGS) are available only in its service territory, which is concentrated in the Lake Champlain region.

In addition to the economic benefits of investment in thermal efficiency are environmental benefits. Fossil fuels used in buildings are the second-largest source of greenhouse gas emissions in Vermont, exceeded only by the transportation sector. Because of this ranking, Vermont needs to develop policies and resources that enable the kind of progress in delivering thermal efficiency services that the State has made in electric efficiency. Fossil fuel savings associated with the investments recommended by the Task Force would keep **6.8 million tons of carbon dioxide emissions** from entering the atmosphere, equivalent to the annual CO₂ emissions of 1.7 coal fired power plants, or removing 1.26 million passenger vehicles from the roads for one year.

To improve Vermont's economic security, create local jobs, and reduce the State's impact on the environment, Vermont must also make a fundamental shift in *how* homes and businesses are heated. Making buildings more energy efficient should continue to be the first and best strategy for reducing the population's reliance on fossil fuels—and paying the economic and environmental costs associated with them. In addition to efficiency, the State must shift toward local, renewable sources and renewable-blended fuels for heating. These recommended changes can be undertaken in ways that create opportunities for existing fuel providers while also enabling a transition to a new, clean-energy economy.

The context for this report is the enactment of the Vermont Energy Efficiency and Affordability Act, which established building efficiency goals and was approved in the 2007-2008 legislative session (Act 92; 10 V.S.A. § 581). This law calls for:

- Improving the energy fitness of 25% of the state’s housing stock by 2020 (approximately 80,000 housing units)
- Reducing annual fuel use and fuel bills by an average of 25% in the housing units served
- Reducing total fossil fuel consumption across all buildings by an additional 0.5% each year, leading to a total reduction of 6% annually by 2017 and 10% annually by 2025
- Saving Vermont families and businesses over \$1.4 billion on their fuel bills over the lifetimes of the improvements and measures installed
- Increasing weatherization services to low-income Vermonters

Since the enactment of this law, Vermont has made some progress, but is behind pace in achieving the goals. Current programs and funding are estimated to be sufficient to improve the energy efficiency in approximately 18,000 housing units by the end of 2013, leaving an additional 62,000 housing units (or 77.5% of the total) to complete by 2020. To fulfill this law, more than 8,800 units per year will need to be weatherized. This number is more than twice the number of units completed in 2011, when ARRA funding temporarily boosted the funding capacity for weatherization. **Figure ES-1** shows that the current expected pace of weatherization programming will result in a failure to meet the first goal of Act 92.

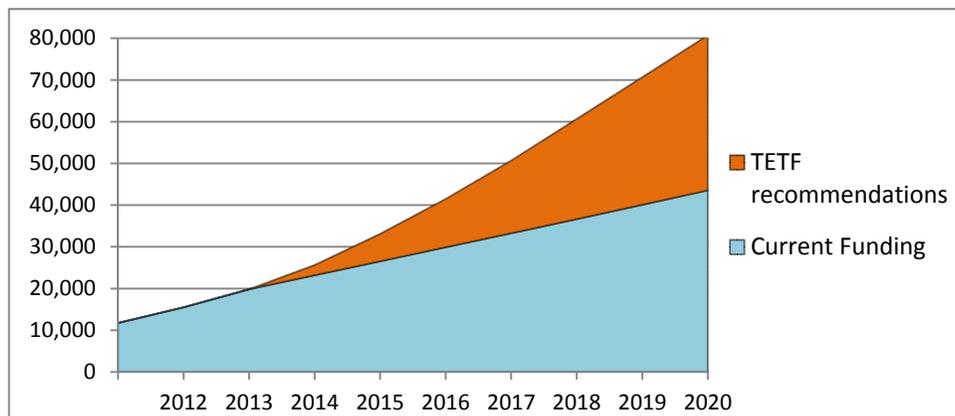


Figure ES-1. Estimated Cumulative Households Served - Current Funding and TETF Recommendations to Meet State Goals

Completing the weatherization of these 62,000 housing units will require a significant ramp-up of thermal efficiency programs and services, and of private investment. For the State’s other goals to be met, an additional significant ramp-up of energy programming will need to be put in place for weatherization projects with commercial and industrial customers that use unregulated fuels. It is important to note that these customers have had a relatively low number of efficiency services available

to them, to date. Such investments will more than pay for themselves in long-term economic, environmental, and social benefits for Vermonters.

The energy efficiency and renewable energy program recommendations presented in this report will yield significant economic benefits: **Over \$1.4 billion**. The direct benefit-to-cost ratio from the recommended thermal energy programs (based on private and public costs) is 2.05 to 1, and \$6.18 in overall benefits is provided for every dollar in public investment.

In addition, the recommendations for incremental programs are expected to:

- Result in an increase in Gross State Product of \$1.47 for every \$1.00 invested.⁴ Implementation of incremental energy efficiency programs alone are expected to result in an increase in Gross State Product of \$1.80 for every \$1.00 invested.
- Prevent 6.8 million tons of carbon dioxide-equivalent emissions from entering the atmosphere, over the lifetime of these investments. This reduction in CO₂e emissions is equivalent to the emissions associated with operation for 1.7 years of a coal-fired power plant, or taking 1.2 million passenger vehicles off the road for one year.⁵

Although the estimates are based on projections, they are rooted in many years of independently monitored and verified results from Vermont's existing programs. Vermont electric energy and gas efficiency programs and the Weatherization Assistance Program full documentation on the cost-effectiveness of energy efficiency investments. Burlington Electric Department and Efficiency Vermont's electric efficiency programming has been successful enough since 2007 to enable the efficiency utilities to sell back their electric energy efficiency savings to the regional grid as a revenue-generating demand resource—providing capacity to the grid from energy *not* used, just as power suppliers provide capacity to the grid to meet the expected demand.

Additional non-energy benefits will also be realized in homes and businesses that make these energy efficiency investments, with regard to comfort, health, and safety. Furthermore, improved energy efficiency help stabilize energy costs for the low income and elderly, providing a critical level of housing stability to populations with very little ability to respond to fuel price volatility.

⁴ The PSD estimated the long-term economic impacts of incremental thermal efficiency programs, as recommended by the Task Force; the Department used the Vermont PI+ model developed by Regional Economic Models Inc. (REMI). This model is used throughout the United States to capture and measure effects on the national and / or regional economy from changes in economic inputs and costs. REMI has baseline forecasts of economic activity that are calibrated to the Vermont economy. Changes in economic activity represent “policy changes” that affect the trajectory of the state economy. In this study, such changes relate to consumer spending; to household and business energy costs; and to additional commercial activity and industry demand associated with thermal energy efficiency investments. The model also captures the statewide savings from reduced thermal energy expenditures. For more on the model, please see www.remi.com

⁵ Calculated using Environmental Protection Agency carbon calculator. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>. Benefits to Vermont's economy from reductions in carbon dioxide emissions were not monetized for this report.

The Task Force has recommended specific actions and initiatives that it believes will enable Vermont to meet its building efficiency goals. Among them are:

Policy / regulatory / legislative action

- **Increase affordability for low-income households.** Expand the low-income weatherization program to serve more low-income Vermonters, and coordinate with LIHEAP to target large energy users. WAP could deliver greater energy savings and make a bigger impact on reducing the energy burden faced by low-income households if it could prioritize the weatherization of LIHEAP clients by *energy intensity* (energy use, in BTUs per square foot). This approach would enable prioritization for serving the least-efficient homes, first.
- **Create consistency across programs.** Allow exceptions to certain U.S. Department of Energy (DOE) WAP regulations for activities funded by Vermont's Weatherization Trust Fund (WTF). This allowance for exceptions would improve consistency across Vermont's portfolio of multifamily programs.

Collaboration / coordination

- **Build the industry.** Develop partnerships to encourage heating service companies, building performance contractors, and renewable energy installers to work together to provide customers with a comprehensive roadmap for improving their building energy use.
- **Support industry transition.** Ensure that energy service providers such as fuel dealers are positioned to benefit from the increased investment, and that they have the tools, capability, and capacity to assist the State in reaching its goals.

Program implementation

- **Make it simple for consumers.** Implement a statewide clearinghouse for easy access to information on consumer-level energy improvements and provide coordination across thermal efficiency programs and providers.
- **Show the benefits.** Improve public understanding of, demand for, and investment in, thermal efficiency through the development and implementation of a comprehensive marketing strategy. Include community-based social marketing, delivered in cooperation with energy service providers, community groups, and others, to help Vermonters achieve goals that matter to them, while driving toward achieving the State's building efficiency goals.
- **Assure the savings to customers.** Increase consumer confidence that promised energy savings will actually occur. This can be achieved through case studies that demonstrate actual savings for completed projects, as well as by working with contractors to develop packages that provide long-term financing options and projected guaranteed savings.
- **Increase the use of financing.** Work with financial lending institutions to develop strategies for increasing the use of existing financing options, and for creating new options designed to deliver more efficient, comfortable, and safe buildings. One possibility is to design financing so that its costs could be paid for by the energy savings.

- **Make efficiency visible.** Begin delivering a voluntary energy performance score or label to existing buildings in Vermont, then reevaluate after 3 years to determine whether labeling and disclosure should be phased in as a requirement at time of sale. Help increase the availability of building fuel use data so building owners and tenants can identify energy savings opportunities. These data will also enable buildings owners to benchmark their energy performance against other similar buildings and / or the building's own historical energy consumption.

Some of the initiatives proposed in this report do not need additional public funding and therefore can and should be implemented. The collaboration / coordination between energy services providers is one set of examples; another is improvements to existing programs. However, many of the recommended initiatives will require both financing (private dollars) and funding (public dollars).

The Task Force analysis presents projections, as shown in **Table ES-1**, of the necessary levels of investment to achieve the described benefits, and to meet the building efficiency goals. The analysis also reviews current and potential new sources for funding and financing.

The budgets for meeting the State's building efficiency goals reflect the fact that a significant proportion of all needed dollars will come from financing, not public funding. In 2014, every dollar in funding is expected to leverage approximately \$1.40 in financing or private funding.⁶ This ratio is projected to increase from 1.40 to 1 in 2014, to 2.60 to 1 by 2020. Overall, they average 1.90 to 1 over the full term.

⁶ The ratio compares participant costs to public funding

Table ES-1. Compiled costs and revenues for thermal efficiency

	2014	2015	2016	2017	2018	2019	2020	Total
Natural Gas Costs								
Incentives	\$ 1,409,548	\$ 1,460,023	\$ 1,513,743	\$ 1,593,573	\$ 1,782,670	\$ 1,782,670	\$ 1,782,670	\$ 11,324,897
Participant costs (financed and self-funded)	\$ 4,437,719	\$ 4,638,556	\$ 4,817,819	\$ 5,092,830	\$ 5,734,456	\$ 5,734,456	\$ 5,734,456	\$ 36,190,292
Other program costs (technical assistance, marketing, etc.)	\$ 1,212,050	\$ 998,225	\$ 1,016,576	\$ 1,092,480	\$ 1,105,995	\$ 1,105,995	\$ 1,105,995	\$ 7,637,315
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 5,847,268	\$ 6,098,579	\$ 6,331,562	\$ 6,686,403	\$ 7,517,125	\$ 7,517,125	\$ 7,517,125	\$ 47,515,188
Total program costs (incentives plus other program costs)	\$ 2,621,598	\$ 2,458,249	\$ 2,530,319	\$ 2,686,053	\$ 2,888,664	\$ 2,888,664	\$ 2,888,664	\$ 18,962,212
Propane, Fuel Oil, Kerosene Costs								
Incentives	\$ 25,249,797	\$ 33,362,957	\$ 35,851,092	\$ 37,879,350	\$ 37,659,100	\$ 36,596,600	\$ 36,421,100	\$ 243,019,994
Participant costs (financed and self-funded)	\$ 51,907,487	\$ 65,347,383	\$ 80,452,528	\$ 94,431,652	\$ 109,863,027	\$ 119,107,527	\$ 129,375,027	\$ 650,484,630
Other program costs (technical assistance, marketing, etc.)	\$ 11,542,733	\$ 12,275,746	\$ 13,800,478	\$ 14,017,587	\$ 14,686,062	\$ 14,243,562	\$ 13,251,062	\$ 93,817,229
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 77,157,284	\$ 98,710,340	\$ 116,303,620	\$ 132,311,001	\$ 147,522,126	\$ 155,704,126	\$ 165,796,126	\$ 893,504,624
Total program costs (incentives plus other program costs)	\$ 36,792,530	\$ 45,638,703	\$ 49,651,570	\$ 51,896,936	\$ 52,345,161	\$ 50,840,161	\$ 49,672,161	\$ 336,837,223
Total Costs								
Incentives	\$ 26,659,345	\$ 34,822,980	\$ 37,364,835	\$ 39,472,923	\$ 39,441,769	\$ 38,379,269	\$ 38,203,769	\$ 254,344,891
Participant costs (financed and self-funded)	\$ 56,345,206	\$ 69,985,939	\$ 85,270,347	\$ 99,524,482	\$ 115,597,482	\$ 124,841,982	\$ 135,109,482	\$ 686,674,921
Other program costs (technical assistance, marketing, etc.)	\$ 12,754,783	\$ 13,273,971	\$ 14,817,054	\$ 15,110,067	\$ 15,792,056	\$ 15,349,556	\$ 14,357,056	\$ 101,454,544
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 83,004,551	\$ 104,808,920	\$ 122,635,182	\$ 138,997,405	\$ 155,039,252	\$ 163,221,252	\$ 173,313,252	\$ 941,019,812
Total program costs (incentives plus other program costs)	\$ 39,414,129	\$ 48,096,951	\$ 52,181,889	\$ 54,582,990	\$ 55,233,826	\$ 53,728,826	\$ 52,560,826	\$ 355,799,435
Natural Gas Revenue								
Currently available program funding	\$2,078,874	\$2,148,849	\$2,231,969	\$2,352,003	\$2,597,964	\$2,597,964	\$2,597,964	\$16,605,587
Incremental funding needed	\$542,725	\$309,400	\$298,350	\$334,050	\$290,700	\$290,700	\$290,700	\$2,356,625
Propane, Fuel Oil, Kerosene Revenue								
Currently available program funding	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$71,960,000
Incremental funding needed	\$26,512,530	\$35,358,703	\$39,371,570	\$41,616,936	\$42,065,161	\$40,560,161	\$39,392,161	\$264,877,223
Total Revenue								
Currently available program funding	\$12,358,874	\$12,428,849	\$12,511,969	\$12,632,003	\$12,877,964	\$12,877,964	\$12,877,964	\$88,565,587
Incremental Public Funding needed	\$27,055,255	\$35,668,103	\$39,669,920	\$41,950,986	\$42,355,861	\$40,850,861	\$39,682,861	\$267,233,848
Total Investment (Incentives, Participant Costs plus Other Program Costs)	\$95,759,335	\$118,082,891	\$137,452,236	\$154,107,471	\$170,831,308	\$178,570,808	\$187,670,308	\$1,042,474,357

The recommendations made in this report were developed through stakeholder input and informed by thorough analysis and considerations over the course of 2012. They are intended to set the State on a course for a secure, integrated energy and economic future. They set the foundation for meeting the goals articulated in 10 V.S.A §581 (Act 92), and help transition important players in the supply chain—local heating fuel companies and workers—to that new energy future.

1. Introduction

The Vermont Legislature has recognized the challenges Vermonters face in heating their homes and businesses. It has also recognized the economic and environmental opportunities associated with improving the energy efficiency of those buildings, including the opportunities associated with renewable energy installations. In response to these challenges and opportunities, the Legislature passed the Vermont Energy Efficiency and Affordability Act, known as Act 92 (10 V.S.A. § 581) in the 2007 - 2008 Session. The law established goals for reducing the consumption of energy in buildings.

Although the State has made some progress in meeting those goals, it is not on track to achieve them. Vermonters continue to spend more on heating than would be the case if widely available, affordable, and cost-effective energy efficiency and renewable energy measures were in place to address heating needs. This cost burden to Vermonters contributes to the destabilization of energy (and by association, economic) security for the State. Vermont had already established aggressive goals (10 V.S.A. §578) for reducing 50% of carbon dioxide emissions from 1990 baseline levels by 2028, and 75% by 2050. The State is not on track to achieve these goals, either. Further, it is recognized that with energy improvements to buildings come greater physical comfort in those spaces, greater consumer control over energy costs, and enhanced energy security to the region. Meeting all of these goals will require a significant ramp-up of thermal efficiency programs, services, and investment.

This report was created by the Thermal Efficiency Task Force, which was convened by the Public Service Department to recommend specific actions and initiatives that will guide the State in meeting its building efficiency goals, improve its energy and economic security, create local jobs, and reduce environmental impacts. The recommendations made in this report were developed through stakeholder input and informed by analysis and considerations throughout 2012. Although the Task Force made every effort to reach consensus on the recommendations whenever possible, not all members agree with all of the recommendations. Some member's opposition to recommendations is duly noted in the report. However, the report does not capture all of the various views and positions of all the members and / or the organizations they represent.

1.1 Purpose of the Task Force

In recognition of the challenges and opportunities surrounding energy use in Vermont, the *2011 Comprehensive Energy Plan* recommended that the Department of Public Service create and facilitate a task force to provide recommendations that will ensure an integrated and comprehensive statewide, whole-building approach to thermal energy efficiency. The intention of the *Plan* was that recommendations from the task force put Vermont on the path toward meeting the goals set forth in the Energy Efficiency and Affordability Act:

1. *Improving the energy fitness of 25% of the state's housing stock by 2020 (approximately 80,000 housing units).*

2. *Reducing annual fuel needs and fuel bills by an average of 25% in housing units served.*
3. *Reducing total 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.*
4. *Saving Vermont families and businesses a total of \$1.5 billion on their fuel bills over the lifetimes of the improvements and measures installed.*
5. *Increasing weatherization services to low-income Vermonters by expanding the number of units weatherized, or the scope of services provided, or both.*

Beginning in March 2012, the Public Service Department administratively created the Thermal Efficiency Task Force, with the following charges:

1.1.1 Program / services assessment

Building on the work accomplished in the *2011 Comprehensive Energy Plan* and related recent reports and efforts, the Task Force will first work to clearly identify: (1) all current market actors delivering thermal efficiency services; (2) programs providing incentives and technical assistance; and (3) the interrelatedness of electric and thermal efficiency measures and services. The assessment will also consider the following:

- Whether all consumers / market sectors (including low- and middle-income consumers, renters, historic building owners, small businesses, etc.) are being adequately addressed through the existing programs / services.
- The current level of integration and coordination between LIHEAP and the state Weatherization program, and recommendations for improving the delivery of whole-building efficiency services to LIHEAP recipients.
- Potential for integrating delivery of thermal energy efficiency with encouraging the increased use of renewables for heating (such as biomass and geothermal systems).
- Where Vermont currently stands, relative to the statutory goals for improving the energy efficiency of Vermont homes and other buildings.
- The relationship between electric and thermal efficiency measures to ascertain electric savings gained from implementing thermal efficiency measures, and vice versa.

1.1.2 Program delivery and coordination development / improvement

The Task Force will address consumer barriers and develop recommendations designed to achieve, from a customer's point of view, a smooth "one-stop" approach to energy efficiency projects. Examples of activities in this area are:

- Developing a plan to address any major gaps in the consumer / market sectors.

- Developing a Coordination, Outreach, and Training plan to ensure that information and adequate training are accessible to energy service providers in a timely, ongoing fashion.
 - Assess how current and potential energy service providers, including local fuel dealers, can best be encouraged to fully participate in existing thermal efficiency programs / incentives.
 - Assess what contractors, fuel dealers, and other small business or self-employed Vermonters need so that they can offer efficiency home improvement services and to adequately increase the pace of completed energy efficiency projects (training in whole-building performance services, business planning, sales and marketing skills, etc.).
 - Identify geographic areas of the state that lack effective programs or an adequate number of service providers, and develop a plan to build that capacity where needed.
- Mapping out a clear, simple process that service providers can implement and consumers can follow to quickly and easily make energy efficiency improvements to their buildings, from assessment through financing and implementation. This should include consideration of various consumers—low-income, middle-income, and small business, for example—having different points of entry and / or program support, and should ensure that, from an individual customer’s point of view, the process is smooth, even though multiple program types and deliveries exist.
- Designating a central location, through a coordinated website perhaps, to be the statewide repository for information and advice on all programs / services available in the state.

1.1.3 Financing and funding assessment

The Task Force will make recommendations regarding the level of money needed to achieve the State’s thermal efficiency goals, and will identify appropriate financing mechanisms and funding sources. Examples of activities are:

- Considering the mix of funding vs. financing needs for various fuel types and market segments—e.g., low-, moderate-, and high-income; institutional; renters.
- Exploring potential financing mechanisms, recommending and prioritizing which ones should be pursued, and creating a plan for doing so, including:
 - Utility on-bill financing
 - Energy-efficient mortgages
 - Property assessed clean energy (PACE) districts
 - Public-purpose energy savings company
- Investigating other private financing options.
- Identifying all current and possible funding sources, including any and all taxes, and recommending what sources should be pursued and at what level, balanced with financing options.

- Investigating steps necessary to better incorporate a buildings' efficiency into traditional lending considerations.

1.1.4 Measurement and tracking development

The Task Force will investigate and recommend systems to measure progress, track results and benefits, and develop interim benchmarks to meet the state's building efficiency goals. Examples of activities in this area are:

- Recommending a designated entity to be responsible for tracking progress and making the information publicly available.
- Developing a tracking process to ensure the State will have an accurate count of how many buildings have been improved, and an accurate picture of the extent and cost / benefits of those improvements.
- Developing a timeline for meeting the State's building efficiency goals.

An extensive set of stakeholders and experts in thermal energy efficiency were invited to join the Task Force. The Task Force formed seven subcommittees to focus on particular market segments and specific topic areas:

Energy Service Providers	Renewable Energy
Residential	Funding and Finance
Multifamily	Planning and Measurement
Commercial and Industrial	

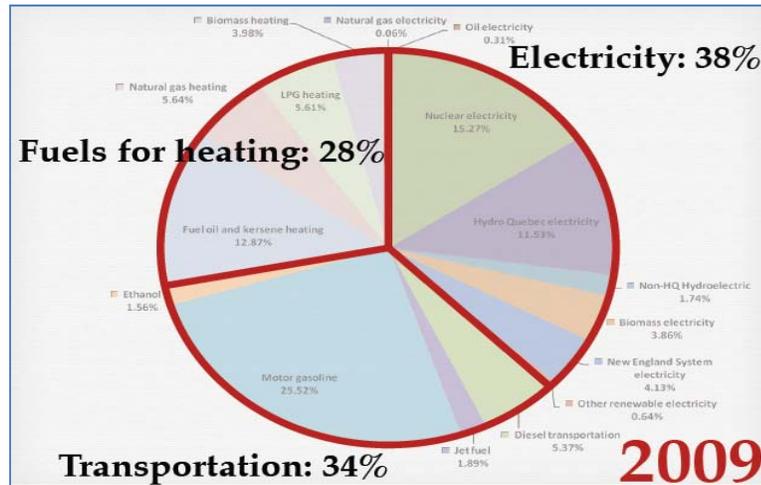
Some Task Force members participated only in the subcommittees, but most also participated in the seven full Task Force meetings that were held between March 2012 and January 2013. In addition, the Subcommittee Chairs formed a group to provide coordination between the subcommittees and to address cross-cutting recommendations. The Task Force is composed of 65 members from nonprofits, utilities, state government, trade associations, and the private sector.

1.2 Historical Perspective on Energy Efficiency

The building efficiency goals (10 V.S.A 581) reflect a recognition that Vermont's consumption of fossil fuels for thermal energy creates challenges to energy affordability and challenges in meeting greenhouse gas goals. Unlike costs in regulated industries, the cost for most fuels used to heat Vermont homes and businesses are not shared among a defined and closed group of ratepayers. Thus, customers using fuel oil, propane, and kerosene have had limited access to thermal efficiency services to assist them in reducing their heating costs. This section describes the amount of fossil use by sector and the progress of efficiency services to date. It also presents an assessment of the impact the policies and programs recommended in this report will have in reaching Vermont's energy goals.

1.2.1 Vermont's thermal energy consumption and costs

Thermal energy use in buildings accounts for approximately 28% of Vermont's total energy consumption. This thermal use is largely from fossil fuels: fuel oil, kerosene, natural gas, and propane. Biomass (cord wood and pellets, and wood chips in some commercial applications) makes up a relatively small portion of the thermal energy use in Vermont, as shown in **Figure 1**.



Source: Department of Public Service

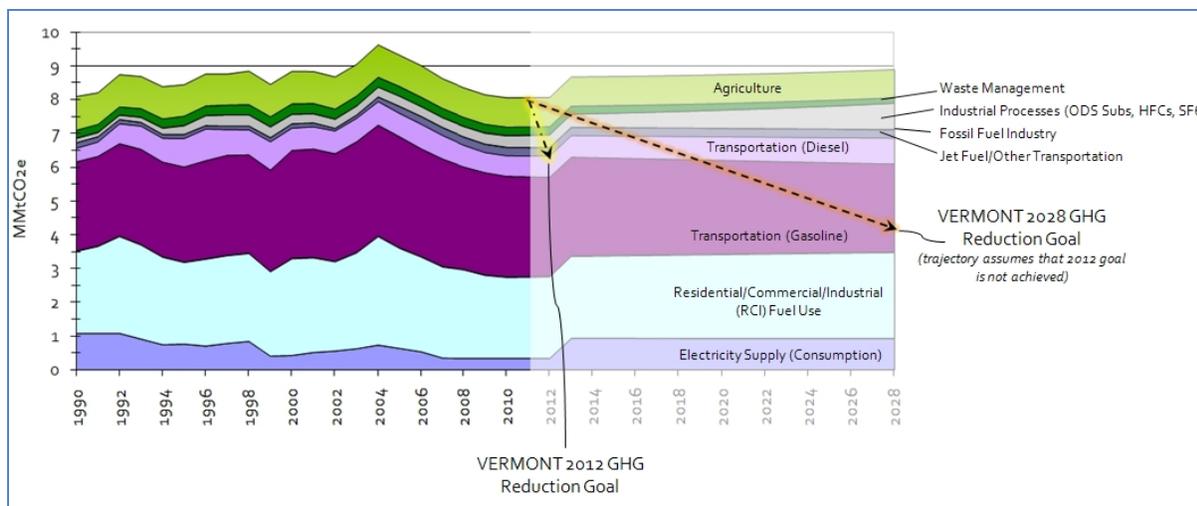
Figure 1. Vermont's 2009 energy mix

It is important to note that this thermal use is the second-largest contributor to Vermont's greenhouse gas emissions. The Governor's Commission on Climate Change in 2007,⁷ and reiterated by the Regulatory Assistance Project's "Affordable Heat" reports,⁸ recognize that curbing greenhouse gas emissions require significant reductions in fuel use in residential and commercial buildings. As shown in **Figure 2**, actions need to be taken in all sectors to meet the state's greenhouse gas goals. The recommendations outlined in this report will put Vermont on a trajectory towards the thermal fuel use portion of those goals.⁹

⁷ Vermont Governor's Commission on Climate Change, *Report and Recommendations of the Governor's Commission on Climate Change*, October 2007.

⁸ Most recently, Regulatory Assistance Project, *Affordable Heat: Whole-Building Efficiency Services for Vermont Families and Businesses*, June 2011.

⁹ Vermont's GHG reduction goals were established under Executive Order #07-05 and written into law by the Vermont Legislature as Act 168 of the 2006 Session.



Source: Agency of Natural Resources, as presented in the Vermont 2011 Comprehensive Energy Plan

Figure 2. Vermont’s historical greenhouse gas (GHG) emissions, GHG reduction goals, and draft forecast of future GHG emissions

Vermont’s consumption of unregulated liquid fuels across sectors has not significantly changed in the last 20 years, despite a slow trend of increasing population. This suggests that Vermont homes and business have become more efficient in how they consume energy. Indeed, improvements in heating equipment efficiency and new construction practices have reduced per-unit energy consumption in Vermont buildings. As equipment baseline efficiency standards improve, so does the efficiency of buildings. In addition, general energy awareness and individual efforts (outside any program) have led to increased installations of insulation and other thermal efficiency measures in homes and businesses, through fuel dealers and other players in the energy improvement market. Finally, some Weatherization and other thermal efficiency programs have made an impact. However, as these improvements have been made, fuel costs have increased. Meeting the goal to improve 80,000 units with at least a 25% reduction in energy consumption and energy bills will take significant future effort.

The U.S. Energy Information Administration (EIA) forecast of energy prices in 2012 indicates a long-term average annual increase of approximately 1% for all fuels prices, on top of inflation, as their “reference case.” This forecast is long term, and does not reflect the volatility generally associated with fuel prices. In some years the price might be slightly lower; in others, the price might be higher. The EIA forecast is used as the source document for the estimated savings in this report.¹⁰

Approximately \$600 million in retail heating fuel, including natural gas, was sold in Vermont in 2010. A significant portion of those dollars flowed not just out of Vermont, but out of the

¹⁰ Energy Information Administration, *Annual Energy Outlook 2012*, June 2012.

United States. Increases in thermal efficiency that are estimated to result from this report's recommendations will mitigate the effects of volatile or increasing fuel costs, while also keeping those dollars within Vermont. As described in the section, **The Real Value of Thermal Efficiency and Renewables**, savings from the new, incremental investment recommended in this report will provide \$1.4 billion in net benefit to Vermont families and businesses, and result in a \$1.47 net benefit to Vermont's Gross State Product for every \$1.00 invested.

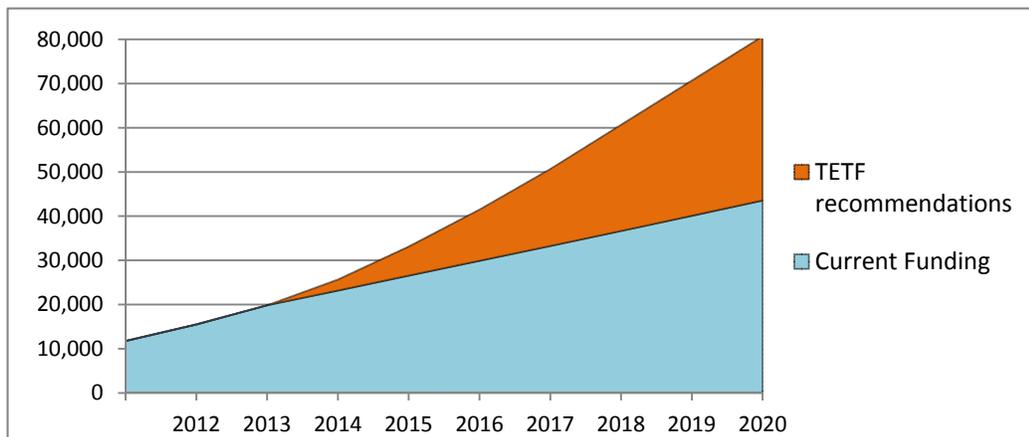
1.2.2 Overview of existing thermal efficiency services

Vermont has made progress in developing whole-building efficiency services, for both households (low-income and non-low-income) and businesses and institutions across the state. This expansion of services is in addition to the "out-of-program" activity.¹¹ Even with no additional funding, some households and businesses will continue to receive services through existing programs such as those offered through WAP, VGS, and Efficiency Vermont. An overview of these existing programs is provided in **Appendix 1**.

Notably, it is expected that natural gas customers will continue to have access to energy efficiency services through their regulated utility. Those services currently target large energy users. The incremental funding recommended in this report does not include estimates for additional program funding for natural gas.

Funding for thermal efficiency services is especially constrained for unregulated fuels customers, despite the presence of existing Weatherization, Efficiency Vermont and Vermont Gas programs. The problem is exacerbated for low-income Vermonters, because federal funding through the American Recovery and Reinvestment Act has come to an end, and the U.S. Department of Energy's funding of Vermont's Weatherization Assistance Program has been reduced to zero. However, these programs have a sound delivery structure, and with the acquired savings, the Task Force has a firm understanding of how these programs can work successfully. That understanding has informed the recommendations for improvements to this type of service delivery. If Vermont does not implement the recommendations made in this report, it will fall well short of the State's building energy goals for comprehensively serving 80,000 households. Further, ignoring the recommendations will risk the loss of the well-developed pool of trained, experienced service providers. **Figure 3** shows the estimated number of residential units that will be served under the current funding structure and capacity. Briefly, if the State does nothing to change the status quo, it will reach barely half of its target by 2020.

¹¹ The Public Service Department was unable to obtain or derive a value reflecting out-of-program activity occurring in the state. As a result, this report cannot quantify this category. The section on Planning & Measurement makes recommendations that would lead to better understanding of the amount of non-program activity occurring in Vermont.



Source: Department of Public Service

Figure 3. Estimated Cumulative Households Served - Current Funding and TETF Recommendations to Meet State Goals

With the recommendations in this report, the 80,000 housing unit goal—along with the goals for comprehensiveness, fossil fuel savings, and overall bill savings—will be achieved by 2020. Meeting these goals will provide real economic value to Vermont.

1.2.3 The real value of thermal efficiency and renewables

The recommendations outlined in this report are expected to provide significant economic benefits that can be tallied in several different ways:

- A total of \$2 billion (net present value [NPV]) of benefits by directly reducing Vermonters' billed heating costs over the lifetimes of the efficiency and renewable energy measures installed, including current and recommended programs. The total program benefit-to-cost ratio (involving a combination of current funding levels and recommended incremental funding, via private and public sources) is 2.23 to 1. It is important to note that the value of public investments increases when combined with these other sources: \$6.40 in benefits is provided for every \$1 in public investment, as shown in **Table 1**.
- Over \$1.4 billion of the total \$2 billion in benefits result from the new, *incremental* efficiency and renewable investments recommended by the Task Force. The direct benefit-to-cost ratio from the recommended thermal efficiency programming (based on private and public costs) is 2.05 to 1, and \$6.18 in overall benefits is provided for every \$1 in public investment.
- A total NPV benefit of \$927 million through efficiency investments alone (not including renewable energy). The direct benefit-to-cost ratio from this programming (private and public costs) is 2.59 to 1; with \$5.57 in overall benefit is provided for every \$1 in public investment.

Table 1. Economic benefits estimated from Thermal Efficiency Task Force recommendations

Programming Combination	Net Present Value of Benefits	Benefit-to-Cost Value of all Investments	Benefit-to-Cost Value of Public Investments
Total renewable and efficiency initiatives (via current and recommended incremental funding)	\$2 billion	\$2.23 to \$1.00	\$6.40 to \$1.00
Incremental renewable and efficiency initiatives, per TETF recommendations	\$1.4 billion	\$2.05 to \$1.00	\$6.18 to \$1.00
Incremental efficiency initiatives alone, per TETF recommendations	\$927million	\$2.59 to \$1.00	\$5.57 to \$1.00

In addition to the economic returns on investment described in **Table 1**, the recommendations for incremental programs are expected to:

- Result in an increase in Gross State Product of \$1.47 for every \$1.00 invested.¹² Implementation of incremental energy efficiency programs alone are expected to result in an increase in Gross State Product of \$1.80 for every \$1.00 invested, as shown in **Table 2**.
- Result in a net increase of nearly 800 job-years within Vermont’s economy.¹³
- Prevent 6.8 million tons of carbon dioxide-equivalent emissions from entering the atmosphere, over the lifetime of these investments. This reduction in CO_{2e} emissions is equivalent to the production from a coal fired power plant for 1.7 years, or taking 1.26 million passenger vehicles off the road for one year.¹⁴

¹² The PSD estimated the long-term economic impacts of incremental thermal efficiency programs, as recommended by the Task Force; the Department used the Vermont PI+ model developed by Regional Economic Models Inc. (REMI). This model is used throughout the United States to capture and measure effects on the national and / or regional economy from changes in economic inputs and costs. REMI has baseline forecasts of economic activity that are calibrated to the Vermont economy. Changes in economic activity represent “policy changes” that affect the trajectory of the state economy. In this study, such changes relate to consumer spending; to household and business energy costs; and to additional commercial activity and industry demand associated with thermal energy efficiency investments. The model also captures the statewide savings from reduced thermal energy expenditures.

¹³ One job-year is equal to one job lasting for one calendar year.

¹⁴ Calculated using Environmental Protection Agency carbon calculator. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>. Benefits to Vermont’s economy from reductions in carbon dioxide emissions were not monetized for this report.

Table 2. Additional benefits from Thermal Efficiency Task Force recommendations

Indicator	Benefit
Gross State Product – all incremental programs	\$1.47 for every \$1.00 invested
Gross State Product – incremental efficiency programs only	\$1.80 for every \$1.00 invested
Net job-years – all incremental programs	793
Tons of carbon dioxide equivalent saved – all incremental programs	6.8 million tons

Although these estimates are based on projections, they are rooted in many years of independently monitored and verified results from Vermont’s existing programs. Vermont electric energy and gas efficiency programs and the Weatherization Assistance Program full documentation on the cost-effectiveness of energy efficiency investments. Burlington Electric Department and Efficiency Vermont’s electric efficiency programming has been successful enough since 2007 to enable the efficiency utilities to sell back their electric energy efficiency savings to the regional grid as a revenue-generating demand resource—providing capacity to the grid from energy *not* used, just as power suppliers provide capacity to the grid to meet the expected demand.

1.3 Concurrent Efforts

In addition to this Task Force, many concurrent efforts have been and are under way through organizations that informed the Task Force’s work:

- Energy Action Network - *Mobilizing Capital to Transform Vermont’s Energy / Economy*
- Energy Futures Group and Grasteu Associates, who conducted interviews with Vermont home performance contractors & fuel dealers
- PSD process and impact evaluation of VGS and Efficiency Vermont thermal efficiency retrofit programs
- Market research on barriers to and motivators for energy efficiency home improvements, funded by the High Meadows Fund, in partnership with PSD and Efficiency Vermont
- As a Better Buildings grantee of the U.S. Department of Energy, NeighborWorks of Western Vermont (NWWVT) contracted for an evaluation of its Heat Squad program in Rutland County

1.3.1 Energy Action Network

The Energy Action Network (EAN), consisting of more than 40 leaders from private, nonprofit, and public-sector organizations involved with energy in Vermont, produced a report on the capital needed to achieve EAN’s goal of meeting 80% of the state’s 2030 energy needs, via increased efficiency and renewable sources. EAN commissioned the report, *Mobilizing Capital to Transform Vermont’s Energy / Economy*, releasing it in October 2012. Members of EAN participated actively in subcommittees, including the Finance & Funding Subcommittee. That

body drew directly from the network's analysis and findings to inform its discussion and recommendations regarding thermal efficiency finance options.

1.3.2 Interviews of home performance and heating industry professionals

In July 2012, the High Meadows Fund released a report reflecting the perspectives of home performance professionals and other residential contractors and heating industry professionals. Grasteu Associates and the Energy Futures Group conducted the interviews that informed the report. The goal was to learn more about the barriers and opportunities related to the residential energy improvement professionals and the heating industry professionals, as Vermont charts a path to achieve the 80,000-homes goal.¹⁵ The findings and conversations from this report informed the work of the Task Force, in particular, of the Energy Service Providers Subcommittee.

1.3.3 PSD process and impact evaluation of thermal efficiency programs

The PSD has contracted with GDS Associates for an evaluation of the energy efficiency retrofit programs serving Vermont's single family existing buildings market. The primary purpose of this study was to separately evaluate and verify the impact of Efficiency Vermont's Home Performance with ENERGY STAR program and Vermont Gas System's Home Retrofit program. The evaluation covers thermal energy efficiency programs for both regulated and unregulated heating fuels for program years 2008, 2009 and 2010. The goal of the impact evaluations is to develop independent estimates of program savings and to compare those evaluation results with internal program savings projections as well as to provide suggested mechanisms for adjusting future savings projections as necessary. The goal of the process evaluations is to identify recommendations for increasing participation rates and average savings per participant.

1.3.4 Market research

The High Meadows Fund is supporting market research, conducted by GDS Associates, that surveys program non-participants to understand why they have not participated in residential thermal efficiency retrofit programs. This market research is being funded in partnership with Efficiency Vermont and the PSD, with input from other key providers. The goal of the market research is to identify strategies for lowering those barriers and for motivating more single-family households to improve the energy efficiency of their homes.

¹⁵ Interviews with Vermont Home Performance Contractors and fuel dealers, conducted by Richard Faesy (EG) and Chris Granda (Grasteu) for the High Meadows Fund, July 27, 2012; <http://www.highmeadowsfund.org/storage/research/HMF%20Fuel%20Dealers%20-%20HP%20Contractors%20Interviews%20Report%20%207-27-12%20v3.pdf>

1.3.5 NeighborWorks of Western Vermont

NWWVT contracted with The Cadmus Group Inc. for an evaluation of its NeighborWorks HEAT Squad program which has a goal to improve the energy efficiency of 1,000 homes in Rutland County over a three-year period. The evaluation is to inform two areas of interest: program impact and cost-effectiveness that is relevant to energy efficiency and housing organizations to then be applied to other regions of the state, and nationally.

2. Task Force Considerations and Process Recommendations

To address the various elements of the PSD's charge to the Thermal Efficiency Task Force, the group divided its work among seven subcommittees: Residential Single-Family; Multifamily; Commercial and Industrial; Energy Service Providers; Renewables; Measurement and Evaluation; and Finance and Funding. Each subcommittee conducted an in-depth review of thermal energy service delivery in its market segment, and developed a comprehensive set of recommendations to improve the thermal energy profile of Vermont's homes and businesses. This section directly presents the recommendations of the subcommittees. In developing these market sector reports, the subcommittees became aware that each of them was working under a similar set of core principles. These are described in **Section 2.1**. Also, some recommendations were common to multiple subcommittees, and / or crossed multiple sectors. These have been separately identified as cross-cutting recommendations in this report.

Each sector presents a description of its corresponding savings goals, relative to Act 92, along with background characterizations of thermal energy used by the market segment. Each sector also provides a discussion of identified gaps between current services and what would be needed to meet the goals for the sector; and recommendations for improvements to existing services, with suggestions for coordination, policy, and programming. Summaries of current policies and programs are provided for some sectors; detailed information regarding current programs in the Residential, Multifamily, and Commercial and Industrial subcommittees is included as **Appendix 1**.

The funding and financing levels and mechanisms needed to fully implement the recommendations are described in **Section 3.4**.

2.1 Core Principles

The subcommittees quickly recognized that they were working under a common set of core principles to guide their work. Subcommittee chair persons soon jointly articulated these core principles and used them to stay on track with their respective recommendations so that a cohesive portfolio of recommendations would result. These core principles are:

1. **Recommendations should present voluntary, mandatory, and celebratory approaches.** A combination of carrot, stick, and tambourine is needed to accelerate the pace of building energy

infrastructure improvements in Vermont. The carrot represents voluntary approaches for customers (incentive and financing programs); the stick represents mandates and regulatory approaches (code compliance, for example); and the tambourine represents the importance of education, marketing, leadership, and a social movement to drive energy improvements.

- 2. Recommendations should balance maximizing the societal net benefits of energy savings at the least cost with the delivery of equitable benefits to all Vermonters.** Recommendations should support the development of the private market for cost-effective energy efficiency services—and in doing so, seek to minimize the public expenditures necessary to meet State goals. However, certain customer segments such as low- and middle-income Vermonters might merit ongoing public funding to pay for programs and services designed to overcome specific barriers to energy improvements. Other sectors, such as buildings that serve public purposes (schools, municipal buildings, etc.) might merit a higher level of public investment commensurate with the potential benefits to taxpayers.
- 3. Recommendations should coordinate seamlessly with programs serving the new construction sector.** The Task Force was charged with developing solutions to comprehensively retrofit existing buildings. However, to meet the State’s long-term goals, programs addressing new construction and major additions or renovations should be provided in close coordination with retrofit offerings.
- 4. Recommendations should include strategies to ensure that customers receive consistent, consumer-friendly service that leads to comprehensive improvements.** Available programs and services from all providers should be integrated to the extent that when customers enter the system—whether through a contractor, fuel dealer, or program—they receive recommendations to comprehensively improve their home over time and are able to proceed smoothly from start to finish through the process. To facilitate the most rapid, inclusive uptake of energy improvements, it is essential to create a clearinghouse to meet Vermonters wherever they are in the thermal energy awareness and investment spectrum, and connect them with appropriate programs and services. Ensuring that Vermont residences and businesses make whole-building energy improvements, from efficiency retrofits to renewable energy installations, will require compelling case-making, easy access to programs, and a seamless path through the process.
- 5. Recommendations for achieving the building goals articulated in Act 92 should also lay the foundation for achieving the State’s long-term goals for energy and greenhouse gas emissions.** Vermont should set the stage for a sustainable energy future by setting long-term goals that achieve the *Comprehensive Energy Plan* goal of 90% of the state’s energy supply coming from renewable energy sources, across all sectors, by 2050,¹⁶ as well as the greenhouse gas emission

¹⁶ *Comprehensive Energy Plan*, 2011. <http://www.vtenergyplan.vermont.gov/>.

reduction goals of 50% by 2028 and 75% by 2050. Building on this framework, the State should develop interim goals and benchmarks to achieve these long-term goals, including progress milestones on thermal efficiency and thermal renewable energy deployment.

2.2 Cross-cutting Recommendations

The Residential, Multifamily, Commercial and Industrial, Renewable Energy, and Energy Service Provider subcommittees independently developed recommendations that applied across more than one, if not all, sectors. Those areas that have common characteristics are summarized in the following sections. Details regarding how these cross-cutting recommendations relate to each sector are included in the relevant sections.

2.2.1 Coordinated clearinghouse

Vermont homeowners, property owners, businesses, and the public sector will all be targeted as participants in retrofit efforts associated with the program recommendations throughout this Task Force report. Currently, multiple entities are active in the marketplace delivering thermal efficiency programs: Efficiency Vermont, Vermont Gas Systems (VGS), Burlington Electric Department (BED), Weatherization Assistance Program (WAP), Renewable Energy Vermont (REV), regional partners, contractors, and others. No single clearinghouse for customer information yet exists.

Vermont has already taken some significant steps to address this issue for electric efficiency programs. The creation of Efficiency Vermont in 2000 consolidated all of the 20-plus distribution utility electric efficiency programs (with the exception of BED), thus enabling a single point of contact (website, toll-free number), and for consistent programming that is equitably implemented across the state. Efficiency Vermont's scope was expanded in 2008 to include thermal efficiency services to most customers in the state (with the exception of regulated natural gas customers who are served by VGS, and income-qualified customers served by the Weatherization Assistance Program).

Both Massachusetts and Connecticut have only just recently tackled the issues of splintered program delivery and the lack of a single brand. In Massachusetts, the six electric utilities¹⁷ and six gas utilities¹⁸ now operate statewide efficiency programs under the MassSave brand, with a single website and toll-free number. Connecticut moved its programs (operated by two electric and three gas utilities) into the Energize CT unifying brand, with a single, statewide website and portal into those programs. At the same time, all of the utilities are coordinating an effort to

¹⁷ Five electric distribution utilities and one municipal aggregator

¹⁸ Collectively termed the *Program Administrators*

offer consistent programs statewide. This effort enables much more effective customer messaging and an easier way for customers to participate.

Achieving that level of coordination would be more challenging in the Vermont context because of the differences in mechanisms for providing thermal efficiency services. Although thermal energy customers in Massachusetts and Connecticut are served with a larger proportion of regulated natural gas, Vermont thermal customers are predominantly served by unregulated fuels such as oil and propane. An approach more tailored to Vermont's circumstances might feature a statewide information clearinghouse to enable effective access for customers and effective coordination across programs. This mechanism would build on the Vermont tradition of close coordination among programs (for example, Efficiency Vermont, VGS, and BED work extensively to make program offerings, eligible measures, etc., as consistent as possible).

Implementation of such a clearinghouse in Vermont should enable:

- *Easy customer entry into programs.* A telephone hotline and website for consumers interested in making energy infrastructure improvements should be designed to help customers determine whether they are good candidates for energy upgrades; to provide independent, technology-neutral and impartial advice; and to direct qualifying customers to an appropriate program.
- *Centralized tracking and information-sharing.* A managed central information system should help partners, contractors, and customers keep track of all available rebates, incentives, financing options, and other program services.
- *A list of qualified energy service providers.* Customers should be able to easily find and contact energy service providers, such as certified or otherwise qualified Building Performance contractors, heating service companies, and renewable energy system installers. Service providers can also use this list to identify potential business partners for comprehensive projects.
- *A database of skills and available trainings.* A managed central information system should contain a database providing information as to skills and certification required for specific energy services, as well as options for energy service providers to obtain relevant training and certifications.

2.2.2 Consumer education and marketing

Attaining Vermont's ambitious energy goals requires an education and marketing campaign for all segments of the population. Because Vermonters have a wide array of energy programs available to them, the campaign should promote the basic economic and environmental benefits of the efficient use of energy, and articulate how individual actions contribute to Vermont's ability to reach its overarching goals. The campaign should direct consumers to the coordinated clearinghouse (see **Section 2.2.1**) to guide next steps and identify available and appropriate technical and financial assistance. A successful education and marketing campaign should consider:

- Establishing a clear, well-researched understanding of what Vermonters care about with respect to their home and business energy use, and what motivates them to reduce their energy use.
- Developing a statewide brand that builds on existing marketplace brands. Consideration should be given to how such a statewide brand might interact with and / or leverage the state-owned Efficiency Vermont brand.¹⁹
- Message and delivery mechanisms (print, social media, and radio or television ads) targeted to specific audiences. These audiences might be in the commercial and industrial sector, and / or in the residential, multifamily, low-income, service provider, retailer, and distributor sectors. The media could be myth-buster flyers for do-it-yourselfers, via retail home improvement or hardware stores; cooperative marketing materials to support fuel dealers and contractors; and commercial building benchmarking information.
- Using disruptive, edgy marketing, to attract attention and shift social norms.²⁰
- Messages and behavior modeling by recognized and respected leaders—for example, when a public figure completes a home retrofit, make a story of it.
- A community-based social marketing campaign with visible cooperation from regional partners, including homeownership centers, town energy committees, civic groups, faith-based partners, and human services delivery systems.

Developing a statewide marketing strategy is a high priority, but its implementation needs to be coordinated with other TETF recommendations so that services can be delivered as promised, once elements of the campaign are implemented.

2.2.3 Training

As market demand for efficiency work increases, Vermont’s energy service providers will need to broaden their skill base and capacity to support a ramp-up of energy efficiency work to the level needed to achieve the State goals. **The availability and pace of training Vermont’s workforce should be in lockstep with the demand for services.** Training courses should be delivered primarily through existing Vermont educational institutions and training organizations such as Vermont Technical College, Vermont Green, the Vermont Fuel Education Center, and the network of Technical Centers.

Each type of energy service provider has a specialized set of technical training and certification requirements. For example, Building Performance contractors must be certified by the Building Performance Institute (BPI), and oilheat service technicians must hold National Oilheat Research Alliance (NORA) Silver or Gold certification. Service providers and training organizations should

¹⁹ 75% of Vermonters associate Efficiency Vermont with efficiency in the home, according to 2012 Efficiency Vermont internal market research.

²⁰ See, for example, the Shelton Group’s *Wasting Water Is Weird* campaign: <http://www.wastingwaterisweird.com>.

work together to ensure that the relevant technical training is sufficiently available to meet the growing demand for energy services. Technical training should include applicable energy codes and health and safety protocols.

In addition to the technical skill areas, Vermont's energy service providers will also need training in business development and customer service skills. Programs and service providers should collaborate to develop trainings that involve the following components: developing comprehensive energy plans for customers that include all systems (building envelope, mechanical systems, and renewables); understanding the available customer programs and funding options; best practices for customer service, marketing, and sales to increase the closure rate; and support with business development planning.

2.2.4 Increase energy code compliance for additions, repairs, and renovations consistent with new construction compliance

With the adoption of new Vermont energy codes (in October 2011 for the Residential Building Energy Standards [RBES] and January 2012 for the Commercial Building Energy Standards [CBES]), the codes now apply to all building additions, repairs, and renovations, as well as to all new construction. Although the energy codes are rigorous in terms of technical requirements, Vermont lacks a mechanism to ensure code compliance. The lack of code compliance in both the Residential and Commercial and Industrial sectors means lost opportunities for reducing building energy use. Energy efficiency measures installed at the time of building construction or renovation often result in substantial, cost-effective improvements and might serve buildings not otherwise reached by Vermont's energy programs. In addition, lack of code compliance is a concern for builders and contractors who do comply with code, because as increasingly rigorous energy codes are adopted, the disparity between compliant and non-compliant builders can widen; further, there is a concern within the marketplace that non-compliant builders could undercut the compliant builders on price.

The *Vermont Energy Code Compliance Plan* was commissioned by Public Service Department to address how to achieve at least 90% compliance with energy codes by 2017. The *Plan* set forth training and enforcement programs, and resulted in a system for annual measurement of the rate of compliance.²¹ The *Plan* also prioritized the development of a compliance process and infrastructure for new construction. It contained a recommendation to widen the focus to include initiatives for addressing additions, repairs, and renovations over time, after the mechanisms for new construction were well developed. Lessons learned with new construction can be applied to renovations in existing buildings to some extent, but completely new approaches will also be needed to assure that additions, repairs, and renovation projects comply with the energy code. Vermont should first implement the recommendations of the *Compliance*

²¹ http://publicservice.vermont.gov/energy/ee_energy%20code%20compliance%20plan.html.

Plan for new construction; the second step would be to develop a compliance plan focused on additions, repairs, and renovation projects. While this plan is being developed, the State should continue to educate the construction and real estate industries and town officials about the energy code generally, and specifically the code requirements related to renovations and additions.

2.2.5 Building labeling

All existing buildings that complete efficiency projects should receive visible recognition, in the form of a certificate, label, or medallion, as well as an energy performance score or benchmark that allows for comparison to comparable apartments, homes, buildings and / or to the building's own historic energy consumption. This encourages property owners to participate in thermal efficiency programs, if a building label helps to demonstrate the benefits and effects of energy efficiency. It also provides a way to value the energy efficiency measures if the building is later sold, or in the case of an apartment or commercial rental space, allows prospective tenants to understand the true costs of renting—ultimately increasing demand for those retrofitted, rented spaces.

Due to the differences in building energy use and occupant behavior across market sectors, specific implementation strategies for the label and score should be developed for each (Single-Family, Multifamily, and Commercial and Industrial sectors), but with a common brand to support broad-based education and outreach. For example, a simplified asset rating might be most appropriate for a single-family home, whereas annual benchmarking might be more appropriate for large commercial and industrial buildings. This voluntary approach to building labeling should be evaluated after 3 years, to determine its rate of adoption, impact on the marketplace, feedback from stakeholders, and any evaluations that might have been conducted in other jurisdictions. Based on this assessment, the State should determine whether labeling and disclosure should be phased in as a requirement when a building is put on the market for sale, for example.

2.2.6 Review role and intersection of historic preservation

There are ample opportunities for improving energy efficiency and installing thermal renewable energy systems in and around Vermont's older and historic buildings. However, taking action can seem like a particularly daunting task to owners. These buildings' special historical nature and characteristics must be addressed when performing energy efficiency upgrades and / or adding renewables, which can be challenging and can sometimes add significant costs to the project.

In developing strategies for upgrading the efficiency of the existing building stock in Vermont, including revisions to energy codes and other energy efficiency goals or mandates, consideration

should be given to the potential difficulties and limits for older and historical buildings as well as other types of unique homes.

When providing State support for thermal renewable energy systems on structures over fifty years of age or that involve ground disturbance, the home owners need to obtain approval from the State Historic Preservation Office (SHPO) before proceeding with the installation. This approval can add a disproportionate cost in time and money for the home owner when installing small systems. In particular, the need for archeological review for small residential ground-mounted systems seems to be an inefficient use of resources when so little ground is being disturbed.

Due to these challenges, the Task Force recommends that a working group of the PSD, the Office of Economic Opportunity (OEO), the Agency of Commerce and Community Development (ACCD), and other relevant stakeholders be formed to develop a package of energy measures that are cost-effective and appropriate for historical buildings. The Task Force also recommends that ACCD consider developing a larger threshold for ground disturbance than is currently allowed; the current threshold triggers the need for SHPO review for small-scale residential renewable energy projects.

2.3 Energy Service Providers

Achieving Vermont's building efficiency goals will require programs and financial mechanisms to address the Residential, Multifamily, and Commercial and Industrial market sectors. The success of the efforts will depend on the businesses that provide the energy efficiency and renewable energy services. Vermont will rely heavily on the network of energy service providers to identify, sell, and implement comprehensive energy improvements.

There are four major categories of Energy Service Providers in Vermont, each with a different customer offering, but all critical to the process of delivering comprehensive energy solutions:

1. **Building performance auditors and contractors.** These companies provide energy audits and energy efficiency improvements, primarily focused on the building envelope. For residential and small businesses, examples are the contractors who participate in Efficiency Vermont's Home Performance with ENERGY STAR® and building performance programs. Large-scale Commercial and Industrial audits are often performed by third-party consultants following ASHRAE Energy Audit Levels 1 and 2.²²

²² ASHRAE is the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. It has established procedures for commercial building energy audits. It offers professional certification programs in building energy assessment, modeling, commissioning processes, and other skills. www.ashrae.org.

2. **Heating service companies.** These companies provide sizing, tuning, and installation of heating equipment for unregulated fuels of all types, including oil, propane, and wood pellets. Some also provide services for regulated natural gas. Many of these companies also deliver heating fuels to end use customers (oil, propane, diesel, kerosene, and pellets). Examples are HVAC contractors and fuel dealers.
3. **Regulated natural gas providers.** As a regulated utility, Vermont Gas Systems (VGS) delivers natural gas via pipeline and provides service for heating, ventilation, and air conditioning (HVAC) equipment and water heaters. Through its energy efficiency programs, Vermont Gas also offers rebates and financing for efficiency projects that reduce natural gas use for Residential and Commercial and Industrial customers.
4. **Renewables installers.** These companies provide sizing and installation services on renewable systems for heating and hot water (typically solar thermal, biomass, and geothermal). Many companies offer services in multiple categories (for example, heating service companies that deliver pellets, and Building Performance contractors who install renewables). Few, if any, offer all services. It is important to note that the ability to offer effective, comprehensive solutions to customers will depend on the extent to which partnerships are formed among the different energy services.

The purpose of the Energy Service Provider Subcommittee is not to define energy efficiency programs and initiatives, but rather to explore the actions and systems needed to best build and support an energy service industry in Vermont so that it can be capable of delivering the comprehensive retrofits needed to reach the defined goals. In this way, the subcommittee's work supports the Residential, Multifamily, and Commercial and Industrial subcommittee recommendations and enables their respective success.

The Energy Service Provider Subcommittee has been tasked with identifying ways to support the efforts of heating service and building performance companies and contractors. To help Vermont buildings become more energy-efficient, it is important to identify the scope of activity in the thermal energy efficiency marketplace.

As different programs and initiatives are developed, two core elements must exist so that the Energy Service Provider network can grow and thrive. These fundamental elements are:

- **Positive value proposition.** Energy efficiency services must provide a benefit for customers and offer a sustainable livelihood for the energy service providers.
- **Workforce development.** Vermont must be able to provide training in the knowledge and skills required to perform comprehensive energy services and have a sufficient number of contractors and businesses to support the growing demand.

The Energy Service Provider Subcommittee would like to acknowledge that many of the recommendations reflect ideas derived from solid research efforts by several organizations. In particular, the market research sponsored by the High Meadows Fund provided substantial and important insight into some energy service provider segments of activity, and offered several appropriate recommendations.

In addition, several of the recommendations are already being implemented. Most notably, the Vermont Fuel Dealers Association (VFDA) recently collaborated with Efficiency Vermont and the newly formed building performance Professionals Association (BPPA) to hold regional meetings to encourage fuel dealers to diversify their services to become whole-home energy providers. Another purpose of these meetings has been to promote business partnerships between heating fuel dealers and Building Performance contractors.

2.3.1 Background and context of the subcommittee's recommendations

Given the increase over the past five years in the price of home heating fuel, the consumer has become more focused on energy efficiency. This is evident in the number of heating systems that have been upgraded or replaced in the same period, as well as in the decrease in consumption of heating fuel over the past 30 years.

Based on industry estimates, the typical heating service company each year replaces the heating equipment in approximately 2% of the homes they serve. On just the oilheat side, that represents (conservatively) 2,500 homes per year in Vermont. The average initial oil savings for these replacements is approximately 20%, according to research by Brookhaven National Laboratory (overseen and primarily funded by the U.S. Department of Energy's Office of Science **Figure 4** shows a decline in residential heating oil consumption.

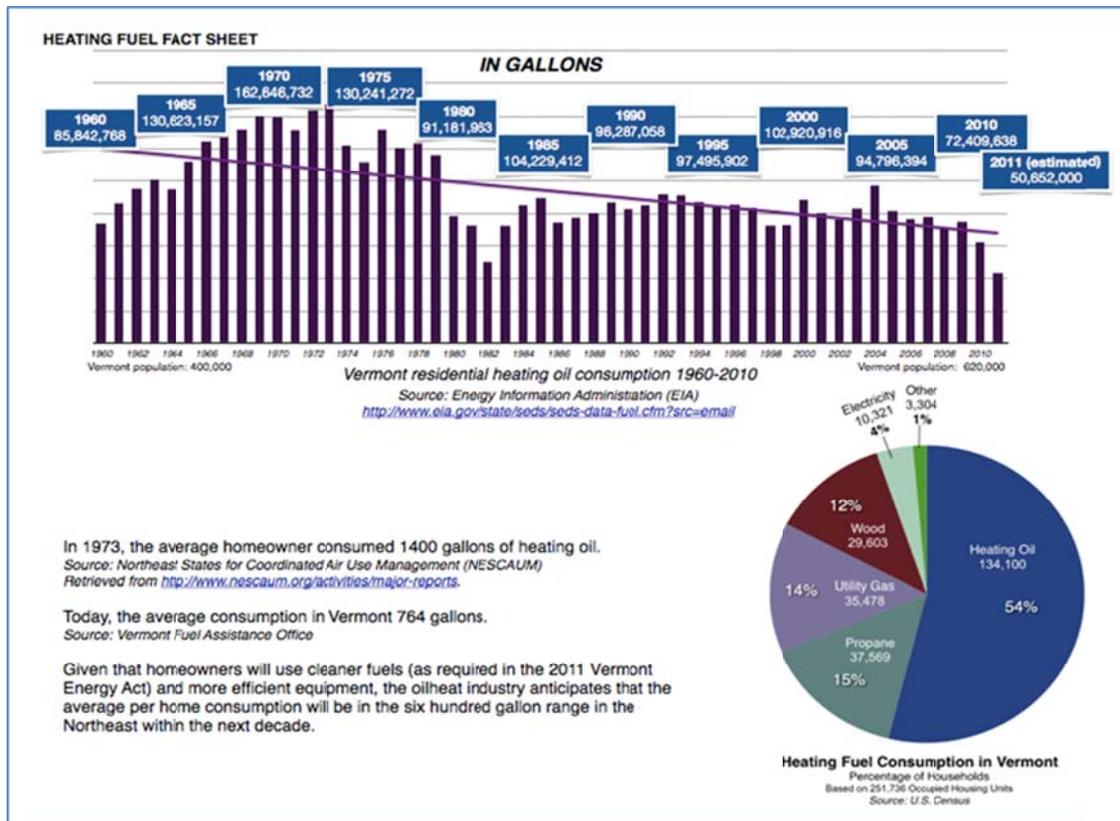


Figure 4. Vermont residential heating oil consumption 1960-2010, and characteristics of heating fuel consumption in Vermont

These data provide a sound foundation for assessing the progress of the 80,000-home retrofit goal set forth in Act 92, the energy efficiency and affordability legislation signed by Governor Jim Douglas in 2008. The data also indicate the extent of the opportunity for offering more efficiency services to Vermonters. Unlike a roofing company that a home owner might contact once every 20 years, a heating service company has ongoing and relatively frequent customer relationships. Heating service companies generally offer services 24 hours a day, seven days a week. Those that also sell heating fuel have multiple points of contact with the customer throughout the year. Developing systems using Vermont’s well-established network of heating service providers is likely to lead to a noticeably higher census of energy-efficient homes.

Building Performance contracting is an emerging industry. Many Building Performance contractors started out as general contractors, performing renovation and / or new construction before diversifying into energy audits and efficiency improvements. Others began as insulation contractors using either cellulose or spray foam, or as subcontractors to weatherization agencies. The number of comprehensive energy efficiency projects completed by Building Performance contractors has grown from 7 in 2005, when Efficiency Vermont began tracking these data, to 799 in 2011. The industry’s growth is supported by Efficiency Vermont,

Burlington Electric Department, Vermont Gas, NeighborWorks of Western Vermont, and others; however, to date only a small fraction of Vermont’s building stock has been served.

VGS serves approximately 45,000 residential, commercial, and industrial customers in Franklin and Chittenden counties. There are significant expansion plans in place to bring natural gas service to Addison County in 2014 / 2015. Vermont Gas has been offering a suite of energy efficiency programs to its customers since 1993. Since that time, the programs have served more than 24,000 participants, saving over 1 billion cubic feet (Bcf) of natural gas. The cumulative impact of energy savings from 1993 through 2011 is equal to approximately one full year of gas use across all customer classes in Vermont. The quality and effectiveness of these programs has been recognized by the U.S. Environmental Protection Agency and the American Council for an Energy-Efficient Economy. **Figure 5** shows Vermont Gas’ sales for the period 2001 through 2011, and what sales would have been if Vermont Gas had not implemented energy efficiency programs in 1993.

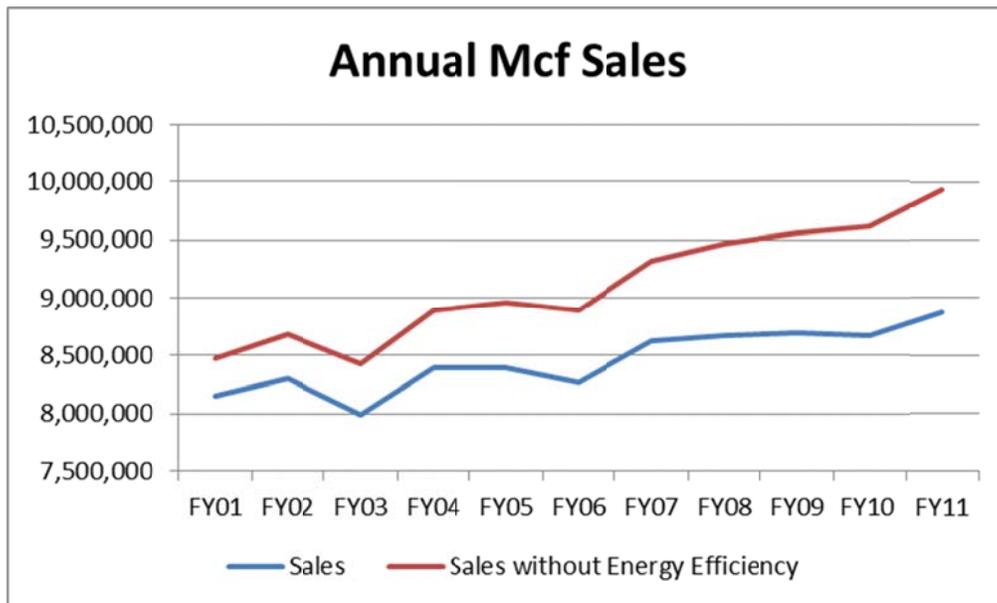


Figure 5. Vermont Gas annual Mcf sales, 2001-2011, showing estimated sales if energy efficiency programs had not been in place, in millions of cubic feet (Mcf)

The reduction in Mcf sales translates to lower energy bills for Vermonters, as well as reduced greenhouse gas emissions. Based on current rates, Vermont Gas customers collectively are annually saving over \$12 million on their natural gas bills, as well as avoiding more than 62,000 tons of greenhouse gas emissions each year.

Renewable energy is an emerging market with customer demand growing for a wide range of renewable technologies. The Renewable marketplace is discussed in detail in **Section 3.4**.

Understanding the market trends of the major service provider groups offers insight into the opportunities to support and develop the energy service industry.

2.3.2 A positive value proposition

Improving the energy efficiency of the building stock in Vermont creates both challenges and opportunities for the energy service industry. Fuel dealers in particular face the challenge of sustaining an industry that is historically based on fuel sales. However, based on an evaluation of market barriers, interviews with energy service providers, and an assessment of market potential within Vermont, the Energy Service Providers Subcommittee determined that all types of energy service providers—including fuel dealers—stand to benefit from the opportunity to ramp up comprehensive retrofits in Vermont. As mentioned previously, few providers currently offer the full portfolio of energy services. By working together, all types of energy service providers can position themselves to provide the customer with comprehensive recommendations and services to address the building envelope, heating and hot water system, and renewable energy system. With a solid level of contractor knowledge of the thermal efficiency landscape, customers stand to benefit from receiving a holistic recommendation to improve their buildings over time. This benefit is less likely if a customer receives conflicting or piecemeal recommendations from contractors narrowly focused on selling just one measure such as windows or heating systems. Energy service provider businesses stand to benefit from increased referrals and sales, as well as from increased customer satisfaction and retention. Beneficial partnership opportunities also exist within each energy service segment. For example, Building Performance contractors might not offer a full range of insulation measures, or HVAC contractors might not be familiar with all equipment types.

The Energy Service Provider Subcommittee investigated several possible partnership models to understand the benefits and challenges of each (see **Appendix 2**):

- Heating service company as general contractor
- Building performance contractor as general contractor
- Third-party auditor and general contractor
- Referral-only relationships

More important than the details of potential partnership types is the cross-industry relationships that need to be developed and fostered. Productive partnership development activities have already begun and will be discussed in later sections.

The energy service provider industries are well represented in Vermont by their respective trade associations: VFDA, BPPA, and REV. VFDA and REV are well established and have dedicated staff, while BPPA is still in the formative stages. These trade associations understand the issues and trends facing their industries and are key players in developing cross-industry partnerships.

2.3.3 Workforce development: Capability and capacity

As market demand for efficiency work increases, the energy service provider industry will need to broaden its skill base and capacity in some areas to support a ramp-up of energy efficiency work to the level needed to achieve the State goals. The subcommittee assessed both the workforce growth needs and availability of the training that would be required. The subcommittee found differing levels of training availability within Vermont, depending upon the market. For residential and small business efficiency work, for example, the various Vermont training facilities already offer the classes and certification opportunities needed to support an increase in skill training for energy efficiency, if market demand requires it. Training and certification opportunities for the renewable energy and commercial and industrial markets are offered primarily outside Vermont and typically cost more than residential and small business training. A significant project volume increase in the renewable energy and commercial and industrial markets would require an increase of skilled certified contractors. Adding classes specific to these fields, with certification opportunities, to the existing Vermont training centers would allow the workforce to grow as needed.

Skill development. In assessing specific training needs, the Energy Service Providers Subcommittee recognized the importance of determining the various measures that can commonly be included in a comprehensive energy retrofit. Energy retrofit measures can be characterized in the following categories:

- Shell insulation and air-sealing improvements
- Heating and hot water equipment maintenance and ongoing servicing
- Heating and hot water equipment replacement
- Renewable heating and hot water equipment installation
- Industrial process equipment replacement, upgrades, and maintenance
- Window and door replacement
- Addition of control systems that optimize or limit use
- Occupant behavioral changes that reduce overall energy use, while maintaining a safe living or working environment

A large number of organizations in Vermont offer energy-related training and workforce development: Vermont Technical College (including its Center for Sustainable Practices), Vermont Green, VFDA's Vermont Fuel Education Center, Efficiency Vermont, and the high school Tech Centers across the state. **Appendix 3** lists trainings and certifications that are currently available in Vermont for the various energy measures.

Workforce growth. The subcommittee also determined that it is important that the size of the trained and available workforce appropriately matches market demand. Both under-capacity and over-capacity environments have negative consequences to the market. When customer demand exceeds the available workforce, prices increase and service delivery slows down. Disgruntled customers become more likely to leave the market—and opportunities for installing

energy efficiency and renewable energy measures are lost. When the workforce has significantly more trained staff than work available, businesses must shift away from energy work and potentially decrease staff.

From the standpoint of workforce capacity, the subcommittee recognized that it is also important to consider the geographic location of the available workforce in relation to demand. Much of the state is rural, and in inclement seasonal conditions, not all communities are easy to access. For some service types, there is greater capacity around the bigger cities, but little coverage in the rural locations.

NeighborWorks of Western Vermont implemented a creative workforce capacity solution that addresses workforce fluctuation in a localized area. LaborWorks at NeighborWorks is a temporary labor pool for BPI Home Performance with ENERGY STAR contractors involved with the NeighborWorks H.E.A.T. Squad home energy efficiency program, as well as for other local building trade professionals. Prospective employees are interviewed and screened before being added to the labor pool. All candidates must pass a criminal background check and provide references that the organizations subsequently verifies. Once hired, LaborWorks employees are covered with general liability and workers' compensation insurance. Employees are matched to contractors according to experience, abilities, location, and the contractor's needs. LaborWorks employees are not guaranteed part-time or full-time work, and are paid only for hours worked.

2.3.4 Recommendations of the Energy Service Providers Subcommittee

Positive value proposition: Partnerships and program support

1. *Host periodic partnership events.* Trade associations should host events designed to match complementary energy service offerings, geography, skill sets, and volume capacity.

During the summer of 2012, representatives from the heating service industry and building performance industry met several times to discuss areas of common interest. This was an important first step, since both industries have not always recognized or appreciated the mutual opportunities available to them in the marketplace. In September 2012, nearly 200 people from both industries attended one of three regional meetings held in Fairlee, Manchester, and Middlebury, Vermont. Each meeting featured a workshop by Craig Snyder, president of a full-service heating fuel dealer and whole-home energy provider company in Connecticut. His Whole-home Energy Diversification Workshop provided the framework on how data can be collected on home performance and used to increase efficiency services. Bob Hedden, Senior Project Manager for Research and Education with NORA and the author of the NORA Gold Technican book, *Efficient Oilheat, an Energy Conservation Guide*, followed up with another presentation that focused on possible collaborations between heating fuel dealers and building performance contractors. The meetings also involved a discussion

with Richard Faesy (Energy Futures Group), Chris Granda (Grasteu Associates), Dave Keefe (Efficiency Vermont), home performance contractors Jim Bradley and Tom Perry, and Melanie Paskevich (NeighborWorks). The event was co-sponsored by VFDA and Efficiency Vermont. The meetings established better coordination between the two industries. Nevertheless, the Energy Service Providers Subcommittee recognized that the meetings were only a first step in building a unique partnership for improving the distribution of thermal efficiency services to Vermonters.

2. *Provide tools and processes for partnership matching.* Not all partner matches can be made through partnership events. Trade associations and / or Efficiency Vermont can also help match potential cross-service partners. Partnership matching could be identified by trade association executive directors, for example. Another option is to create a statewide database with a Web portal to list services offered and services needed, by contractor. Identifying opportunities for both project and long-term partnerships would be valuable in determining potential collaboration.
3. *Offer recognition and benefits to service providers who meet high standards for technical excellence and comprehensiveness.* Program implementers should provide enhanced recognition and other program benefits, such as access to incentives and financing, to companies that meet high standards for technical excellence and comprehensiveness. For example, Efficiency Vermont maintains a Web-based “Marketplace,” where customers can find energy service providers in categories such as energy auditing, home performance contracting, and heating and cooling. The contractors listed in the Marketplace have an advantage by being promoted through a third-party source with an established brand. Efficiency Vermont can provide enhanced recognition and other program benefits such as access to incentives and financing to companies that meet high standards for technical excellence and comprehensiveness. This level of participation is already in place for the Home Performance with ENERGY STAR contractor network and should be expanded to include other energy service providers as well. Energy service providers should have a formal mechanism to work with Efficiency Vermont on the management of the marketplace, and to participate as subject matter experts in the dispute resolution process.

Efficiency Vermont and the VFDA have been in the process of establishing Whole Home Energy Provider certification, which would distinguish whole-home heating service companies from other heating service companies. This effort was begun more than a decade ago by the oilheat industry with the passage in Congress of the Energy Act of 2000, through the Act’s Title VII, the National Oilheat Research Alliance Act of 2000. NORA is a collaborative check-off program that until 2010 was authorized to collect user fees that have generated funds for research and development of high-efficiency oilheat systems. NORA also created the standards and credentials for heating service technicians—and are those adopted by the Vermont Department of Public Safety. The

NORA Gold Certification focuses on energy efficiency. A fuel company with Gold-certified heating technicians provides more value to oilheat customers because the training standards reflect a commitment to energy efficiency and a higher level of capability. In addition to highlighting this certification standard, NORA has developed a curriculum that recognizes the whole-home approach to energy efficiency and has incorporated solar hot water with hydronic oilheat systems. Although Congress allowed NORA funding to sunset in 2010, it might eventually be reauthorized. In the meantime, the organization does not have the funding to achieve these goals.²³

The concept initially developed by NORA is being revisited in Vermont, thanks to a unique collaboration between Efficiency Vermont and VFDA. The “value proposition” for full-service heating fuel companies that sell fewer gallons per home is their ability to sell other services to their customers, retain existing customers, and attract new ones. Just as the demand for thermal efficiency services is expected to increase, the amount of fuel sold per home is expected to continue to decrease. Thus, the key to survival of heating fuel companies that will be selling less fuel is *diversification*. In many ways, this is not unlike the story of Vermont’s dairy farmers, who have had to figure out how to best use their assets (the land) in order to survive. In the case of the heating fuel provider, the most important asset is the customer list. A heating fuel company that diversifies to become a Whole-Home Energy Provider has an opportunity not only to survive, but to thrive. This is a benefit to the state, since most of these companies are small family businesses. A certification standard that would help consumers discern which companies are Whole-Home Energy Providers will make it easier for customers to find heating service contractors who provide comprehensive services. VFDA and Efficiency Vermont are collaborating on an effort to define and support this standard.

4. *Ensure that all types of service providers can take advantage of program benefits such as marketing, incentives, and financing.* Whatever business model succeeds in the marketplace, it is important to ensure that all service providers have equal access to thermal efficiency program benefits such as marketing, incentives, and financing. However, a caveat pertains: The service providers must meet the criteria established by the program and / or the Vermont Department of Public Safety. Customers should be able to take advantage of incentives and financing, whether they undergo a complete home energy retrofit or break the project into smaller increments, to be completed across several years. In addition, all qualifying service providers should have equal access to Efficiency Vermont materials and resources that will assist in their efforts to sell efficiency services. An energy service provider advisory group should be formed to provide guidance and feedback on program design and implementation.

²³ For complete information on NORA, see <http://www.nora-oilheat.org/>.

5. *Partner building performance contractors or other energy service providers with fuel dealers to identify high fuel use customers and target potential projects.* Customers with high fuel use can go unserved when the provider has neither the knowledge nor external partners from whom customers can be provided with a comprehensive solution. Fuel dealers can reach out to these high users and offer efficiency as a solution by either directly offering efficiency services or by partnering with a building performance contractor. Fuel dealers can use bill inserts or other marketing collateral to reach out to high users, directing customers to energy efficiency services and programs. In all cases, it is critical that the existing customer-provider relationship is maintained and the provider keeps the lead role in customer outreach.

6. *Provide centralized information and tracking for energy service providers and their customers.* It is challenging enough for contractors to keep track of the available rebates, incentives, and financing options within their own service provider market. The subcommittee recognized that trying to keep current on these options across markets is not feasible. Thus, the subcommittee recommends that a managed central information system or portal be created to enable partners to know and communicate current, relevant offers in the comprehensive services they provide to customers. Ideally, the system could also provide a method to keep track of customers through the retrofit process, and to report results and energy savings from all types of energy service providers. Efficiency Vermont currently provides this type of system to Home Performance with ENERGY STAR contractors and could expand it to support other types of service providers.

Workforce development: Capability and capacity

1. *Provide a database and portal of required skills and available training, by Industry.* It should be easy for energy service providers to understand the skills and certifications required for any of the energy services that are relevant for their customers, as well as the options available to the providers through which they can obtain the training and certifications. A hosted database and portal should be created to support this.

2. *Ensure that key trainings and certifications are available in Vermont.* Efficiency Vermont, energy-related trade associations (VFDA, REV, BPPA, etc.), and other energy service provider groups (WAPs, VGS, BED, etc.) should work together to identify key courses and certification programs appropriate to thermal efficiency service delivery. As a second step, this group should coordinate with Vermont Technical College, Vermont Green, the Vermont Fuel Education Center, and other training providers to ensure that the identified courses are regularly promoted and offered. A lack of certification classes specific to renewable energy and commercial and industrial markets is a known gap and should be addressed if commercial and industrial (C&I) or renewable energy programs are put in place to significantly increase project volume.

3. *Create and deliver an energy efficiency business development training.* Although each market segment has specialized professional training and certification requirements, many overarching skill and knowledge capabilities are needed to ensure effective branding, sales, and delivery of comprehensive energy solutions to customers. To achieve significant market transformation with energy efficiency through the energy service providers, there is a cross-market need for the development and delivery of energy efficiency business development training. Some key components of the training would be:

- Developing comprehensive energy efficiency plans, inclusive of all applicable markets
- Best practices for customer service and sales
- Understanding all available customer programs and funding options
- Knowledge of the applicable energy codes
- Health and safety protocols associated with efficiency work

Much of this training already exists in various market segments. This initiative should not seek to duplicate existing materials, but rather create a comprehensive training package that brings together the important aspects of all markets.

4. *Require occupant health and safety training.* The health and safety of building occupants is of paramount importance for a program involving building performance. Hazards that can be encountered during renovation of existing buildings are asbestos, lead, mold and mildew, exposed wiring (knob and tube), poor indoor air quality, and high carbon monoxide levels from combustion. For many of these items, only a certified professional with specialized equipment is capable of detecting and mitigating the hazards. Any energy service provider who tightens the building shell (affecting ventilation), disturbs insulation, works near electrical wiring, or installs / modifies heating equipment, should have training in occupant health and safety. For the Home Performance with ENERGY STAR program, Efficiency Vermont has chosen to align with the national BPI certification program, for its comprehensive training and testing in health and safety topics. Similar health and safety certifications should be identified for other energy service provider categories, such as heating service companies. State and federal codes will eventually need to align with the protocols in the training, to require worst-case testing for combustion appliance zones (CAZ), per BPI or equivalent standards.

2.3.5 Budget for effective implementation of the Energy Service Providers Subcommittee recommendations

The subcommittee recognized that the energy service provider industry will naturally grow or shrink with market demand. As new business opportunities arise, energy service providers will likely acquire the skills necessary to perform services that are profitable within their business structures. The subcommittee found that through the training sources, relatively low-cost options for developing relevant skills already exist within Vermont, with the exception of those for the renewable energy market. The subcommittee recommends that training costs be borne by the market, since substantial training subsidies would lead to capacity development that is likely to exceed market demand.

The most significant areas of potential benefit for the energy service provider industry can come from partnership development, consistent messaging around comprehensive work and available customer programs, and cooperative industry marketing. This section's recommendations have in common a requirement for appropriate coordination and communication throughout the state. To support these recommendations, the subcommittee estimates that approximately \$200,000 per year will be needed to cover the personnel, information-sharing tool development, and common marketing.

2.3.6 Conclusions

To meet the State's building efficiency goals, Vermont will need to turn productively to the energy service provider industry—those who identify, sell, install, and service the energy efficiency measures. The Energy Service Providers Subcommittee recommendations are designed to ensure that the energy service providers are positioned to benefit from the retrofit ramp-up; further, they help ensure that the providers have the tools, capability, and capacity to reach the goals. **Appendix 2** provides a discussion of possible models for energy provider partnerships, and **Appendix 3** lists available training certification opportunities.

The Thermal Efficiency Task Force's mission to provide recommendations for improving the energy efficiency of the building stock in Vermont means that an enormous opportunity could exist for growth for all types of energy service providers—while providing high-value services to Vermonters. Through diversification and strategic partnerships, energy service providers can expand from offering single services to providing the customer with comprehensive recommendations and services to address the whole building. Customers will benefit from better service and coordinated recommendations. Energy service provider businesses will benefit from increased referrals and sales, and will likely see increased customer satisfaction and repeat business.

3. Market Sector Analysis and Recommendations

3.1 Residential Single-Family

Vermont has two sets of goals for thermal energy efficiency improvements to its housing stock. One set resides in Act 92, for improving the energy fitness of 25% of the state's housing stock by 2020 (80,000 homes and apartment units), and reducing annual fuel needs by an average of 25% in homes served. To reach the 80,000 homes goal, the single-family residential sector must retrofit approximately 58,000 homes between 2008 and 2020, with the remainder of the goal to be completed in the multifamily sector. The term *retrofit* refers to a home improvement project(s) that result in an average of at least 25% energy savings per home, through comprehensive efficiency and renewable energy measures such as air sealing, insulation, and heating system upgrades.

The other set of goals resides in the *2011 Comprehensive Energy Plan*, which articulated a goal of achieving 90% of the energy consumed coming from renewable sources by 2050. The Thermal Efficiency Task Force has been charged with focusing on the State building efficiency goals contained in Act 92. It is important to note that meeting the building efficiency goals is only the start, and more aggressive action will be needed to put Vermont on pace to achieve the *Comprehensive Energy Plan* goals. For example, to achieve the 90%-from-renewables goals in the *Plan* will likely require Vermont to achieve net zero energy in all buildings in the state.²⁴

Several Vermont programs already focus on home energy retrofits.²⁵ After factoring in the number of homes retrofitted between 2008 and 2013 through these existing single-family programs, **the single-family sector must retrofit 47,250 additional homes between 2014 and 2020, an average of 6,750 homes per year.**

If this metric is to be achieved, the Residential Single-Family Subcommittee recommends action in three areas, and provides an estimated budget to fully implement the recommendations:

1. Low-income programs and services
2. Market rate programs and services
3. Policies and regulations

3.1.1 Background and context for the subcommittee's recommendations

Vermont has 322,000 housing units and 256,000 households.²⁶ Of these, 181,000 households (71%) live in homes that they own. The average conditioned floor area for homes is 1,972 square feet, and the average age of a Vermont home is 66 years. Approximately 55% of homes

²⁴ A *net zero energy* home produces at least as much energy as it consumes.

²⁵ Primarily the WAP, Efficiency Vermont Home Performance with ENERGY STAR (HPwES) Program, and the VGS Retrofit Program.

²⁶ Data from www.housingdata.org. Housing units include seasonal homes and camps.

depend on oil as the primary heating fuel, and approximately 15% use natural gas, 15% use propane, and 15% use wood. The average number of occupants per home is 2.3. Vermont has one of the oldest housing stocks in the country, and these homes are heavily dependent on heating oil, compared to other states where natural gas is dominant. Most Vermont homes have significant opportunities—and a pressing need—for cost-effective thermal energy efficiency improvements.

In 2010, Vermont ranked 44th out of 50 states for energy affordability.²⁷ In 2010, low-income Vermonters spent an average of \$1,870 *more* per family, per year, on energy bills than is considered affordable. Of those who received weatherization services, a quarter saved \$1,900 per year, a quarter saved \$900 per year, and half saved \$600 per year.²⁸ It is important to note the links among energy affordability, health, and physical comfort: In addition to saving customers money, properly weatherized homes are more healthful and more comfortable than unweatherized spaces.

Vermont's drafty housing stock and reliance on heating fuel is a drain on the state's economy. In 2010, Vermonters paid over \$600 million to import and use fossil fuels for use in homes, businesses, and other buildings, almost \$300 million more than they paid in 2000. Fuel expenditures for residential and commercial heating alone were greater than the revenues of the entire agricultural sector. Further, fossil fuels used in buildings are the second largest source of greenhouse gas emissions in Vermont.²⁹

3.1.2 Residential single-family sector contribution to the 80,000-unit goal

Programs serving the residential single-family market sector must scale up to meet Vermont's goal of comprehensively retrofitting 80,000 units by 2020. Based on the level of activity in existing single-family and multifamily efficiency programs since 2008, and assuming that current levels of funding continue, Vermont is on track to retrofit approximately 44,000 units by 2020 – essentially meeting only half of the goal.

Existing single-family programs—primarily WAP, HPwES, VGS Retrofit Program, and the NeighborWorks H.E.A.T. Squad, as well as multifamily programs and services—are described in **Appendix 1**. Together, these single-family and multifamily programs retrofitted approximately 3,500 units in 2011, saving on average 25% to 30% of energy use in the homes served. This represents an annual market penetration of 1.4%, placing Vermont among the leading

²⁷ Tyrell, Marianne, Rebecca Wigg, and Colin Hagan. *Financing Residential Energy Efficiency in Vermont*, Institute for Energy and the Environment, Vermont Law School, July 2011.

²⁸ Dalhoff, Gregory. *An Update of the Impacts of Vermont's Weatherization Assistance Program*, February 2007.

²⁹ Regulatory Assistance Project. *Affordable Heat: Whole-Building Efficiency Services for Vermont Families and Businesses*, June 2011.

http://www.highmeadowsfund.org/storage/research/RAP_AffordableHeatFullReport_2011_07_18_Final2.pdf.

jurisdictions both nationally and internationally for building energy efficiency activity.³⁰ However, this level of activity falls well short of what is needed to meet the 80,000-unit retrofit goal. Moreover, the 2011 results were disproportionately high because of a one-time influx of funding from the Recovery Act of 2009. The number of project completions by WAP and the multifamily Vermont Fuel Efficiency Partnership (VFEP) declined in 2012, although short-term funding from the Green Mountain Power (GMP) Community Energy and Efficiency Development (CEED) Fund might enable the programs to ramp back up, beginning in 2013. GMP created the CEED Fund to provide energy efficiency benefits to Central Vermont Public Service (CVPS) customers following the 2012 merger of GMP and CVPS.

To meet the 80,000-unit goal by 2020, Vermont must retrofit approximately 8,800 housing units of all types, per year, beginning in 2014. This would achieve an annual market penetration of 3.5%. The Task Force proportionally divided this goal between the single-family and multifamily sectors corresponding to the percentage of Vermont households living in homes versus apartments,³¹ and then increased the multifamily share by 25% to align with the core principle of “equitable benefits to all Vermonters.” Apartment dwellers typically have lower incomes than single-family home dwellers, and face a particularly challenging set of barriers to participating in energy efficiency.³² Accordingly, the single-family sector is responsible for retrofitting 59,250 units and the multifamily sector 20,750 units between 2008 and 2020. Given current program activity, the single-family sector will have retrofitted approximately 12,000 homes by the end of 2013, leaving **47,250 homes to retrofit between 2014 and 2020**. To meet the State’s building goal, 6,750 units per year must be retrofitted, nearly three times the number of homes that were retrofitted in 2011. **Table 3** provides one scenario for reaching the 80,000-unit goal across the single-family and multifamily sectors, in both the low-income (WAP-eligible) and market-rate markets.

³⁰ Neme, Chris, Meg Gottstein, and Blair Hamilton. *Residential Efficiency Retrofits: A Roadmap for the Future*, Montpelier: The Regulatory Assistance Project. <http://www.raonline.org/document/download/id/918>. May 2012.

³¹ According to data from www.housingdata.org, 19% of Vermont households live in apartments.

³² See **Section 3.3** for details about the multifamily market.

Table 3. Estimated current and goal levels of retrofits in Vermont market segments

Sequence of Retrofit Activity Needed to Meet Goal	Number of Units
Total units completed 2008-2013 (actual + estimates from 2012 program activity and 2013 funding levels)	18,000
Single-family units	12,000
Multifamily units	6,000
Remaining units to complete, 2014-2020	62,000
Single-family units	47,250
<i>Low-income (including households at 60-80% of median income)</i>	<i>14,850</i>
<i>Market rate</i>	<i>32,400</i>
Multifamily units	14,750
Total activity	80,000

3.1.3 Single-family market sector contribution to the energy reduction goal

In addition to the comprehensive retrofit goal, activity in the residential single-family sector contributes to the State’s Act 92 building goal of reducing total fossil fuel consumption by 7.5% by 2020. Using data from the EIA State Energy Data System, the total 2008 Vermont consumption from fossil fuels (natural gas, fuel oil, kerosene, propane) was 37.6 trillion BTU. Therefore, the Task Force has targeted the securing of at least 2.82 trillion BTU of annualized thermal energy savings by 2020.

The residential sector accounts for 20.3 trillion BTU of annual consumption; the commercial and industrial sector accounts 17.3 trillion BTU. The PSD has provided guidance that the target for each sector should be at least 7.5% of total consumption for each sector. **Table 4** summarizes the energy reduction goals that would be required to meet the 7.5% target, by sector.

Table 4. Energy reduction targets, by market sector

Market Sector	Total Annual Consumption, in Trillion BTU	Task Force 2020 Target	Energy Savings Target, in Trillion BTU
Residential	20.3	7.50%	1.52
C&I	17.3	7.50%	1.30
Total	37.6	7.50%	2.82

A reasonable assumption is that a typical, comprehensive residential retrofit saves 25% to 30% of total energy use, or 30 MMBTU of savings per home or apartment unit.³³ Achieving the goal of comprehensively retrofitting 80,000 units will therefore result in 2.4 TBTU of savings—more than the savings in the residential sector target of 1.52 TBTU. In other words, **if Vermont retrofits 80,000 units by 2020, it will also meet its goal for reducing energy consumption by 7.5% in the residential sector.** For this reason, the Residential Single-Family Subcommittee has focused its efforts on developing strategies for accelerating the pace of comprehensive retrofits to achieve the 80,000-unit goal.

3.1.4 Analysis of program gaps and customer barriers to participation

If retrofitting a home makes it more comfortable and saves the customer money, why are more Vermonters not doing it already? **Table 5** presents the experience and insights of members of the Residential Single-Family Subcommittee, which identified program gaps and customer barriers in the existing Vermont single-family services and programs.

Table 5. Customer barriers and program gaps in Vermont’s existing single-family programs and services

Customer Barriers
Initial costs (<i>first costs</i>) are perceived to be too high to undertake comprehensive energy improvements.
Many Vermonters do not understand what is involved with the retrofit process, how much money they could save, or that they could be more comfortable in their homes after weatherization.
Customers lack sufficient knowledge to prioritize steps and actions for effective retrofits, because they must choose from competing (and sometimes conflicting) measures.
Program services do not provide an appealing customer value proposition. Even households where homeowners understand the benefits and have adequate financial means do not undertake comprehensive energy improvements in high numbers.
Customers can be frustrated by the fact that some efficiency measures are not addressed by existing retrofit programs. For example, there are no state rebates or incentives for oil, propane, or kerosene-fired heating equipment or high-efficiency windows.

³³ This estimate is consistent with actual MMBTU savings per project claimed in the Efficiency Vermont HPwES Program; these savings averaged approximately 37 MMBTU per project in 2012, prior to savings verification. It is also consistent with the U.S. Energy Information Administration, which shows an average site energy consumption of 115.6 MMBTU per household in 2009 for New England states, excluding Massachusetts. <http://www.eia.gov/consumption/residential/data/2009/index.cfm?view=consumption#fuel-consumption>.

Program Gaps
The 60-80% median income customer segment is served by neither market rate programs nor low-income programs, which serve customers earning less than 60% of median income.
WAP has a 2-year waiting list, indicating more need than resources.
The middle-income customer segment (80 – 120% of median income) is not targeted or well served by existing programs, with the exception of the NWWVT H.E.A.T. Squad program in Rutland County.
Funding to support market rate retrofits is insufficient; the HPwES Program budget is insufficient to meet the demand for services.
Customers in residential market segments such as mobile homes, condos, and homes with elderly residents are participating at noticeably low levels.
State funding for biomass incentives is limited and is primarily for central systems.
Insulation contractors and do-it-yourself homeowners undertake a significant amount of insulation activity outside existing programs; much of this work is of low quality and when not coupled with air-sealing, yields poor results for the investment.
The current trained workforce is not large enough to support retrofiting 8,800 units / year.

To supplement the program gaps and customer barriers identified by the Subcommittee, a partnership of Efficiency Vermont, VGS, the PSD, and the High Meadows Fund (HMF) sought to better understand the customer motivations for and barriers to participation in retrofit programs such as Home Performance with ENERGY STAR and the VGS Retrofit Program. In the autumn of 2012, the group conducted market research involving more than 600 telephone surveys targeting single-family homeowners earning above 60% of median income, and who have not yet participated in a retrofit program. This survey of program “non-participants” asked about recent energy efficiency-related upgrades, plans for the future, perceived barriers to pursuing such upgrades, and motivations for doing so.

The survey revealed that more than 70% of non-participants have completed some type of home improvement project for the purpose of lowering energy costs, ranging from installing a compact fluorescent light bulb (CFL) to adding insulation. The most frequently reported upgrades were adding insulation, replacing windows, and replacing heating equipment. The projects were frequently undertaken by the homeowner, or by a contractor recommended by a friend or family member. Further, more than half of non-participants were interested in completing energy improvements in the future. This indicates that most non-participants are interested and engaged in making energy improvements to their homes, and are therefore good

candidates for comprehensive energy services. There are several key benefits of completing improvements through a comprehensive retrofit program rather than through a do-it-yourself (DIY) approach:

1. Professional auditors and Building Performance Institute-certified contractors provide prioritized recommendations for improvements, based on their potential to save energy; improvements carried out by these professionals are installed in a high-quality manner that typically delivers the estimated energy savings.
2. Improvements through programs contribute to reducing the home's fossil fuel use by holistically addressing all systems of the home: building envelope, heating and hot water systems, and renewable energy systems.
3. Improvements through retrofit programs are based on building science and on an understanding of whole-home interactive effects. Further, they are designed to improve building durability, solve problems like moisture and ice dams, improve indoor air quality, and protect the health and safety of the home's inhabitants.
4. Without the guidance of trained energy professionals, homeowners often make decisions based on insufficient information about how to save the most energy. This frequently results in non-cost-effective work. For example, installing windows was mentioned in the survey as one of the most common steps taken, even though new windows rank very low in cost-effectiveness. Another commonly mentioned action was adding insulation, but adding insulation without also sealing air leaks significantly reduces its effectiveness in actually saving energy.

The Residential Single-Family Subcommittee survey also confirmed what many suspected— that the perceived cost of a project is the main barrier to taking action on energy improvements. Non-participants most commonly cited the “overall cost” or the “up-front cost of the improvements” as the key barriers. The survey team anticipated that this would be the case, and probed further to determine what would make a difference in overcoming the cost barrier. In a rating of hypothetical, but valuable, program features, non-participants ranked “confidence that estimated energy savings would be realized” and “rebates that offset the cost of equipment” as the top features. This indicates that reasonable assurance that their financial “investment” in upgrades would be met with appropriate cost savings could help reduce the cost-related barrier. Other hypothetical program features such as “attractive financing options” and “a third-party project advisor” were less highly valued.

It is important to note that survey respondents interested in energy efficiency projects seemed to have access to financing (only 5% indicated financing as a barrier). Nevertheless, they still identified overall project cost as a barrier. Breaking down the project and the associated costs into smaller steps might be one strategy for overcoming this barrier and spurring the customer to undertaking a project.

The recommendations presented in this section have been informed by the market research, and are designed to address the identified gaps and barriers in the Vermont single-family residential market.

3.1.5 Recommendations: Low-income single-family market segment

A subgroup of the Residential Single-Family Subcommittee developed recommendations to ramp up services for low-income Vermonters. The recommendations pertain primarily to the State's building efficiency goals, with consideration to Act 92's goal of increasing low-income weatherization services.

Policy / regulatory / legislative recommendation

Expand the Weatherization Assistance Program. Vermont's five weatherization agencies currently have capacity to provide comprehensive retrofits to roughly 1,700 homes and apartment units each year, with eligibility limited to households earning less than 60% of median income.³⁴ With an average job cost of \$7,200, including administrative costs, the programs save an average of 34% of total energy use per home.³⁵ WAPs also deliver electric-saving products and services under contracts with Efficiency Vermont. Vermont should expand WAP to better meet demand and accelerate the retrofit of low-income homes by ramping up annual completions by 40% or 700 more units, to serve 2,400 homes and apartment units per year by 2015.

In addition, 100,000 Vermonters have household incomes below 80% of the state median. An evaluation and pilot program should be launched to determine how best to serve households earning 60% to 80% of median income. One option is to expand WAP eligibility to provide subsidized weatherization to this group, but there may be other options such as providing enhanced financing and other services via the NeighborWorks HomeOwnership Centers. Ultimately, an initiative targeting the 60-80% of median income segment should begin in 2014 and ramp up gradually to serve 800 homes and apartment units per year by 2020.

COLLABORATION / COORDINATION RECOMMENDATIONS

1. Cooperate with LIHEAP to target large energy users. The federal Low-Income Home Energy Assistance Program (LIHEAP) provides fuel assistance to low-income Vermonters. Weatherizing LIHEAP clients both saves them money and allows federal and state LIHEAP dollars to assist more low-income Vermonters with their fuel needs. Currently LIHEAP clients are required by law to apply for the Weatherization Assistance Program. However, with

³⁴ The five agencies are the Champlain Valley Office of Economic Opportunity (CVOEO), Central Vermont Community Action Council (CVCAC), Bennington Rutland Opportunity Council (BROC), Northeast Employment and Training Organization (NETO), and Southeastern Vermont Community Action (SEVCA).

³⁵ Average job cost and total units includes multifamily projects, which tend to be lower per unit than job costs for single-family projects.

more than 29,000 Vermont households qualifying for LIHEAP assistance over the 2011-2012 winter, the demand overwhelmed the available weatherization service agencies and funds. WAP could deliver greater energy savings and make a bigger impact on reducing the energy burden faced by low-income households if it were able to prioritize the weatherization of LIHEAP clients by energy intensity. That is, if clients were prioritized according to the number of BTU they need to heat a square foot of space, the programs could serve the most energy-wasting homes, first. LIHEAP should collect and share data with WAPs to target high energy intensity buildings with occupants who receive LIHEAP assistance.

- 2. Research all options that could align low-income energy cost relief programs with conservation and efficiency goals.** Several programs provide energy security to vulnerable Vermont households. LIHEAP is the largest, and has seen recent growth as income eligibility has been increased to 185% of the federal poverty level in the past five years. The Legislature has also called for rate discounts on regulated fuels for qualifying low-income households. Although these programs address pressing social challenges, they distort the energy supply marketplace and thus place burdens on other ratepayers.

Vermont should research the impacts of and options for transitioning low-income energy-cost relief programs, such as LIHEAP and electric and natural gas low-income rate discount programs, to align with conservation and efficiency goals. All Vermonters share a responsibility to make sure that everyone stays warm in the winter. But, we need to align our low income weatherization programs so that they help the low income households with the greatest waste and the greatest need first. Making this change will make more efficient use of resources, help more Vermonters, and help Vermont more quickly reach our conservation and efficiency goals. Over time, investments in weatherizing low-income households should lead to reduced costs for LIHEAP and other electric and thermal energy subsidy programs.

3.1.6 Recommendations: Market-rate single-family market segment

This section provides recommendations to drive retrofits in the market-rate single-family subsector through both market-based and program approaches. Together, they contribute to achieving the building efficiency goal of improving the energy fitness of 80,000 housing units.

COLLABORATION / COORDINATION RECOMMENDATIONS

These recommendations focus on supporting and empowering the private market of energy service providers, including Home Performance contractors, heating service companies, fuel dealers, and renewable energy system installers, to provide whole-home energy services.

- 1. Leverage the existing home improvement market to promote comprehensive solutions.** Vermonters, at a high rate, are making investments in home energy improvements, beyond existing programs such as Home Performance with ENERGY STAR and the VGS Retrofit

Program. Recent market research shows that more than 70% of these “non-participant” Vermont homeowners have taken some action on their own within the last five years, with the intention of reducing electricity or fuel use, from installing a CFL to adding insulation. Nearly 20% of these non-participants have received an estimate for installing a renewable energy system.³⁶ Further, VFDA estimates that, of the 140,000 oil-heated homes in Vermont, approximately 2,500 (2%) replace the boiler or furnace each year. The average oil savings for each of these replacements is 20%. Although their actions are positive, these non-participants could be making more effective (and cost-effective) decisions if energy service providers could be coordinated to “upsell” more energy efficiency services at the same time, particularly high-quality air-sealing.

2. ***Energy service providers should work together to deliver comprehensive services that involve both energy efficiency and renewable energy.*** Home Performance contractors, heating service companies, fuel dealers, and renewables installers should work together to provide customers with a comprehensive roadmap for improving their homes and reducing their use of fossil fuels over time. The roadmap should address all systems of the house, including the building shell and the heating systems, as well as a strategy to add renewables. It should also provide a friendly “good, better, best” recommendation to help the customer break the project into smaller increments that can be completed over time. To increase the uptake of energy efficiency investments, Vermonters who have installed renewables such as solar photovoltaic systems (PV) and solar hot water should be encouraged to complete energy efficiency projects. Energy service providers should also provide customers with financing options that enable positive monthly cash flow.

3. ***Program implementers should offer recognition and benefits to service providers who meet high standards for technical excellence and comprehensiveness.*** Program implementers should provide enhanced recognition and other program benefits, such as access to incentives and financing, to companies that meet high standards for technical excellence and comprehensiveness. For example, Efficiency Vermont maintains a Web-based “marketplace,” where customers can find energy service providers in many categories (for example, energy auditors, home performance contractors, and heating and cooling companies). Enhanced recognition is already in place for the Home Performance with ENERGY STAR contractor network, and Efficiency Vermont is currently working with VFDA to develop a similar recognition program for heating service companies. The goal is to encourage fuel dealers and heating service companies to identify energy efficiency opportunities and to partner with building performance contractors to complete energy efficiency projects. This approach enables customers to find contractors who can provide comprehensive services. Energy service providers should have a formal mechanism to work

³⁶ *Vermont Single Family Retrofit Market: Process Evaluation and Market Research*. GDS Associates and Research Into Action, November 6, 2012.

with Efficiency Vermont and other program implementers on the management of the marketplace and to participate in the dispute resolution process.

- 4. *Ensure that all types of service providers can access program benefits.*** Program strategies such as marketing, incentives, and financing should be designed to ensure that all types of service providers and all partnership models have access to these program benefits. For example, programs should enable customers to access incentives and financing whether they complete the retrofit all at once or break the project into smaller increments with the goal of achieving at least 25% savings over time. Similarly, program benefits for the customer should be equally available, regardless of whether a building performance contractor or a fuel dealer serves as the general contractor—as long as the program requirements are met. Program implementers should develop an advisory board of energy service provider representatives to provide guidance and feedback on program design and implementation.

3.1.7 Recommendations: Program implementation

These recommendations focus on programming strategies to drive retrofits, expanding existing market-rate single-family programs (primarily VGS Retrofit Program, Efficiency Vermont HPwES Program, and the NWWVT H.E.A.T. Squad in Rutland County). The first recommendation is an overarching one, and the remainder of the section offers high-level recommendations related to program design topics, for consideration by program implementers.

- 1. *Program implementers such as Efficiency Vermont and VGS should be empowered to design programs that drive retrofits—using strategies in marketing, incentives, financing, contractor support, and customer service—within a performance-based regulatory framework that seeks to maximize societal benefits at the least cost.*** With this overarching recommendation, the Residential Single-Family Subcommittee does not seek to mandate specific program designs or approaches.
- 2. *Market research and best practices.*** Whenever possible, program designs should be based on market research to understand customer and contractor motivations and barriers to participation, as well as best-practice research on leading program designs from around the country. Marketing and messaging strategies can also be tested with customers prior to launch.
- 3. *Pilot innovative strategies.*** If Vermont is to achieve its building energy efficiency goals, it will be necessary to experiment with innovative approaches to home energy retrofits. This statement reflects the simple reality that public resources are too constrained to support the level of investment that would be necessary to achieve those goals—assuming the existing limits on program implementers' current tools. The ultimate objective should be to motivate Vermonters to take action with the lowest possible level of total public investment

in whatever form (incentives, marketing, outreach, etc.). To achieve this objective, the overall statewide approach to retrofits in the market-rate sector should involve mechanisms to support and fund experiments with innovative models. Specifically, some component of the thermal efficiency program should be designated for an "Innovation and Experimentation" fund to test innovative marketing and program delivery approaches, as well as innovative technologies. This fund should be open to proposals from all stakeholders and partnering organizations, and should be overseen by a group that represents multiple stakeholders and perspectives. These innovative approaches should be implemented in a way that enables consistent evaluation, so that the ones that are proven most effective in an apples-to-apples comparison can be ramped up with higher levels of investment to make the most efficient use of limited resources and maximize scalability. At the same time, effective communication will be needed to avoid confusion among the Vermont homeowners who will be the subject of these experimental initiatives.

4. ***Easy entry into the program.*** Vermont should build on existing program infrastructure, including the Efficiency Vermont website and hotline, the VGS website, and regional partners (such as the NWWVT H.E.A.T. Squad) to provide an easy point of entry for customers interested in retrofitting their homes. The entry point can be used to collect leads, help customers determine if they are good candidates for energy upgrades, and direct qualifying customers to the appropriate service such as WAP, VGS, regional partners, and home performance contractors. This should not be the only way to enter the system; rather, customers should also be able to begin the process by working directly with a contractor or a regional partner, or by directly contacting VGS or the WAPs.

5. ***Comprehensive marketing strategy.*** Program implementers should work with marketing experts to develop a comprehensive marketing strategy to help Vermonters achieve goals that matter to them, while driving toward the State's building efficiency goals. The strategy should take into account these considerations:
 - a. The marketing strategy should be informed by a research-based understanding of what Vermonters care about with respect to their home energy use, and what motivates them to reduce their energy use. The motivating factors are likely to be different among market segments, and the marketing strategy should allow for that distinction. To the extent possible, marketing approaches and messages should be piloted or tested with customers prior to full deployment.
 - b. There are mixed opinions among Task Force members regarding the value and use of a statewide brand. On the one hand, 75% of Vermonters associate Efficiency Vermont with efficiency in the home. On the other hand, localized or segment-targeted messages might also be effective. Program implementers and stakeholders should further research the potential development of a statewide brand that builds on the existing brands. Consideration should be given to how such a statewide

brand would interact with and / or leverage the existing, state-owned Efficiency Vermont brand, while enabling local promotion of thermal efficiency.³⁷

- c. Vermont should allow for creativity and regional targeting, but also strive to prevent customer confusion, especially given that there are few specifically regional media markets in the state. Program implementers should encourage coordinated local marketing campaigns to supplement statewide marketing.

The marketing strategy should consider the following approaches:

- d. Message and delivery mechanisms (print, social media, radio, or TV ads) tailored to specific audiences. Examples are myth-buster flyers for distribution to do-it-yourselfers through retail home improvement or hardware stores; material about “roofing dos and don’ts” for roofers and solar PV installers; and cooperative marketing materials to support fuel dealers and contractors.
- e. Disruptive, provocative marketing, to attract attention and change social norms.³⁸
- f. Messages and behavior modeling by recognized and respected leaders—for example, when a public figure completes a home retrofit, make a story of it.
- g. A community-based social marketing campaign (see **Recommendation 6** in this section).

Developing a statewide marketing strategy is a high priority, but its implementation needs to be coordinated with other Task Force recommendations so that services can be delivered as promised, once elements of the campaign are implemented.

- h. **Community-based social marketing.** To maximize the impact of a comprehensive marketing strategy, program implementers should incorporate community-based social marketing (CBSM)³⁹ into energy efficiency programs, where appropriate, to motivate customer action to save energy—by engaging communities. By harnessing the attributes of human sociability, programs might be able to lower real and perceived barriers to action and motivate behavior change beyond what financial incentives can sustainably affect. CBSM can help overcome the hurdles to reaching maximum adoption of “low-hanging fruit” energy efficiency opportunities and put the harder-to-reach savings within reach. CBSM techniques are implemented by:
 - Selecting behaviors that will achieve program outcomes
 - Identifying barriers and benefits, using local research when possible
 - Developing strategies, drawing from social science tools to address barriers

³⁷ 75% of Vermonters associate Efficiency Vermont with efficiency in the home, according to 2012 Efficiency Vermont internal market research.

³⁸ The Shelton Group’s Wasting Water is Weird campaign is one good example of this: <http://www.wastingwaterisweird.com>.

³⁹ Adapted from “Reaching the ‘High-Hanging Fruit’ through Behavior Change: How Community-Based Social Marketing Puts Energy Savings within Reach” by Michelle Vigen and Susan Mazur-Stommen, ACEEE.

- Piloting the strategies, ensuring the effectiveness of the strategies
- Deploying broad-scale implementation and evaluation, utilizing direct measurement when possible.

In Vermont, the most fully realized example of a CBSM approach is the H.E.A.T. Squad, which drives demand at the Rutland County level and supports customers and contractors in completing home energy retrofits. This support comes in the form of third-party education, counseling, and financing. The State should explore whether it makes sense to expand this kind of CBSM model to other regions through networks such as the five NeighborWorks HomeOwnership centers, and / or other groups with similar community connections and delivery capacity. This work can be done in coordination with local groups such as town energy committees, civic groups, faith-based partners, and human services delivery systems like Meals on Wheels and the Visiting Nurse Association. By directly addressing barriers to action at the local level, with individual homeowners, CBSM should allow per-project costs to be reduced, freeing up funds to help pay for the CBSM services but lowering overall program costs. If the CBSM services prove popular and cost-effective, it might be possible to move to a market-based approach where customers and / or contractors pay for them. Methods for measuring and evaluating this approach should be consistent with the statewide program.

6. Incentives. Program implementers should evaluate incentive design options to determine the most effective for jumpstarting the market and driving Vermonters to act, while balancing the competing objectives of market transformation and equitable benefits to all Vermonters. Program implementers will need to determine how best to allocate limited program funds between incentives and other program services such as marketing and customer support, to offer a successful value proposition to customers. Program implementers should review incentive design options, such as:

- Higher incentives for middle-income customers (those at 60-120% of median income) and / or means testing to base incentives on income level⁴⁰
- An option to donate or waive incentives for customers who don't need them
- Short-term inducements and deals to drive action by creating deadline pressure
- Equitable incentive levels for renewables and efficiency
- Use of incentives for renewables and efficiency to encourage homeowners to address the building comprehensively (for example, Vermont's Small-Scale Renewable Energy Incentive Program recently introduced an "efficiency adder" that provides a higher incentive to households that receive an energy audit prior to installing renewable energy measures).

⁴⁰ Households earning 60-80% of median income could alternatively be served through an expanded Weatherization Assistance Program; see Recommendation 4.1.

- Establishing thresholds for energy consumption that a home would need to reach before being eligible to receive other incentives. This approach will ensure that efficiency measures that reduce use to a reasonable level have been prioritized.
- Offering incentives to drive other program goals (contractor reporting, health and safety, comprehensiveness, etc.).
- Cash versus more immediately tangible incentives (such as solar panels and ENERGY STAR appliances).
- Custom incentives designed to achieve positive cash flow.

7. *Financing.* The statewide program should work with lending institutions to develop new and modified financing options that are designed to deliver a more comfortable and safe home, paid for by the energy savings. Financing options could include PACE, an unsecured loan product that is long-term and backed by a loan loss reserve, and on-bill financing on the fuel bill. Some of the key elements of effective financing options are:

- Payments are structured as a tariff that runs with the location, not with the customer.
- Customers see immediate improvement in their cash flow.
- Customers are not required to sign on to more debt by accepting the offer.
- Easy transaction for customer to get the work done.
- Assurance that if there is any problem with the work, it is not the customer's problem.
- Allows renters to participate.

In short, if Vermont is to accelerate the pace of home retrofits, it needs financial products with characteristics that will move the market: eliminating risk to participants, assured immediate positive cash flow, and simplified transactions. The statewide program should also work with contractors and fuel dealers to develop tools to help them use financing as a sales tool. For more information on specific financing tools and options, see Finance Products and Mechanisms, **Appendix 5**.

8. *Labeling.* All existing homes that complete efficiency projects should receive a certificate or medallion (something visible) from the program recognizing energy improvement projects, as well as an energy performance score that allows for comparisons between homes. The presence of a labeling or rating system encourages participation by homeowners seeking a label for a home, helps to visibly demonstrate the benefits of energy efficiency, and also provides a way to value the energy efficiency measures if the home is later sold. At the time of sale, a homeowner and real estate professional can include the energy performance recognition and score in the Multiple Listing Service entry and be shared with potential buyers. Labeling can also provide an opportunity to improve coordination among builders, real estate agents, appraisers, and lenders to provide homeowners with accurate and consistent information related to annual energy costs and the value of energy investments.

Implementation of a recognition label and scoring system for existing homes should be coordinated with the Vermont Green Homes Alliance (VGHA), a stakeholder group that includes representatives from energy efficiency programs, the real estate community, builders, and financial institutions. Most recently, VGHA has been working intensively with MLS administrators, appraisers, and other real estate professionals on a plan for voluntary disclosure of energy performance for new homes (the Residential Energy Services Network's Home Energy Rating System [HERS] index score) and "green" certifications (for example, ENERGY STAR homes). Implementation of this recommendation should also be informed by the recommendations and principles set out in the final report of the Building Energy Disclosure Working Group, which was delivered to the Legislature in 2011. This recommendation also lays the foundation for Recommendation 2 in the Policy / Regulatory / Legislative recommendations in this section: building energy disclosure requirements.

- 9. *Improve customer confidence in energy savings.*** In 2012 market research, a high proportion of Vermonters indicated that a program feature that would help them overcome the initial cost barrier of a home retrofit is increased confidence in the projected savings. This confidence factor was mentioned more often than any other desired feature. Program implementers should explore strategies to increase customers' confidence in the energy savings from retrofit projects. Some options might include offering a savings guarantee, developing case studies demonstrating savings in actual Vermont homes, supporting homeowners in continuing energy-saving behaviors after the installation of measures, and providing evidence that the savings estimates from contractors and the program are accurate. Programs should also work with contractors and fuel dealers to explore the possibility of developing an offer that packages long-term financing with guaranteed savings, to deliver guaranteed positive cash flow to homeowners.
- 10. *Make energy audits less cumbersome and financially easier for customers.*** Program implementers should work with home performance contractors to reduce customers' reluctance to undertaking an efficiency project by reducing the barriers associated with the cost and hassle of the energy audit. This can be accomplished either by streamlining / optimizing the audit process and / or by subsidizing the cost of the audit. Programs should also work with energy service providers to determine how best to provide customers with a comprehensive roadmap to improve their homes, as well as energy performance scores.
- 11. *Encourage DIYers to understand priorities and cost-effectiveness.*** The state should continue to pilot efforts that encourage do-it-yourselfers to pursue high-quality installations that save significant amounts of energy and protect the health and safety of the building's occupants. For example, programs could consider offering incentives for performance testing of DIY projects. This approach would enable the program to capture savings, to protect occupant health, and to help DIYers prioritize home improvements such as air-sealing—measures that might otherwise be overlooked.

- 12. Streamline the contractor reporting process.** Efficiency Vermont should work with home performance contractors, using a process such as value stream mapping, to optimize both the contractor business process and the program reporting process for the energy improvements, from start to finish.⁴¹ Streamlining the program management and reporting system will improve customer service, increase conversions from audit to installation, and reduce the burden of reporting to the program.

- 13. Vermont Gas Retrofit Program services should continue.** VGS should continue to offer the residential programs it currently has in place, including a pilot to provide HPwES incentives to VGS customers who opt for that path. VGS could ramp up its Retrofit Program if a study indicates significant remaining need that can be served cost-effectively. Since VGS has been operating a retrofit program in its existing service territory for 19 years, the remaining savings potential is likely to be small. Absent evidence of significant unserved demand, an aggressive ramp-up could result in a non-cost-effective program. However, VGS's expansion into new regions such as Addison County will provide a new, untapped market for its Retrofit Program. VGS currently anticipates maintaining its existing efforts and directing more of its resources to new markets. If cost-effective efficiency opportunities exist, VGS could increase its investment in the Retrofit Program. However, that funding would ultimately be reflected in customer rates and therefore could affect VGS' competitive position. That is, natural gas, as a regulated fuel, funds efficiency, whereas customer purchases of unregulated fuels currently do not.

- 14. Establish a well-understood system of program accountability.** Programs should be held to a high level of accountability, consistent with existing regulated programs that make use of public and / or ratepayer funding, to ensure public confidence in the use of those funds and the effectiveness of the programs.

3.1.8 Recommendations: Policy / regulatory / legislative

This section recommends policy and regulatory approaches to drive retrofits and support the transition to 100% net-zero in Vermont's building sector.

- 1. Set interim targets for energy efficiency in the building sector.** The PSD has been charged by the Legislature to engage with a wide variety of stakeholders to examine policies and funding mechanisms designed to achieve the *Comprehensive Energy Plan's* 90% renewable energy goal and the statutory greenhouse gas reduction goals, including consideration of a total energy standard; this study is referred to as the "Total Energy Study." Through this

⁴¹ Value stream mapping is a lean manufacturing technique to analyze the flow of material and information in a process; in this context, *lean* is a method of process improvement designed to add value to the customer while eliminating wasteful steps.

process, the PSD should specifically create a roadmap with interim goals related to thermal efficiency in the building sector.

Some potential interim goals for this study to consider include:

- By 2030, 80% of the existing residential buildings in Vermont will meet a defined energy efficiency standard. By 2040, 100% of the existing residential buildings in Vermont will be brought up to defined energy efficiency standard.
- By 2050, all residential buildings in Vermont will produce 90% of the energy needed by the building from local or regional renewable sources.

2. Establish building energy disclosure requirements. A long-term strategy for improving Vermont's building stock cannot rely on financial incentives alone. There simply will never be enough public funding available for the State to achieve the goals it has set for itself. Vermont should begin implementing voluntary tools such as an energy label and performance score for existing homes, building on Recommendation 8 in **Section 3.1.7**, to drive demand for energy efficiency improvements by making the value of those improvements visible to the marketplace. A standardized method for tracking and disclosing energy performance would be beneficial for home sellers, buyers, appraisers, the financial community, and other real estate stakeholders. This approach should be evaluated after three years to determine its rate of adoption, impact on the marketplace, feedback from stakeholders, and the scope and findings of any other evaluations that might have been conducted in other jurisdictions. Based on this evaluation, the State should determine whether labeling and disclosure are to be phased in as a requirement at the point where a house is put on the market for sale and / or at other times, as discussed below.

This topic was explored in 2011, when the Building Energy Disclosure Working Group, comprising a wide range of stakeholders, was chartered by the Vermont Legislature to review this issue and provide recommendations for legislative action.⁴² The result was H. 497 and section 1 of S. 143, both of which reflected the majority recommendation of the Working Group. Neither piece of legislation was ultimately enacted, but there was significant discussion in both the House and Senate about various aspects of this as a policy approach to supporting higher levels of investment in energy efficiency. This recommendation signals a continuation of this work as an effective method for educating and transforming the marketplace.

Sometimes described as an "MPG sticker for the home," the concept is that if the energy performance of a building was made visible, there would be benefits to both buyers and sellers of real property:

⁴² The final report is available at <http://www.leg.state.vt.us/reports/2012ExternalReports/274427.pdf>. Additional information will be available on the Public Service Department's site: <http://www.publicservice.vermont.gov/>.

- Buyers would have an understanding of the comparative energy costs and performance of different buildings, and be able to take into account these large operational costs (typically second only to mortgage and interest costs for residential property). In addition, buyers will be less likely to purchase a property they cannot afford to operate, reducing the risk to mortgage lenders of default.
- Sellers would have a better chance of recouping investments they made in energy efficiency improvements because there would be a standardized and visible way for the value of those improvements to be communicated to the marketplace.

Taken as a whole, this concept could reduce the need for incentives, because energy efficiency will be valued in the marketplace, just as other attributes of a building are (square footage, number of bedrooms, quality of appliances, etc.). As a result, natural market forces can come into play that encourage building owners to make improvements with the knowledge that they will get positive, if not substantial, returns on their investments.

Many tools and approaches can be used for the rating and labeling of both residential and commercial buildings. For labeling, EPA Portfolio Manager is the *de facto* industry standard and is available for free. For rating, the marketplace is more crowded, ranging from free online tools such as Energy Savvy to detailed in-home HERS rating tools that can cost as much as \$1,000. The Building Energy Disclosure Working Group explored the pros and cons of different tools, which vary widely with regard to cost and accuracy. Although the Working Group ultimately made a nearly unanimous recommendation (with only one dissent) in favor of a free online audit tool, a significant minority expressed a preference for a more detailed onsite audit that would be performed by a qualified professional.

One consideration in selecting the type of tool should be the degree to which it can be linked to other approaches, using consistent language and metrics, including any system of labeling that is adopted voluntarily. Working toward a consistent approach for how home energy performance is measured and described will be challenging, but it is important from the standpoint of minimizing customer confusion. Partners and stakeholders are currently evaluating different residential tool options and determine the preferred approach for the tool and metric in Vermont. In its deliberations, the Working Group from 2011 suggested the following criteria be considered for any tool:

1. Reasonable cost to end user (\$0-300)
2. The rating is presented as a single number or letter to allow comparisons between buildings in the market
3. Accuracy: Replicable and predictable results, with energy use estimates close to average actual usage by an occupied building
4. Recommendations focus on high-priority areas for upgrades
5. Enabling a smooth process to pursue upgrades based on rating, with an optional link to home inspection

6. Compatible with HERS ratings that are currently produced for new ENERGY STAR Homes in Vermont; or if different from HERS, can be translated or linked to HERS
7. Provides a multi-level on-ramp with the ability to obtain more information if a higher level of accuracy is desired
8. Ability to customize and maintain the tool for Vermont, but ratings can be used and understood outside Vermont
9. Residential ratings: Asset rating based on features of home, rather than on occupant behavior
10. Commercial and Institutional ratings: Operational rating based on occupant behavior and actual energy use

In addition to using this at the time of transfer of property, the building energy analysis could potentially be provided at other times, such as when a homeowner is applying for building permit, requesting state funds for efficiency work, incentives for installing renewable energy, or applying for funding through a (PACE) program. Additional programs could be added to the list as the building energy analysis becomes more mainstream and accepted. This would lead to a more rapid pace of rating activity than relying solely on the real estate sales process.

Beyond the cost of the tools themselves, there might be other costs as well, such as administration, reporting, and technical assistance. These potential costs (and benefits) should be considered within the broader context of the design and funding of services for market-rate homes and businesses.

3. ***Increase Energy Code Compliance for Additions and Renovations.*** Vermont should fully implement the recommendations of the *Vermont Energy Code Compliance Plan*, commissioned in 2012 by the PSD.⁴³ The plan provides comprehensive recommendations to achieve code compliance through measurement and evaluation, leadership and policy, outreach and education, and resources and funding. Because the compliance plan focuses on new homes, Vermont should also allocate funding to develop a targeted plan for compliance and enforcement of the energy code on additions and renovations. The plan should also consider options for applying the energy code to historic homes, mobile homes, and manufactured housing, either by removing the blanket exemption for historic homes or by creating a separate track for these housing types during the next code update process.

The State of Vermont agreed to develop and implement a plan to achieve 90% compliance with energy codes by 2017, as a condition of accepting Recovery Act funds. Vermont also committed to adopt a residential energy code that meets or exceeds the International Energy Conservation Code (IECC 2009) and a commercial building energy code that meets or

⁴³ http://publicservice.vermont.gov/energy/ee_energy%20code%20compliance%20plan.html.

exceeds the ANSI / ASHRAE / IESNA Standard 90.1–2007. Vermont formally adopted the 2011 Vermont Residential Building Energy Standards (RBES) on October 1, 2011. With this update, additions and renovations are subject to RBES for the first time.

While the 2011 RBES is rigorous in terms of its technical requirements, Vermont lacks a mechanism to ensure compliance with the energy code. The 2009 report “Residential Building Energy Standards Compliance Analysis,” produced for the Vermont Public Service Department by Nexus Market Research, found that of an inspected sample of 106 new homes, 76 passed RBES, resulting in a technical compliance rate of 72%. However, inspectors found an RBES certificate during on-site inspections in only 12 of the 106 homes, an 11% compliance rate for the certificate posting requirement.

The lack of code enforcement is a concern for builders and contractors who do comply. As increasingly rigorous energy codes are adopted, the disparity between compliant and non-compliant builders might grow wider, and compliant builders are concerned about non-compliant builders undercutting them on pricing during bids. Implementing the Compliance Plan for new homes, while also developing a targeted plan to increase energy code compliance for additions, repairs, and renovation projects, will help to close this gap.

3.2 Multifamily Market Sector

The Multifamily Subcommittee focused on buildings containing at least two or more apartments for rent. Apartments are defined as self-contained residences (with private bathrooms, kitchens, and sleeping facilities).

Nearly one-fifth (19%) of Vermont’s households live in buildings containing two or more rental units. Of those apartments, 27% (13,000) specifically provide affordable housing to low-income residents. More than half (57%) of Vermont’s apartments are heated by (typically) higher-priced heating oil or electricity. Almost 50% of renters have lived in their apartment for 5 years or less; 79% have lived in their apartments for 10 years or less. The median income for apartment renters is 58% of the statewide median income.

The significant challenges faced within the multifamily market in meeting the State’s energy goals include a population without the funds or access to long-term incentives, to implement energy efficiency improvements.

- A survey of private multifamily property owners shows the primary motivators for improving energy efficiency are lower utility bills, investment protection, and the availability of project financial incentives. Whereas only 38% of private property owners are responsible for apartment heating energy costs, a majority of property owners simply do not have

access to the primary motivator (lower utility bills) to implement energy efficiency improvements.⁴⁴

- Property owners are not motivated by energy efficiency improvements which would enhance the lives of low income tenants (including appealing to prospective renters, environmental benefits, reduced tenant turnover, fewer tenant complaints, etc.)⁴⁵

The Multifamily Subcommittee reviewed four methods to calculate the extent to which energy improvements in multifamily housing stock can contribute to meeting Vermont's energy goals. The subcommittee, in consensus, recommends a multifamily retrofit goal of 14,750 units between 2013 and 2020.

The recommended goal represents a multifamily retrofit contribution that is 25% higher than the percentage of total buildings with two or more units, compared to Vermont's total housing stock. The higher proportion of the multifamily market sector's contributions to the overall State goal is due to two primary factors:

1. Multifamily apartments tend to house lower-income Vermonters. Improving the energy efficiency of apartments can provide direct benefits to the State's most vulnerable residents:

- a. Median income of apartment renters is 58% of single family home residents.⁴⁶
- b. Energy savings that accrue to the low-income sector bring a greater benefit to that sector because its energy bill-to-income ratio is higher than that of other sectors.⁴⁷
- c. Greater non-energy benefits from energy efficiency investments seem to accrue to participants in the low-income sector (both single-family and multifamily housing), particularly with regard to comfort, health, and safety. The PSD stated that these benefits can be very difficult to quantify, but the Department considers 15% to be a reasonable and conservative estimate of the additional non-energy benefits energy efficiency investments can provide to this sector.⁴⁸
- d. Improved energy efficiency helps to stabilize energy costs, which in low-income apartments provides a critical level of housing stability for our most vulnerable populations.⁴⁹
- e. Low income family and senior housing projects have very little ability to respond to price shocks (including fuel price) and operational cost inflation.⁵⁰

⁴⁴ Efficiency Vermont Building Performance Survey, Sept 15, 2011, Market Research and Consulting Services

⁴⁵ Efficiency Vermont Building Performance Survey, Sept 15, 2011, Market Research and Consulting Services

⁴⁶ VHFA Housing Data, www.housingdata.org

⁴⁷ Order re Cost-Effectiveness Screening of Heating and Process Fuel Efficiency Measures and Modifications to State Cost Effectiveness Screening Tool, testimony from the Vermont Public Service Department, February 7, 2012

⁴⁸ Ibid.

⁴⁹ Order re Cost-Effectiveness Screening of Heating and Process Fuel Efficiency Measures and Modifications to State Cost Effectiveness Screening Tool, testimony from the Vermont Housing and Conservation Board, February 7, 2012

- f. Typical tenant profile is predominately in the bottom quartile of statewide income distribution. Real income growth in this segment of our society has been virtually stagnant for more than two decades. The ability to fund operating cost inflation through substantial rent increases is simply not an option.⁵¹

2. Public assistance is a source of funds for the occupants of 27% of Vermont’s apartments.

Since the majority of these subsidized units have permanent affordability covenants, they should be viewed as unique statewide assets that warrant particular attention when it comes to energy planning and long term housing sustainability.⁵²

- a. Energy efficiency investments will protect public investments by state and federal taxpayers in these apartments. It is estimated that the public investments across the past 30 years total in the hundreds of millions of dollars.⁵³
- b. Stabilizing energy consumption in multifamily buildings protects an extremely low-income population of the elderly and disabled. A survey in 2010 showed that half the residents in affordable housing had incomes of \$15,100 per year or less.⁵⁴
- c. Energy efficiency investments in low-income multifamily buildings will maintain as affordable housing both historic structures that contribute to Vermont's sense of place and many buildings that are located near to services for residents who do not drive automobiles.⁵⁵

Attaining the goal of 14,750 multifamily units cannot be successful without retrofitting a minimum of 5,500 units of private housing stock. This statement reflects the fact that approximately 3,750 of Vermont’s 13,000 total subsidized housing units have undergone significant rehabilitation over the past several years. Historical efforts to retrofit non-subsidized rental housing units have not been successful without significant technical and project management assistance, and cash incentives. Although improving private rental stock represents a significant challenge for Vermont, the potential benefits available to the vulnerable populations housed in these units warrant a commensurate effort.

The total combination of public / private investment is estimated to be lower per unit, but the program-related, or public costs (incentives, project management, etc.) of serving the multifamily retrofit market are likely to be higher than they are for single-family homes.

- Energy efficiency retrofits tend to address a building’s thermal envelope; multifamily buildings have more internal living area volume compared to external shell area than single-family buildings, ultimately enabling lower per-unit retrofit costs.

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Ibid.

⁵⁵ Ibid.

- Due to a combination of split incentives and the extremely low vacancy rate of Vermont’s apartments, public / program costs are likely to be higher per unit than single-family retrofits. That is, multifamily projects require increased technical assistance, project management functions, and incentives.

Success in the multifamily sector will be realized through a combination of solutions. One of these is providing a single customer “portal” that guides customers to appropriate program referrals, coordinating consistent program definitions and activities, and mitigating barriers to comprehensive project implementation.

3.2.1 Background and context for recommendations

Vermont’s multifamily properties are served by at least seven separate energy efficiency or renewable energy programs.⁵⁶ Each has developed characteristics to best achieve its respective goals, while meeting specific funding parameters (including fuel type, income level, geographic territory, etc.).

The Multifamily Subcommittee finds that the various types of programs are a net benefit to the multifamily market as a whole, offering solutions specific to the unique and diverse situations of Vermont’s multifamily housing stock. However, many programs overlap, leading to implementation inconsistencies, and to partner and customer confusion about the most appropriate technologies, incentives, and program requirements. In addition, privately owned multifamily properties are not well served by existing programs, which over time have developed to serve primarily non-profit affordable housing providers.

For the multifamily sector to effectively and efficiently contribute to Vermont’s aggressive energy goals, the Multifamily Subcommittee recommends adoption of the following:

3.2.2 Recommendations: Policy / regulatory / legislative

1. **Define Multifamily Housing as two or more rental units for energy programs funded / regulated by the State of Vermont.** Although many of Vermont’s rent-restricted apartments are in larger buildings, the majority of Vermont’s apartments are in buildings containing fewer than five units. To increase multifamily production, strategies must be developed that consistently and comprehensively address barriers specific to the multifamily sector, regardless of building size. This is particularly important in privately owned buildings. The existing definition for *multifamily as* five units or more complicates program delivery; it is not unusual for multifamily barriers in smaller buildings to be disregarded in program design, when the buildings are reported and funded through

⁵⁶ Weatherization Assistance Program, Efficiency Vermont Comprehensive Track and Building Performance programs, Burlington Electric Department, Vermont Gas, Vermont Fuel Efficiency Partnership, Renewable Energy Resource Center

“Single-Family” programs. Categorizing all multi-unit residential rental property into a single funding and reporting group will provide economies of scale that will enable efficient identification of similar market barriers.

2. ***Define and adopt exceptions to Weatherization Assistance Program (WAP) / U.S. Department of Energy (DOE) regulations.*** To improve consistency across the seven (7) energy programs funded or regulated by the State of Vermont, exceptions to certain DOE WAP regulations should be acknowledged and accepted for activities funded by Vermont’s Weatherization Trust Fund (WTF). Vermont WAP has been funded primarily by the WTF for many years (DOE funding for VT WAP in FY 2013 is zero). Whereas DOE regulations provide standardization and consistency to facilitate their national program delivery model, they can be burdensome for meeting the specific needs of Vermont’s low-income multifamily sector. As discussed in other Multifamily market sector recommendations, there are specific areas where national program rules could be adapted to both improve consistency across Vermont’s portfolio of multifamily programs and strengthen Vermont WAP’s participation in multifamily projects. Some of these are:
 - a. Building eligibility, including income threshold and qualification protocols;
 - b. Re-weatherization criteria: under what conditions VT WAP may reinvest in previously served buildings;
 - c. Cost effectiveness screening protocols
 - d. Program performance criteria (including treatment of multifamily buildings, or other program metrics.); and
 - e. Longer term funding pool: increase stability to the WAP programs through provision of lengthened planning and budgeting timelines. (Currently, most programs operate on a year to year basis, hampering planning for larger, multiyear projects or long term strategies.)

Exceptions to DOE regulations should remain limited (in order to facilitate WAP program delivery funded by multiple sources) and also allow future review and adjustment (ensuring continued consistency with Vermont’s portfolio of multifamily programs.) This recommendation assumes DOE funding will return to the Vermont WAP program, and does not suggest alterations that would exclude Vermont from receiving future DOE funding for WAP.

3. ***Assure the availability of public asset affordable housing (rent-restricted) funding.*** Ensuring that the development and renovation of “Public Asset” affordable housing is funded will produce housing that can withstand long-term fuel price volatility, as articulated in *The Roadmap to Housing Energy Affordability*.⁵⁷ Funding for new housing and major

⁵⁷ Andy Shapiro, Energy Balance, Inc, with assistance from Maclay Architects and Stephen Pitkin, March 2011. Produced by the Vermont Housing & Conservation Board with support from the John D. and Catherine T.

rehabilitation projects should be sufficient to exceed energy code minimums (including Vermont’s Residential Building Energy Standards) to effectively manage long-term energy affordability. Specifically this means:

- a. Support of the Vermont Multifamily Energy Standards, collaboratively developed by Efficiency Vermont, Vermont Housing Finance Agency, and the Vermont Housing and Conservation Board.
- b. Support of projects that achieve specific energy standards above code minimums (such as ENERGY STAR for New Homes for new construction projects.)
- c. Support of “deep-energy retrofit” incentives and technical support, such as that provided by the Vermont Fuel Efficiency Partnership.

4. Establish consistent definition of income eligibility. To the extent possible and within the context of programs funded or regulated by the State of Vermont, for programs with funding or savings performance goals for low-income populations, establish a consistent definition of *income eligibility*.

- a. Determine appropriate lead agency: This recommendation acknowledges the intersection of State energy and human service policies. A stakeholder process should include representation from the Agency of Health and Human Services and the Department of Public Service as well as human services and energy implementation programs.
- b. Determine an *income eligibility* definition that identifies Vermont households that cannot afford to undertake energy efficiency improvements to reduce their energy burden.
- c. Income eligibility standards should be sensitive to the transitional nature of rental housing, such as:
 - i. Maintaining rent and utility costs below a certain percentage of area median income
 - ii. XX% of households in buildings with or fewer units and XX% of households in buildings with XX or more units meet income standards. (“XX” represents a value that should be established within this recommendation)
- d. This recommendation is intended align the multiple State funded / regulated energy efficiency services for low income households with a consistent customer definition. The recommendation is not intended to prescribe the level of services available from any given program to the defined customer sector.

5. Coordinate income eligibility implementation. Within the context of programs funded or regulated by the State of Vermont with low-income funding or savings performance goals, allow qualification for one program to satisfy the qualification requirement for other

programs to reduce duplicative efforts when multiple energy programs participate on a single building.

6. **Energy and building codes**

- a. **Develop energy code compliance mechanisms.** Energy efficiency improvements to Vermont's multifamily housing stock are currently being overlooked due to lack of compliance with the State's energy code. Energy efficiency measures capitalized on at time of building renovation and / or sale will result in the most cost effective improvements to buildings (occurring with other projects), and will serve buildings which may not be reached by Vermont's energy programs.
 - i. *Renovations:* Develop mechanism to ensure rental property renovations are in compliance with State Energy Codes.
 - ii. *Time of sale:* Institute time of sale requirements for rental properties to meet minimum energy efficiency standards. Modeled on the existing City of Burlington Ordinance, would require apartment buildings to meet a minimum set of energy efficiency standards at time of sale.
- b. **Overcome adverse compliance consequences:** A barrier to implementing energy efficiency improvements is the fear a property owner might have in potentially identifying unknown building deficiencies. Vermont should develop building improvement policies that support energy efficiency retrofits without adversely penalizing well-intentioned building owners. Potential policies include financing and / or funding options to support property owners to rectify non-energy code deficiencies (such as electrical, fire, building, etc.). These deficiencies are likely to be discovered during energy efficiency retrofit projects. (This would apply to building owners who work to meet or exceed energy code standards, but encounter unexpected structural or technical problems that prove such an improvement unreasonable or to otherwise cause hardship.)
- c. **Clarify Vermont energy code treatment of multifamily buildings.** Clearly define within both the Residential and Commercial Building Energy Standards which standard applies to types of residential rental properties. Specific recommendations for clarification are:
 - i. Residential non-living spaces (common hallways, laundry facilities, management office, community rooms, storage rooms, foyers, parking facilities, etc.)
 1. Buildings 4 stories and higher: Commercial Energy Code (CBES)
 2. Buildings 3 stories and lower: Residential Energy Code (RBES)
 - ii. Living spaces
 1. Buildings 4 stories and higher: CBES
 2. Buildings 3 stories and lower: RBES
 - iii. Mixed-use buildings:
 1. Buildings 4 stories and higher: CBES for all uses
 2. Buildings 3 stories and lower:

- a. RBES for all residential uses, including residential non-living spaces
- b. CBES for all commercial uses (retail, office, convenience store, restaurants, etc.) and common area facilities serving both residential and commercial uses.

3.2.3 Recommendations: Program implementation

1. **Set program goals for the private sector.** Set specific goals and metrics in each program for privately owned apartment rehabilitation projects to ensure increased penetration rates in the private market. Recognizing that serving smaller, privately owned apartment buildings (which have historically been under-represented in energy improvements) will be critical to meeting the State energy goal, metrics should be developed that:
 - a. Establish specific production targets, as shown in **Table 6**, for privately owned retrofitted units.

Table 6. Project completion targets that will help the State meet its building efficiency goals by 2020

Project Type	Proposed Annual Project Completion Targets, by Year								
	0	1	2	3	4	5	6	7	Total
	2013	2014	2015	2016	2017	2018	2019	2020	
Total units / year	1,000	1,375	2,063	2,063	2,063	2,063	2,063	2,063	14,750
Private sector units	-	138	309	516	825	1,238	1,238	1,238	5,500
Rent-restricted units	1,000	1,238	1,753	1,547	1,238	825	825	825	9,250

- b. Establish targets for project comprehensiveness
 - i. Heating systems, thermal shell, domestic hot water, ventilation
 - ii. Establish energy program budget parameters sufficient to overcome the significant barriers to property owners investing in their properties.
2. **Improve program performance monitoring.** Establish program performance monitoring metrics and goals for the entire portfolio of energy programs. Monitoring program performance will result in enhanced accountability and trust between program implementers and property owners by ensuring that the analysis of energy savings accurately portrays performance, and measure implementation is consistent across programs. Each program should develop performance monitoring strategies reflecting projects and measures typical of that program. The Public Service Department should be responsible for coordination of Performance Monitoring to ensure consistency across the program portfolio.

3. *Improve consistency in requirements for auditing and cost-effectiveness screening.*

Establish a single responsible entity (such as the Public Service Department) to facilitate and improve the consistency of auditing, analysis, and cost-effectiveness screening criteria across the portfolio of multifamily energy programs that are funded or regulated by the State of Vermont to:

- a. Improve signals to key market actors, program participants and customers (including contractors, retailers, distributors, etc.)
- b. Reduce customer confusion.
- c. Improve coordination between programs.

Program criteria might include:

- Minimum auditing requirements
- Analysis methodology (such as baseline determination)
- Screening tools (acknowledging avoided fuel costs will be specific to individual fuel type)

This long-term recommendation should include an appropriate stakeholder process that clearly articulates and balances both implementing the State's Comprehensive Energy Plan with allowing creativity to address differing building types and evolving technologies. This recommendation builds the foundation for seamless collaboration and consistency across Vermont's portfolio of energy programs to enable efficient achievement of aggressive energy goals, while acknowledging the challenges of multiple funding sources, fuel types, and income sector goals.

4. *Enhance technical and financial assistance for rent restricted major renovation projects, including major renovation projects that focus on energy efficiency.*

Entities developing and renovating permanently affordable housing are a critical component of Vermont's multifamily housing stock. These development projects expand the supply of housing for low income Vermonter's while revitalizing communities through the significant rehabilitation of older buildings supporting the historic fabric of Vermont's downtowns. Due to their contribution to Vermont's affordable housing stock and the long, complicated nature of the development process, they warrant specific attention.

Some of the challenges to integrating Vermont's energy programs into these major rehabilitation projects include:

- a. **Long-term financing commitments are needed.** It is not uncommon for major rehabilitation projects to literally take years from preliminary need assessments to completion. Developers rely on long-term technical and funding commitments from supporting energy programs which are inconsistent with the short term planning and budgeting capacity of most State energy programs.
- b. **Direct installation programs.** Typical major rehabilitation projects include full design and construction teams with architects, engineers, project managers,

and general contractors to deliver housing that supports the *Roadmap for Housing Energy Affordability's* energy goals. Installation coordination between construction teams and direct installation programs can be challenging for both developers and energy program implementers.

- c. **Incentive levels.** Vermont's current incentive level structure for energy efficiency funding sources in is inadequate for achieving the *Roadmap* level of efficiency measures required to support project specific long term operational viability as well as the viability of alternative stressed resources such as the State's LIHEAP program.
- d. **Pipeline management.** The quantity of developed units varies across the state from year to year, creating unpredictable production variances in one program region or another, from year to year.

There are several possible approaches to resolving the issues with rent-restricted major renovation projects. Two potential approaches, neither of which achieved consensus support within the Multifamily Subcommittee, are presented here as *Approach A* and *Approach B*. Solutions to the approaches should be developed in consultation with the stakeholders which clearly articulate the issues and allow positive resolutions in an environment of expanding resources:

5. *Approach A: WAP installation assistance for rent-restricted major renovation projects.*

In the context of meeting the State's comprehensive energy goals: WAPs would, contingent upon adequate additional funding appropriate for this purpose, increase direct installation production (for both single-family and multifamily units) and include as one of its targeted priorities large renovation projects meeting the deep energy efficiency goals of the *Roadmap to Housing Energy Affordability*. The WAPs would work closely with the general contractor and / or general energy efficiency contractor to ensure coordination and cost-effectiveness of all weatherization measures installed, and avoid duplication of effort.

If the WAP in whose service area a specific major renovation project is located is unable or unwilling to directly install the needed weatherization measures, then, after conducting the appropriate energy audit and developing the project specifications, it may opt to subcontract with other energy efficiency contractors to install the recommended measure under its general guidance and oversight.

The goals and benefits of this recommendation are threefold:

- a. Match WAP resources to low-income sectors with the most critical need, encompassing both low-income single-family and multifamily retrofit projects, and including "gut rehabilitation" projects.
- b. Make the most effective use of the extensive skill, knowledge, and experience of the WAPs on major renovation projects as members of design teams,

conducting energy audits, developing technical specifications, installing or subcontracting to install weatherization measures, and providing quality assurance inspections of project installation.

- c. Support major renovation contractors to effectively coordinate the planning for and installation of all energy efficiency measures on each project.

The Multifamily Subcommittee recognizes the challenges faced by WAPs, including existing single-family waiting lists and budget restraints. This recommendation is not intended to remove budget responsibility or management from the individual WAPs. Further, in absence of the projected corresponding increase in overall WAP single-family and multifamily projects, this recommendation will require prudent implementation to preclude any destabilizing budget effect on the WAPs.

6. ***Approach B: Develop a targeted funding source and operational protocols to support a dedicated thermal efficiency program for major renovation projects.*** The program could be integrated into existing program structures in concert with the comprehensive set of multifamily recommendations suggested in this report. The goals and benefits of this recommendation are fourfold:

- a. A targeted multifamily program would support energy efficiency production goals complementary to the specific statewide production needs of Vermont's low-income housing stock.
- b. Energy service providers operating within the protocols of a specific multifamily program would be in a position to better provide the full range of technical assistance and analysis support to project development teams, encompassing thermal, electrical, and renewables.
- c. A multifamily program would recommend scopes of work and provide an incentive structure based on a set of consistent energy efficiency measures screened and developed within a structure of operational protocols specific to the unique nature of multifamily renovation projects.
- d. The option for direct grant funding to developers would support the most efficient installation of recommended energy efficiency measures. Quality assurance would be achieved through provided technical assistance, whereas grant payments would be contingent on successful final inspections.

7. ***Establish apartment energy disclosure or labeling program.*** Establish a program encouraging property owners to market energy-efficient units as such, and help prospective tenants to understand the true costs of renting an apartment. This approach is expected to increase demand for energy-efficient apartments. Options for consideration include:

- a. **Voluntary disclosure.** Enable property owners to request and receive historical energy use of an apartment from utilities and fuel providers for distribution to prospective renters.

- b. **Labeling.** Provide a label (example: “Certified Vermont Efficient Apartment”) to apartments that have undergone targeted energy efficiency improvements. To ensure consistent application, encourage program collaboration to develop definitions specific to each program that would meet the label guidelines. Labels should be earned retroactively for properties that have either been built to certain standards, or which demonstrate low energy use intensity as an existing status. The Statewide Program Coordinator (per the Collaboration and Coordination section) would facilitate an overall statewide program, implemented through participation with individual energy efficiency programs.
- c. **Behavior.** In addition, explore other “non-price” interventions such as Home Energy Reporting statements that recognize the impact of behavioral cues on owner behavior.

3.2.4 Recommendations: Collaboration and coordination

1. **Coordinate program outreach.** The State should establish a central customer focused referral point, to coordinate customer outreach and match customers to appropriate programs. While not responsible for the planning, budgeting, or operation of any one program, a statewide clearinghouse would act collaboratively and facilitate coordinated activities, including:
 - a. Develop and implement marketing outreach plans to attract property owners and managers of both affordable / rent-restricted and privately owned apartments for energy efficiency improvements.
 - b. Provide a central location for rental property owners to obtain information on all available sources of technical and financial support
 - c. The statewide clearinghouse is not intended as a requirement for participation in any program. Customers with existing service provider relationships will continue to interact with their service providers directly.
2. **Coordinate program implementation.** Establish regular coordination and dialogue among managers of energy programs funded or regulated by the State of Vermont. A statewide entity should facilitate program coordination with the goal of improving customer experiences, identifying barriers and service gaps across the portfolio of energy programs, and developing consensus-based recommendations to overcome gaps and barriers. To identify and remedy service gaps, institute regular and formal process for multifamily energy program providers and housing stakeholders to share feedback and collect input on program effectiveness.

3.2.5 Recommendations: Funding and financing

For the multifamily sector to successfully contribute to accomplishing Vermont’s energy goals, significant and well-documented barriers must be overcome. Residential rental properties are

typically cash flow constrained; raising revenue through increased rents is not a viable solution, given the sector's low-income population (earning 58% of median income). Robust funding and financing of multifamily energy efficiency improvements is essential to overcome these barriers:

1. **Removing split incentives.** When tenants are responsible for utility costs, whereas energy efficiency infrastructure investments are the responsibility of property owners. The “split incentive” provides a significant disincentive for property owners to invest in efficiency when they do not realize the economic benefits.
2. **Investing even though vacancy rates might be extremely low.** Low vacancy rates increase demand for apartments, regardless of their energy efficiency attributes. Property owners have no incentive to invest in energy efficiency improvements due to the tight supply and high demand for existing apartment stock.
3. **Addressing management / owner time constraints**
 - a. *Private:* A majority of private rental property owners manage just one, small building as an investment property. As such, energy efficiency improvements which are not viewed as a wise economic investment (or necessary to reduce vacancy rates), are simply an additional unnecessary burden to the already challenging obligations of rental property ownership.
 - b. *Nonprofit / affordable:* In addition to the obligations of managing apartments, managers of affordable housing properties are also responsible for meeting the significant regulations attached to property funding. Affordable housing managers do not have the capacity or resources to manage property improvements which are not critical to health and safety.
4. **Coordinating project management.** Aside from the unique skill set of construction project management, multifamily renovation projects require coordination with tenants. This coordination can include notification of apartment entry and managing the challenges of working in tenant living spaces.
5. **Increasing property owners' and managers' technical knowledge.** Rental property owners and managers do not possess the technical knowledge needed to identify, prioritize, and implement energy efficiency improvements consistent with professional building science standards.

Even with well-developed program delivery mechanisms and customer propositions, creative financing options and aggressive incentives (set at higher levels than the typical residential and commercial projects) will be required.

In combination with increased incentives and private financing, the following mechanisms should be developed to support improvements in multifamily energy efficiency:

1. **Expand property assessed clean energy (PACE) availability.** Expand PACE eligibility to multifamily and mixed-use investment properties to fund long-term energy efficiency improvements. The benefits of PACE financing include long loan terms where the loans are attached to the property instead of an individual investor. These benefits will be particularly advantageous for multifamily investment properties, which are burdened by split incentive barriers and efficiency measures with long pay backs. While expected to primarily be utilized by private property owners, non-profit affordable housing owners as well as private property owners should both be eligible for PACE financing.
2. **Support the public-purpose energy service company (PPESCO) model.** Support development of a PPESCO financing model specifically for providers of affordable multifamily housing. A PPESCO would serve to finance the long-term investment strategies unique to the preservation of permanently affordable housing, and illustrated in the 2011 *A Roadmap to Housing Energy Affordability*. While providing the benefits of traditional ESCOs, a PPESCO would add these benefits:
 - a. Fund *all* cost effective measures, rather than those with the greatest return on investment
 - b. Include renewables
 - c. Provide a long term financing structure to enable cash flow positive benefits to affordable housing providers
3. **Create a statewide energy efficiency tax credit.** Explore the viability of creating a Vermont Energy Efficiency Tax Credit to support deep energy efficiency retrofits in affordable multifamily housing. Affordable housing developers in Vermont have substantial experience in utilizing federal housing tax credits. A Vermont state energy efficiency tax credit could provide key additional funding specifically targeted at achieving the high level of energy efficiency needed to reach statewide housing and energy goals—while being integrated into project financing models already in place.

For more information on specific financing tools and options, see Finance Products and Mechanisms, **Appendix 5**.

3.3 Commercial and Industrial Market Sector

The Commercial and Industrial Subcommittee set as its target reducing commercial and industrial (C&I)⁵⁸ building heating and process fossil fuel energy use through energy efficiency measures in

⁵⁸ For purposes of this document, *Commercial and Industrial* includes all non-residential buildings, the primary use of which is not related to living or sleeping spaces, based on ASHRAE® Standard, Energy Standard for Buildings Except Low-Rise Residential Buildings, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., page 11, and industrial sectors include manufacturing, mining, agriculture, and **construction** activities, based

existing buildings by acquiring 1.3 trillion BTU of savings: a target equal to 7.5% of 2008 baseline annual consumption.⁵⁹ Success in the Commercial and Industrial sector will be realized via thermal energy savings in C&I buildings of all sizes and types.

3.3.1 Background

The Department of Public Service recently completed an assessment of the building and equipment stock of the C&I sector. Some findings of that report relevant to this report are:

- Nearly half (48%) of Vermont’s C&I buildings are less than 5,000 square feet, and 80% are less than 10,000 square feet.
- 41% of C&I customers lease their buildings.
- The majority of Vermont’s commercial buildings were built before 1970 (69%), with 28% built before 1900. However, energy use in commercial buildings is typically a function of overall building size and function, and not directly proportional to building vintage.
- Even the most efficient of buildings in the state have opportunities to increase energy efficiency.

The Commercial and Industrial Subcommittee has analyzed the C&I market and developed a set of recommendations that are intended address identified market gaps, facilitate the goals stated above, and achieve at least the following MMBTU savings.

Table 7. Commercial and Industrial sector progress and targets

Fossil Fuels	2008 Baseline Consumption (mmBtu)	TARGET mmBtu (7.5%)	Achieved 2008-2011	Expected 2012-2013	Remaining Necessary 2014-2020
<i>Natural Gas</i>	5,500,000	412,500	196,385	52,816	163,299
<i>Propane</i>	3,600,000	270,000	26,924	50,000	808,076
<i>Fuel Oil, Kerosene</i>	8,200,000	615,000			
TOTAL	17,100,000	1,297,500	223,309	102,816	971,375

The recommendations contained in this report are intended to facilitate the acquisition of these savings. They cut across all segments of the C&I market; however, only savings from retrofit and equipment replacement (or *market opportunity*) efficiency installations (including improvements in how the buildings are operated) are included in targets. Savings acquired from the improvement of C&I new construction projects, above and beyond code baselines, are not explicitly counted in the above target because: (1) external factors play an important role in driving the amount of New Construction starts in Vermont, and (2) the C&I Subcommittee understands its charge to develop programs to reduce usage in *existing* buildings. Even so,

on “Guide to Energy Management,” Sixth Edition, Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, page 12.

⁵⁹ Energy Information Administration State Energy Data System, 2008 Commercial and Industrial Natural Gas, Propane, Fuel Oil, Kerosene consumption

comprehensive programs must address the new construction market in order to make new buildings as efficient as possible and avoid missed opportunities. Similarly, fossil fuel savings from thermal renewable energy installations are not specifically addressed in this section of the report (see the Renewable Energy Subcommittee section for more detail). However, the Commercial and Industrial Subcommittee finds it imperative that the policy and program recommendations provided here are not viewed in isolation; renewable energy and energy efficiency policy must be coordinated in order to achieve longer-term, broader goals beyond those set out to be achieved by this Task Force. Costs associated with encouragement of renewable energy were not included here with the exception of education oriented recommendations, and to the extent renewable energy options or recommendations are included in any auditing programs.

Vermont's C&I customers are served by a number of separate energy efficiency programs, including those offered by Vermont Gas Systems, Energy Efficiency Utilities (Efficiency Vermont and Burlington Electric Department), the Vermont Superintendents Association's School Energy Management Program, among others. (A description of the programs available to C&I sector customers can be found in **Appendix 1**.) These programs already often work in concert: for example, Vermont Gas might provide incentives for an efficiency rebate and facilitate a low interest customer loan from the Vermont Economic Development Authority. However, the only substantial services to assist C&I customers in reduction their thermal usage, with a long-term, stably funded presence in the marketplace are those offered by Vermont Gas Systems. Each of the programs must meet certain parameters associated with its funding, (for example, addressing specific fuel types, income levels, geographic territory, applying screening criteria, etc.)

The C&I Subcommittee finds that energy efficiency programs in the C&I sectors have had a significant net benefit, improving businesses' bottom lines relative to energy consumption while also providing an environment that is conducive to achieving the buildings' main purposes. Indeed, investments in the C&I sectors are often the most cost-effective investments that an energy efficiency program can make due to the larger scale of the buildings and energy intensive uses. Overall, they can offer specific solutions to the unique building types and processes of Vermont's C&I customers. However, the programs—as currently delivered—are constrained in scope and funding; the programs in their current state will not lead to a transformation of Vermont's C&I building and equipment stock and will not lead to a reduction in energy consumption consistent with the above stated goals.

This document identifies market gaps in existing programs that are barriers to efficient use of thermal energy. For the C&I sector to efficiently contribute to Vermont's energy goals and enhance the vitality of C&I heating and process fuel customers statewide, the C&I subcommittee also provides recommendations to address these gaps.

3.3.2 Analysis of market gaps

The C&I Subcommittee has identified the following market gaps that are barriers to C&I investment in energy efficiency. This section is followed by program, policy, and funding recommendations to address these gaps. The gaps are not necessarily presented in order of importance.

1. **Geographic and fuel type inequities in available services.** Currently, the only large scale commercial and industrial retrofit program for heating and process fuels is in Vermont Gas Systems (VGS) territory. As described in **Appendix 1**, VGS offers a comprehensive set of efficiency services to C&I customers, including technical assistance, rebates, and more. Efficiency Vermont provides some general education, limited technical assistance services, and targeted rebates in the remainder of the state (outside of Burlington Electric Department's territory, where they are offered by Burlington Electric), however it has limited funding available for thermal measures. Customers who use fuel oil, propane, kerosene, or wood as their primary heating source (or process fuel) thus have very limited opportunity to avail themselves of any comprehensive program.
2. **Customer, contractor, and trade ally education and awareness.** Despite the presence of Vermont Gas Systems and limited Energy Efficiency Utility programs in the marketplace, there is a gap in customer, contractor, and trade ally education and awareness, creating significant barriers to transforming the market.

Like the residential sector, many C&I customers (especially in smaller buildings) have a limited understanding of the connections between their building and its energy usage. Available information on how to address energy usage is limited, piecemeal, and can be inconsistent. There is not one clear trusted source for information to improve a building's thermal energy performance. In addition, C&I customers often have a poor understanding of the wide range of benefits that energy efficiency measures can provide beyond reductions in energy usage, including increased productivity, decreased operations and maintenance costs, better employee health (less sick days), and increased property value.

Vermont has made strides in its available contractor building performance trainings over the last decade. However, this training is often focused on the residential sector. Whereas this type of knowledge is appropriate for the many small commercial buildings that are actually converted old homes, it does not easily translate into more sophisticated C&I building systems. Successful contractors, auditors, and equipment installers who can facilitate C&I efficiency improvements are often specialized, for example they may know everything about the HVAC system but little about the building envelope. The number of knowledgeable, trained commercial auditors and contractors, who can address a commercial building system comprehensively, is limited. This is

partially because there are no comprehensive programs to address C&I buildings holistically. Limited mechanisms have been developed that facilitate partnerships (or a “team approach”) to comprehensively service an existing building, have been developed. The Energy Service Provider Subcommittee report provides some discussion on this topic.

“Trade allies” such as design professionals, retailers, distributors also might not be aware of the most efficient technology or available programs, or might not be communicating efficiency information to customers and contractors at all, or in the same manner as efficiency programs. In addition, system installers are often not trained in the most efficient equipment and methods. This gap in awareness and education can cause market confusion and disruption.

3. **Access to capital.** Many businesses, especially small businesses, have a difficult time paying the up-front costs associated with efficiency improvements even when energy bills would be lowered significantly over time. While some financing mechanisms are available for the C&I sector (see Section 4 – Financing and Funding), there is a gap associated with the information, access, and those availing themselves of those mechanisms. Further, customers appear to be hesitant to avail themselves of those options. Access to capital is less of a problem for large customers who may have the capital but desire a fast return on their energy investments.
4. **Limited mechanisms to reduce timeframe for return on investments.** It is clear that efficiency investments incur an upfront cost and payback over the lifetime of the measure. Heating and process fuel measures often have long lifetimes; the payback can be longer than a commercial or industrial entity desires to make because they have competing uses for their capital. Mechanisms to reduce the payback time are limited (as described next in funding gap).
5. **Limited private investment options.** In order to reach the Task Force goals, significant investment in energy efficiency will be needed. Most of this capital should be privately provided. Currently, many building owners are not making investment decisions that will lead to energy efficiency improvements. A perceived lack of access to capital or perceived long paybacks dissuade many building owners. Typically, private investment options have centered on the Energy Service Company model, where a third party funds improvements in a facility and is paid via part of the energy savings and through construction management fees. However, ESCOs often focus only on large customers that have large scale projects in order to help justify the management overhead costs (typically projects costing greater than \$1 million). The Commercial and Industrial Subcommittee believes there may be an appetite for a mechanism where a third-party investor could invest in a building in order to receive a slower but assured return. However, no trusted, simple mechanism yet exists to allow such third-party investment.

6. **Limited motivation for tenants to improve buildings.** As noted above, 41% of C&I building owners lease their building space to one or more tenants. These commercial & industrial buildings are often built by developers who will never pay for the utilities in the building but assign that responsibility to the tenant. The tenants have little reason to invest in the owner's property. This decoupling of the owner and the tenant who bears the burden of the energy bill tends to lead the tenant to look at the short-term energy saving solutions, despite the long-lived nature of the building stock.
7. **Employee time / authority.** Many commercial sector building occupants simply do not have the time or knowledge-base to make carefully considered efficiency decisions. Facility staff generally do not have the authority to choose the investment that reduces energy in the long-term but may have a longer payback than competing investments. Turnover at some workplaces also leads to a lack of institutional knowledge about building operations. This results in buildings not being retrofitted comprehensively, or not at all, and in building systems not being maintained to operate at optimum efficiency.

3.3.3 Recommendations: Policy / regulatory / legislative

1. **Begin scaling current C&I programs.** The commercial subcommittee recommends that for the near term, existing C&I programs begin to be scaled up to acquire energy efficiency resources in order to meet the savings targets. Table 11 in Section 4.5.2 provides an estimated mmBtu ramp rate to meet the State's targets. As shown, programs in Vermont Gas territory need to increase modestly to meet targets, while substantial increases in unregulated heating and process fuel efficiency programs will be necessary. These increases in program activity are recommended to be accompanied by the program recommendations below. Increasing the scale of the current programs will help to address the market gaps of Geographic & Fuel Type Inequities and Customer, Contractor, and Trade Ally Education and Awareness. Other market gaps could be addressed with appropriate program design.
2. **Implement mechanisms to ensure availability of historical fuel use data.** Customers seeking to make efficiency improvements need access to historical data in order to effectively analyze the costs and benefits of the potential investment. Upon customer request, this information should be available. However, in many instances it currently is not – ownership changes to the building, lack of stored data, or other barriers are prevalent in the marketplace. Upon customer request, this information should also be available to organizations that provide thermal programs (with appropriate confidentiality safeguards). Improved data availability would facilitate improved efficiency measure audit recommendations and energy savings estimates, leading to increased confidence in the probability of identifying and tracking results. This would

have a side benefit of facilitating the measurement and verification of publicly funded programs. The requirement would be most beneficial if at least 3 years of billing and usage were available.

3. **Enhance code compliance.** Vermont formally adopted the 2011 Vermont Commercial Building Energy Standards (CBES) for implementation in early 2012, its second commercial building energy code. As noted in the residential subcommittee report, Vermont lacks a mechanism to ensure compliance with the energy code, and therefore rates of compliance are lower than they otherwise would be. The lack of code compliance is a major concern for those builders and contractors who do comply. As increasingly rigorous energy codes are adopted, the disparity between compliant and non-compliant builders grows wider, and non-compliant builders are able to undercut compliance builders on price. The *Vermont Energy Code Compliance Plan* was commissioned by PSD to address this issue, as well as to address ARRA's requirement that Vermont establish code enforcement programs and develop a system for annual measurement of the rate of compliance no later than June 30, 2012.⁶⁰

Vermont should fully implement the recommendations of the compliance plan. The plan provides comprehensive recommendations to achieve code compliance through measurement and evaluation, leadership and policy, outreach and education, and resources and funding. Because the compliance plan focuses on new buildings, Vermont should also allocate funding to develop a targeted plan for compliance and enforcement of the energy code on additions and renovations.

3.3.4 Recommendations: Program implementation

1. **Enhance thermal efficiency educational efforts.** The Commercial and Industrial Subcommittee recommends that the following methods be considered to enhance education efforts; increasing broad-based awareness and facilitating market transformation.
 - a. **Insert educational information at point of purchase.** Methods that have been successful in the past include developing partnerships with retailers in conjunction with available incentives.
 - b. **Ensure clear and consistent messaging to trade allies.** This messaging should limit confusion in the market.
 - c. Increase available resources to **provide “walk-throughs” and on-site technical assistance**, especially for larger users.
 - d. **Provide trainings to contractors dedicated to medium to large commercial building systems and envelopes** in order to increase the availability of

⁶⁰ http://publicservice.vermont.gov/energy/ee_energy%20code%20compliance%20plan.html.

knowledgeable whole building efficiency market actors. A widely recognized Building Performance certification should be provided for commercial & industrial designers, equipment contractors, and installers.

- e. **Provide training and tools for facility personnel** to encourage full understanding of building operation and maintenance of energy systems, and to manage their energy use. This could take the form of the “Building Operator Certification” program or similar program for personnel. Consideration should be given to requiring building operator certification or licensing for buildings of a certain size. The commercial and industrial subcommittee notes that this should be a priority recommendation – the energy consumption and costs associated with underperforming buildings is a significant, low cost opportunity.
- f. **Benchmark building types** on an energy use-per-square-foot / Heating Degree Day or other easily identifiable metric, and provide information publicly. With information in-hand about similar building types (e.g. hospitals, grocery stores), building owners will more quickly identify areas for improvement. Benchmarking information could drive program participation, as once the problem is identified technical assistance may be necessary to identify and implement efficiency solutions.

2. **Facilitate comprehensive auditing and other technical assistance.** Especially for larger commercial and industrial facilities, an independent third-party auditor might provide higher-quality audits than an auditor who would then be performing measure installation. Vermont Gas Systems already offers incentives from one-third to one-half of an independent auditor’s costs; this practice should be considered to be expanded statewide (it remains important for building owners to have some investment in the audit to increase the chances of implementing available efficiency measures discovered in the audit). If auditors are not able to review the building comprehensively, consider facilitation of multiple audits performed by those who know particular systems (e.g. HVAC). Generally, the program should attempt to facilitate an ASHRAE Level 1 “walk thru” audit to determine the level of building needs and to provide operational and other efficiency recommendations, as well as suggestions for improvements in operations and maintenance. At this time, the customer would also be advised about the availability of incentive and funding options. This would also screen buildings for potential Level 2 audits when more significant improvements and savings can be demonstrated. In a Level Two audit all building systems would be reviewed, and costs and benefits would be estimated. Renewable energy options would also be analyzed in this review. This would then form the basis for knowledgeable funding decisions.

3. **Added societal benefits.** Special consideration should be accorded public buildings such as schools and municipal and state building infrastructure for the additional benefit to society beyond just reducing energy costs. Energy saving projects in these buildings would offer the following additional benefits:

- *Economic*
 - o Reduce overall tax burden and education costs.
 - o Increase local employment
 - o Reduce use of imported fuels
 - o Favorable cost/benefit of measures
- *Educational*
 - o Reduce absenteeism by improved and efficient ventilation.
 - o Students learn first-hand about energy efficient buildings.
 - o Provide technical educational opportunities on energy conservation and renewables
 - o Improve educational outcomes due to enhanced learning environment
- *Environmental*
 - o Reduce greenhouse gas emissions.
 - o Reduce use of fossil fuels and encourage the use of cost effective renewable energy.
 - o Help provide markets for Vermont forest products.
- *Other*
 - o Provides a model for the larger community and for other commercial energy retrofits.
 - o Helps to deal with the disparity between rich/poor communities by equally improving the public buildings.
 - o Projects would directly impact and benefit a large percentage of Vermont's population.

4. *Deliver small business programs similarly to residential programs.* As described above, approximately 50% of businesses occupy buildings that are less than 5,000 square feet. Many of these buildings are houses converted into commercial enterprises. The building envelope and systems, however, remain a residential scale, and should often be treated similarly to a residential building.

5. *Promote behavioral change efficiency programs.* Continue to pursue behavioral change energy efficiency programs and any measures that may be enabled by Advanced Metering Infrastructure. “Behavior change” encompasses all improvements to the way the building uses existing systems to optimize energy performance. This includes the work that the facility personnel do operating controls as well as way the building occupants use the energy using systems. For example, Efficiency Vermont has initiated the “Energy Leadership Challenge” and has also begun examining methods for tracking and evaluating savings from behavioral measures. Another example is the Whole School Energy Challenge where an effort is made to engage the entire school community (students, teachers, maintenance staff, community members) in an effort to improve how the schools use their energy using systems. This an Efficiency Vermont pilot program in its second year which is already showing impressive results. Planning is

under way to expand and improve this program to provide a sustainable model going forward.

6. **Coordinate program delivery.** Ensure the retrofit and equipment replacement/market opportunity programs that have been discussed herein are coordinated with New Construction and Renewable Energy programs to the extent possible. Continue to provide technical assistance and funding for new buildings that exceed the Commercial Building Energy Standards.

3.3.5 Recommendations: Collaboration / coordination

The below recommendations are broad-based recommendations that are intended to, in concert with programmatic recommendations above, address the earlier described market gaps.

1. **Comprehensive energy clearinghouse.** Ensure consistent messaging and coordination of commercial energy efficiency programs across efficiency and renewable service providers to avoid market confusion and increase awareness. Clear and consistent tracking of results across programs should be undertaken, and an independent, trusted resource for customer information should be available. These activities, which could be conducted through a clearinghouse concept, will help to reduce any inefficiencies from multiple program providers, and will help to bridge the market gap of the customer, contractor, and trade ally education and awareness. Such a clearinghouse should also help to direct customers to the appropriate service or services to best serve the customer.

3.4 Renewable Energy

The three other TETF market sector-focused subcommittees (Residential, MultiFamily; Commercial and Industrial) have focused on identifying how much efficiency work must be undertaken in how many units, to improve the efficiency of 80,000 housing units and achieve a 7.5% reduction in fuel use, from a 2008 baseline of 37.6 TBTUs by 2020. The Renewable Energy Subcommittee did not have a “gallons of fuel saved” or “number of buildings served” target. Instead, the subcommittee was tasked with explaining why renewables should be included as part of a comprehensive building approach, including cost comparisons, and recommendations as to how this could be achieved in tandem with efficiency.

3.4.1 Why incorporate renewables with efficiency?

There are many reasons (policy, market, cost and economic development reasons), for incorporating efficiency and renewables:

- Ensuring fulfillment of the state building efficiency goals, particularly those that focus on energy fitness of the building, fossil fuel consumption reduction, saving Vermonters

money on their fuel bills, and increasing the scope of services to low-income Vermonters. Historically, traditional fuel prices have risen much faster than renewable fuel prices. Investing in efficiency alone will provide relative savings; that is, consumers will be paying less than they would without the efficiency investment. But given historical trends, it is likely that the only way to provide absolute savings (an actual decrease in the fuel bills in housing units served) is to make renewables part of the mix. Described another way, if a customer is using 75% of the fuel normally used, but the fuel doubles in price, then the customer is still paying considerably more. If the customer is using 75% of the fuel normally used and then switches to a less expensive fuel that does not change in price or that rises in price more slowly, the customer will actually be paying less, even when capital cost of installation of renewable energy is included.

Additional reasons for viewing building energy fitness in a comprehensive manner of efficiency and renewables together are that:

- Ultimately, what is needed for Vermont buildings is to get as close to “energy neutral” or “zero energy” as possible. In the vast majority of cases, this can only be achieved through the thoughtful, coordinated, and (perhaps) phased process of efficiency and renewables working together. The importance of this has been highlighted by one Vermont company that that offers efficiency and renewables in tandem to their customers (there are only four companies that offer both efficiency and renewable services to their customers). The company pointed out that when renewable energy installations are conducted after insulation and air sealing, without an understanding of the efficiency work previously undertaken (e.g. creating air leakages through laying conduit for renewables), it can have a negative impact on the effectiveness of the efficiency work.
- Consumers will enter the building marketplace from different entry points. If there is not a reciprocal nature and a value proposition to all service providers (efficiency, renewables and home heating service providers), then there is little motivation for these businesses to work together. If the playing field is perceived to be not level,⁶¹ this problem will further prevent these sectors from working together.
- Inevitably, weatherization and equipment upgrade efforts will give way to the consideration of energy source. Building energy upgrades do not happen every day. In fact, in any given building, they are likely to happen once every decade or two. The “strike when the iron is hot” metaphor is particularly appropriate for building owners who are considering an energy upgrade to ensure there are no lost opportunities for achieving the legislated goals provided above through efficiency and renewables together. Providing building owners with the best possible, most comprehensive

⁶¹The following are examples of areas where perception of a non-level playing field could root: the sales tax exemption for residential fossil fuels, or the uncertainty of incentives for the Clean Energy Development Fund beginning January 2013 while electric efficiency funding continues. REV notes that regulated utilities have financial opportunities to pre-fund projects due to the nature of their capital and rate recovery structures.

approach to saving energy and money in their building over the full length of the *investment* (often lasting 20 years or more) should be the goal of all Vermont policy and program design in this area.

- Vermont residential buildings are exceedingly varied, often exhibiting multiple poorly connected and insulated additions that are heated through different fuel sources. Factors such as the presence of vermiculite and the structure and design of the home might impede significant degrees of efficiency. Similarly, it has been challenging to “button up” mobile homes productively. To bring these types of buildings to a place in which the building owner can continue to pay fuel bills (and even save money) will require the use of whatever is the most appropriate mix of efficiency and renewables (solar hot water, photovoltaics, biomass, heat pumps, and waste heat recovery systems).

Policies that support the least-cost use of limited public resources at a particular time should obviously be maximized. However, they should be balanced with the policy imperative to transform the marketplace over the course of time to shift Vermont from an economy based on traditional fuel usage to one based on renewable energy. Aside from the environmental benefits of renewables, renewable fuels also offer a relatively stable fuel price (with biomass and biofuels as the primary examples in which there may be an ongoing and potentially changing price).

As described in the “Massachusetts Renewable Heating and Cooling: Opportunities and Impacts Study” (Meister Consultants Group, March 2012) there is significant potential for economic development, job creation⁶² (or job transfer from traditional heating service provider to renewable heating service provider), and greenhouse gas emission reduction benefits that are achievable through developing integrated policy support for renewable thermal technologies. In particular, these technologies are solar thermal, biomass thermal, advanced biodiesel, and high efficiency heat pumps, combined with renewably powered electricity. This report delves into current market status, supply chain, market barriers and drivers, economics, and job creation potential for each of the four technologies. While this work has been done for Vermont regarding the efficiency sector, it has not been compiled with regards to renewable heating and cooling (RH&C) opportunities.

3.4.2 Recommendations: Policy / regulatory / legislative

1. ***Ensure comprehensive integration of renewable heating and cooling technologies with efficiency***, in particular completing an analysis of opportunities for renewable heating

⁶² With regards to economic development, the Biomass Energy Resource Center recently estimated that if Vermont were to convert only 18.5% of its homes and businesses from heating oil to locally produced biomass fuels used in modern, efficiency boilers, it could create about 7,000 stable local energy jobs.

and cooling in Vermont as has recently been undertaken by the Commonwealth of Massachusetts

(<http://www.mass.gov/eea/docs/doer/renewables/renewable-thermal-study.pdf>).

This report should also address the significant opportunities available for the Commercial and Industrial market sector (for example, biomass within public educational facilities, etc.).

- **Assess the current State Screening Tool** to determine whether it is appropriate for analysis for renewable energy technologies.
- **Assess the opportunity to implement a bioenergy program similar to that of New Hampshire's Residential Wood-Pellet Boiler Rebate Program.** This program used a public-private collaboration to support clustered "neighborhood" installations of residential wood-pellet systems through targeting locations for pellet deployment by assessing and then bolstering current infrastructure opportunities for bulk delivery of wood pellets.⁶³
- **Address the lack of enforcement for geothermal systems being designed and installed to ensure they are in compliance with ISO 13256 standards.** Otherwise, the systems will likely under-perform. Particularly if the project is receiving state funding, require all installers to be "IGSHPAS Certified" Geothermal Installers and that all open and closed loop ground loop heat exchangers are designed to ISO 132566 standards.
- **Improve and develop standards for pellet quality** so that pellets are delivered at a consistent quality and provide consistent heating results for customers.
- **Ensure that the increased use of biomass does not adversely impact air quality.**
- **Research opportunities for developing switchgrass pellets as a biomass fuel.**
- **Maintain a fully funded Clean Energy Development Fund (at least \$6 million per year)** in perpetuity, or at least until enough financing mechanisms are in place to drive AND support customer demand.
- **Work with New Hampshire, New York, and Massachusetts to develop the biofuels market,** so that Vermont's biofuel law from the Energy Act of 2011 takes effect.
- **Recognize biodiesel blended heating oil as a renewable energy source that has a significantly positive energy return on investment** (this might require additional

⁶³ See <http://www.cleanenergystates.org/assets/2012-Files/CESA-SLICE-Report.pdf>

analysis as to whether there is a minimum percentage of biological product within the blended fuel).

- Vermont’s K-12 public schools have proven to be excellent candidates for using biomass fuels because of the size of the buildings, the presence of on-site maintenance personnel and other characteristics. ***Priority should be given to biomass conversions in these schools*** because of the combination of economic and educational benefits that these projects provide.

3.4.3 Conclusions

Many studies have found that building owners, and in particular homeowners, undertake the effort for an energy upgrade relatively infrequently, and when they do, they are unlikely to undertake further upgrades quickly following the first upgrade. Therefore, to achieve the State’s energy goals, the focus of building upgrades needs to be comprehensive, incorporating both efficiency and renewables together.

4. Ways to Achieve Targeted Goals via Finance and Funding

This section addresses how Vermont is going to pay for the recommendations addressed earlier in this report. We cover the budget for achieving the goals and discuss the financing and funding approaches that should be considered as this initiative moves forward.

4.1 Finance and Funding Subcommittee Charge

As one of seven subcommittees of the Thermal Efficiency Task Force (TETF), the Finance and Funding Subcommittee was charged with making recommendations regarding the amount of money needed to achieve the State’s thermal efficiency goals found in 10 V.S.A. § 581, and to identify financing mechanisms and funding sources to achieve those goals. The Subcommittee began by refining its charge, reviewing pertinent studies on energy efficiency finance, defining *finance* and *funding*, and then focusing on the two components separately. The group concluded with development of the funding and finance recommendations presented later in this section of the report.

In the course of its work, the Subcommittee refined its charge to read:

Develop estimates of the levels of financing and funding, and identify financing mechanisms and sources of funding needed to achieve specified statutory and Comprehensive Energy Plan thermal efficiency goals for defined market segments under various scenarios.

4.2 Definitions of *Finance* and *Funding*

As used in this discussion and in the inventory of products, ***finance and financing*** refer to non-program private capital resources such as secured or unsecured loans, mortgages, PACE programs, utility on-bill tariffs, and other such products or mechanisms. It also includes any other contribution from the building owner—for example, funds in a savings account that could be considered “self-financed.” Financing might entail payment for thermal energy efficiency products or services using recourse or non-recourse loans typically paid back from cash savings generated by the project. Some lending institutions offer products to low-income or higher-risk customers with the addition of certain credit enhancements or risk mitigation features such as loan loss reserves, interest rate buy downs, or loan guarantees that make such products viable in the market.

Funding refers to resources for direct program costs, such as incentives, customer service, training and certification of contractors, quality assurance, and evaluation. Funding sources in this case could include mechanisms such as gross receipts, and excise or sales taxes, as well as fees, tax credits, or other public funding mechanisms.

Reaching the State’s building energy efficiency goals will require a combination of funding and financing tools along with appropriate risk mitigation features, with an assumption that a significant majority of the resources will come from private, not public, sources.

4.3 Overview

Meeting the challenge of reducing thermal energy use, called for by the Vermont Legislature in 10 V.S.A. § 581 Building Efficiency Goals, will generate substantial energy and cost savings and benefits for those who participate, for Vermont’s economy and for the environment:

- Implementing the incremental initiatives detailed in this report will provide more than \$1.4 billion in benefits for Vermonters, primarily through lower heating bills. Including initiatives associated with currently available funding increases the benefits to over \$2 billion.
- This incremental investment will result in more than \$941 million in energy improvements to Vermont buildings.
- More than half of this investment in energy improvements will likely be financed and can be structured so that the amount of monthly savings equals or exceeds the financing payments each month.
- Result in an increase in Gross State Product of \$1.47 for every \$1 invested. Incremental Energy Efficiency programs alone result in an increase in Gross State Product of \$1.80 for every \$1 invested.

- Public funding for incentives and program expenses will leverage an average of \$1.90⁶⁴ of private investment in energy projects for every public dollar invested.
- Greenhouse gas emissions will be reduced by 6.8 million tons of CO₂e to removing more than 1.26 million passenger vehicles from the roads for one calendar year.
- The investment in thermal efficiency and renewable energy called for in this report will result in substantial economic benefits, already referenced earlier in this report and summarized in the chart below. These benefits do not monetize the benefits from avoiding CO₂ emissions.

Table 8. Economic benefits estimated from Thermal Efficiency Task Force recommendations

Programming Combination	Net Present Value of Benefits	Benefit-to-Cost Value of all Investments	Benefit-to-Cost Value of Public Investments
Total renewable and efficiency initiatives (via current and recommended incremental funding)	\$2 billion	\$2.23 to \$1.00	\$6.40 to \$1.00
Incremental renewable and efficiency initiatives, per TETF recommendations	\$1.4 billion	\$2.05 to \$1.00	\$6.18 to \$1.00
Incremental efficiency initiatives alone, per TETF recommendations	\$927 million	\$2.59 to \$1.00	\$5.57 to \$1.00

Meeting Vermont’s thermal efficiency building goals will require a significantly increased level of investment compared to current levels of activity. Full implementation of this plan between 2014 and 2020, including both public and private investment, will cost about \$1 billion.⁶⁵ Total program costs over the 2014-2020 period (to manage and implement this initiative) will be \$355.8 million, of which \$88.6 million is available through existing program funding. To build up the program infrastructure and offer the incentives to motivate homeowners, property owners and businesses to participate, Vermont will need to find about \$267 million in new funding for program costs and incentives over this seven-year period.⁶⁶ However, the total public investment (current plus incremental) will leverage \$687 million in private-sector financing and investment, a leverage rate of 1.9 to 1. This public investment is a good deal for all Vermonters and our environment, in terms of energy savings, job creation, reduced greenhouse gas emissions, and the deployment of private vs. public resources.

Thermal energy efficiency retrofits and renewable installations typically require substantial up-front investments by property owners which are repaid through energy savings, increased comfort and

⁶⁴ Ratio is total seven-year participant costs / public funding.

⁶⁵ \$1.042 billion.

⁶⁶ The VFDA has expressed objections to this statement as they feel that “the TETF did not present sufficient evidence that explains why this level of funding is required.”

other benefits over the life of the measures. In the case of both residential and commercial leased properties, it is not uncommon for the investment to be borne by the property owner while the savings are realized by the tenant, resulting in a split-incentive barrier to implementing improvements. However, unlike other markets,⁶⁷ there is a lack of convenient and standardized options to finance this work. Recognition of this situation has led many states, communities, utilities, and other organizations to create options such as the PACE financing mechanism, low- and no-interest loan products, variations on energy service companies, and utility on-bill financing. Development of energy efficiency program services also requires investment of public resources, especially in the case of low- and moderate-income property owners and renters who benefit greatly from reduced energy costs, but require subsidies to undertake and complete building upgrades.

Structurally, the budgets required to meet the State's building efficiency goals provide that a significant majority of the overall resources will come from financing, not funding. In 2014, every dollar in funding is expected to leverage about \$1.40 in financing or private funding⁶⁸. This ratio is projected to increase from 1.40 to 1 in 2014 to 2.60 to 1 by 2020, averaging 1.90 to 1 over the full term.

4.4 Finance and Funding Subcommittee Tasks

The Finance and Funding Subcommittee focused its initial work on reviewing the extensive literature developed in the past few years regarding finance for energy efficiency. From this starting point, the group identified existing and potential sources of finance and funding to support the state policy goals that the TETF was convened to address. In doing so, the group worked closely with the Energy Action Network (EAN), which commissioned a similar review of capital resources for all energy sectors (for example, buildings, power generation, transportation, and renewables), of which thermal energy efficiency is one subset. The engagement with representatives from EAN provided an opportunity to tap the considerable knowledge of this group, and led to an agreement to allow the TETF to draw directly from the EAN capital mobilization study for the Finance and Funding Subcommittee's work. The subcommittee's efforts also benefitted from many other discussions on energy efficiency financing that have taken place over the last two years, including research funded by the High Meadows Fund and conducted by organizations such as the Regulatory Assistance Program (RAP), Vermont Law School (VLS), Sleeping Lion Associates, and Catalyst Group.

Subcommittee meetings explored three main topics related to finance and funding for thermal efficiency: market segmentation; funding and finance products and distribution channels for those

⁶⁷ The automobile sales business and orthodontics both seem to have workable point-of-sale financing models.

⁶⁸ Ratio is participant costs / public funding

products; and policy / regulatory barriers regarding finance and funding. The Subcommittee considered:

- Financing vs. funding needs for various fuel types and market segments, e.g., low, moderate, high-income, institutional, renters.
- Private financing options available via banks and credit unions.
- Potential financing mechanisms such as utility on-bill financing, Energy Efficient Mortgages, PACE, and PPESCO.
- Current and possible funding sources such as taxes, tax credits, fees, and allocations

The subcommittee was also responsible for compilation of the budgets from each of the other subcommittees in order to determine the amount of finance and funding that will be required to meet the goals. First is a discussion of the budgets, then available financing opportunities, and later, funding options.

4.5 Budget for Financing and Funding

Each of the subcommittees developed a budget to cover their sector and programs for years 2014 through 2020 (See **Appendix 4**). For the most part, these were developed from the bottom-up and based on experience with existing programs and initiatives, so there was a strong basis for the budgets developed. Each subcommittee reported out the following information by sector:

Costs

- Incentives
- Participant costs (financed and self-funded)
- Other program costs (technical assistance, marketing, etc.)
- Total installed measure costs (participant costs plus incentives, but not other program costs)
- Total program costs (incentives plus other program costs)

Revenue

- Currently available program funding
- Incremental funding needed

In addition, costs and revenue were further broken out between natural gas and delivered fuels (fuel oil, propane and kerosene). This breakout enabled better alignment with current Vermont Gas Systems programs and activities and a more detailed understanding between the regulated and the unregulated fuels.

Program budgets include up-front funding to jumpstart the private market, as well as a sustainable source of funding to support continued services for certain building and occupant types. As the market transforms and awareness increases, program spending steps down over time so that the

program cost per project decreases as the volume of projects increases and the market steps up as it understand the viable business opportunities this effort will seed.

4.5.1 Budget compilations

The compiled costs and revenues are presented in **Table 9**. Annual participant costs (those that are primarily financed and self-funded) range from \$56 million in 2014 up to \$135 million in 2020, totaling \$687 million over the period. These market-based costs will likely come primarily from the financing options discussed in detail below and will be leveraged through the public funding needed to meet the goals. Beyond the \$12 million in currently available annual program funding (primarily from the Low Income Weatherization, Efficiency Vermont and Vermont Gas programs), annual program funding needed to meet the goals ranges from \$27 million in 2014 to \$39.6 million in 2020. This funding investment will leverage private sector financing at a rate of approximately 1.4 to 1 in early years, ranging up to 2.5 to 1 in 2020, and is projected to save Vermonters over \$2 billion in their heating bills over the life of the installed measures.

Table 9. Compiled costs and revenues reflecting total level of investment needed to meet State building efficiency goals

	2014	2015	2016	2017	2018	2019	2020	Total
Natural Gas Costs								
Incentives	\$ 1,409,548	\$ 1,460,023	\$ 1,513,743	\$ 1,593,573	\$ 1,782,670	\$ 1,782,670	\$ 1,782,670	\$ 11,324,897
Participant costs (financed and self-funded)	\$ 4,437,719	\$ 4,638,556	\$ 4,817,819	\$ 5,092,830	\$ 5,734,456	\$ 5,734,456	\$ 5,734,456	\$ 36,190,292
Other program costs (technical assistance, marketing, etc.)	\$ 1,212,050	\$ 998,225	\$ 1,016,576	\$ 1,092,480	\$ 1,105,995	\$ 1,105,995	\$ 1,105,995	\$ 7,637,315
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 5,847,268	\$ 6,098,579	\$ 6,331,562	\$ 6,686,403	\$ 7,517,125	\$ 7,517,125	\$ 7,517,125	\$ 47,515,188
Total program costs (incentives plus other program costs)	\$ 2,621,598	\$ 2,458,249	\$ 2,530,319	\$ 2,686,053	\$ 2,888,664	\$ 2,888,664	\$ 2,888,664	\$ 18,962,212
Propane, Fuel Oil, Kerosene Costs								
Incentives	\$ 25,249,797	\$ 33,362,957	\$ 35,851,092	\$ 37,879,350	\$ 37,659,100	\$ 36,596,600	\$ 36,421,100	\$ 243,019,994
Participant costs (financed and self-funded)	\$ 51,907,487	\$ 65,347,383	\$ 80,452,528	\$ 94,431,652	\$ 109,863,027	\$ 119,107,527	\$ 129,375,027	\$ 650,484,630
Other program costs (technical assistance, marketing, etc.)	\$ 11,542,733	\$ 12,275,746	\$ 13,800,478	\$ 14,017,587	\$ 14,686,062	\$ 14,243,562	\$ 13,251,062	\$ 93,817,229
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 77,157,284	\$ 98,710,340	\$ 116,303,620	\$ 132,311,001	\$ 147,522,126	\$ 155,704,126	\$ 165,796,126	\$ 893,504,624
Total program costs (incentives plus other program costs)	\$ 36,792,530	\$ 45,638,703	\$ 49,651,570	\$ 51,896,936	\$ 52,345,161	\$ 50,840,161	\$ 49,672,161	\$ 336,837,223
Total Costs								
Incentives	\$ 26,659,345	\$ 34,822,980	\$ 37,364,835	\$ 39,472,923	\$ 39,441,769	\$ 38,379,269	\$ 38,203,769	\$ 254,344,891
Participant costs (financed and self-funded)	\$ 56,345,206	\$ 69,985,939	\$ 85,270,347	\$ 99,524,482	\$ 115,597,482	\$ 124,841,982	\$ 135,109,482	\$ 686,674,921
Other program costs (technical assistance, marketing, etc.)	\$ 12,754,783	\$ 13,273,971	\$ 14,817,054	\$ 15,110,067	\$ 15,792,056	\$ 15,349,556	\$ 14,357,056	\$ 101,454,544
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 83,004,551	\$ 104,808,920	\$ 122,635,182	\$ 138,997,405	\$ 155,039,252	\$ 163,221,252	\$ 173,313,252	\$ 941,019,812
Total program costs (incentives plus other program costs)	\$ 39,414,129	\$ 48,096,951	\$ 52,181,889	\$ 54,582,990	\$ 55,233,826	\$ 53,728,826	\$ 52,560,826	\$ 355,799,435
Natural Gas Revenue								
Currently available program funding	\$2,078,874	\$2,148,849	\$2,231,969	\$2,352,003	\$2,597,964	\$2,597,964	\$2,597,964	\$16,605,587
Incremental funding needed	\$542,725	\$309,400	\$298,350	\$334,050	\$290,700	\$290,700	\$290,700	\$2,356,625
Propane, Fuel Oil, Kerosene Revenue								
Currently available program funding	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$71,960,000
Incremental funding needed	\$26,512,530	\$35,358,703	\$39,371,570	\$41,616,936	\$42,065,161	\$40,560,161	\$39,392,161	\$264,877,223
Total Revenue								
Currently available program funding	\$12,358,874	\$12,428,849	\$12,511,969	\$12,632,003	\$12,877,964	\$12,877,964	\$12,877,964	\$88,565,587
Incremental Public Funding needed	\$27,055,255	\$35,668,103	\$39,669,920	\$41,950,986	\$42,355,861	\$40,850,861	\$39,682,861	\$267,233,848
Total Investment (Incentives, Participant Costs plus Other Program Costs)	\$95,759,335	\$118,082,891	\$137,452,236	\$154,107,471	\$170,831,308	\$178,570,808	\$187,670,308	\$1,042,474,357

Table 10 provides additional detail by breaking out the amount of incremental funding needed, by program.

Table 10. Incremental funding needed to fulfill goals, by sector and by year

Subcommittee / Sector	2014	2015	2016	2017	2018	2019	2020
Commercial and Industrial	\$367,672	\$1,028,426	\$2,032,639	\$2,785,799	\$2,785,799	\$2,785,799	\$2,785,799
Residential Single-Family	\$3,575,000	\$4,825,000	\$5,700,000	\$6,200,000	\$7,700,000	\$6,325,000	\$4,950,000
Residential Low-Income (Weatherization)	\$7,240,000	\$8,752,000	\$9,760,000	\$10,264,000	\$10,768,000	\$10,768,000	\$10,768,000
Residential Multifamily	\$5,770,250	\$9,061,344	\$8,873,281	\$8,591,188	\$8,215,063	\$8,215,063	\$8,215,063
Renewables	\$7,974,000	\$10,788,000	\$12,134,000	\$12,800,000	\$11,747,000	\$11,617,000	\$11,824,000
Energy service providers	\$300,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Planning and measurement and cross-cutting	\$1,828,333	\$1,113,333	\$1,070,000	\$1,210,000	\$1,040,000	\$1,040,000	\$1,040,000
Total	\$27,055,255	\$35,668,103	\$39,669,920	\$41,950,986	\$42,355,861	\$40,850,861	\$39,682,861

4.5.2 Budget descriptions by sector

This section provides details on how each Subcommittee developed estimates for the budget required to fully implement its recommendations.

Commercial and Industrial budget development description. Like other sectors, facilitation of efficiency improvements in Vermont’s C&I building stock will require significant capital investments. Most of this investment will be from the private sector, however public funds are estimated to be needed to provide general education, technical assistance, and incentives where appropriate. The commercial subcommittee developed a savings acquisition rate that would facilitate the achievement of MMBTU goals described in the subcommittee report—acquiring savings of at least 7.5% in both regulated and unregulated fuels sectors. **Table 11** illustrates the MMBTU savings acquisition rate to achieve the goals of the commercial subcommittee.

Table 11. Annualized savings in MMBTUs, from retrofit & equipment replacement

Fuel Type	2008-2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total 2014 - 2020
Natural gas	196,385	21,000	31,816	29,550	29,850	30,850	30,250	39,900	39,900	39,900	240,200
Propane, fuel oil, kerosene	26,924	25,000	25,000	43,750	76,563	114,844	143,555	143,555	143,555	143,555	809,377
Total											1,049,577

To generate reasonable budgets that would facilitate the necessary savings, the subcommittee reviewed existing thermal efficiency programs (offered by Efficiency Vermont and Vermont Gas Systems) as a basis for yield rates (public \$ / MMBTU). Vermont Gas has operated its natural gas efficiency programs since 1992 and Efficiency Vermont has been operating its unregulated fuels program since approximately 2009. The subcommittee reviewed historical program data including program design, program costs and savings and total measure costs. In addition, the subcommittee reviewed this data distributed by size of project; large projects need significantly less incentive dollars per MMBTU to encourage a project, and savings would be overestimated if a simple average of all projects was used. Finally, the subcommittee averaged the results from 2008-2011, in order to smooth the data and avoid results that might be skewed by one or two projects in an extremely successful year.

The Vermont Gas budget and savings goals articulated in its recent Integrated Resource Plan achieve more than the Task Force’s articulated goals for commercial and industrial regulated fuels. As such, their planned budgets and acquisition rates from 2014-2020 were adopted by this committee. To meet the goals of the Task Force, it was assumed that no new natural gas specific

initiatives (other than those related to the cross-cutting activity or that of the Planning and Measurement subcommittee) were necessary.

For unregulated fuels, where Efficiency Vermont has had limited funding and programs, the increasing acquisition rate was developed to meet the Task Force goals. Values provided by Efficiency Vermont were based on past and current program achievements and were projected forward by ramping up savings of unregulated fuels by an increase of 75% from 2014-2016, then 50% in 2017, then held constant until 2020. Unregulated fuel programs’ rapid expansion for the first years of the program is feasible based on the existing program-limited technologies being addressed and number of participants served.

After review of the above mentioned variables, the committee made the following assumptions with regard to project size in order to develop its budget, as shown in **Table 12**.

Table 12. Assumed weighting of Commercial and Industrial projects, based on size and energy saved per year

Project size	MMBTUs saved, per year	Weighted %
Small	0 – 50	25%
Small to medium	50 – 150	25%
Medium to large	150 – 500	
Large	> 500	50%

This allocation recognizes that most of the sector’s energy consumption is from the largest users – and that is where the savings can be acquired for the least cost. It also recognizes the need to increase the amount of engagement for small and medium size projects. Size of a project correlates reasonably well with size of a building. The subcommittee analyzed two alternative scenarios, where: (1) program focus was more heavily weighted to acquire savings from larger projects, and (2) program focus was more heavily weighted to acquire savings from smaller projects. The resulting weighting and budgets reflect careful consideration and the subcommittee’s best judgment.

4.5.3 Residential Single-Family budget development description

Low-income single-family

- Weatherization services for households earning less than 80% of median income ramp up from 1,750 single-family homes with comprehensive energy efficiency improvements in 2014 to 2,240 in 2020. This includes an increase in the number of currently eligible households served, as well as a new program to provide no-cost weatherization to households earning 60-80% of median income.

- Of the homes weatherized each year, approximately 50 are served by VGS, whereas the remainder use unregulated fuels such as oil and propane.
- The average energy savings in the homes served is 30%, or 30 MMBTUs per year, per project.
- WAPs continue to provide fully subsidized weatherization projects at a cost per project of \$7,200, based on current WAP program costs. Of this cost, approximately \$5,200 is installed measure costs and \$2,000 is other program costs such as audits and administration.
- Champlain Valley Weatherization Services (CVWS) and VGS currently split the costs of weatherizing low-income households in VGS territory. VGS typically covers 50% of the cost for screening measures, which is around 18-20% of total project cost. Champlain Valley Weatherization Services (CVOEO) performs the audits and installs, and covers the remaining project cost.
- The VGS contribution will continue to be funded by VGS ratepayers at a level sufficient to serve the 50 natural gas weatherization projects each year.
- The Weatherization Program will continue to be funded at current levels: around \$7 million per year overall, with about \$5 million of that focused on single-family homes.

Market Rate Single-Family

- Market rate services for households earning greater than 80% of median income ramp up from 2,700 single-family homes with comprehensive energy efficiency improvements in 2014 to 5,700 in 2020.
- Of the homes completing energy efficiency improvements, about 200 are served through by VGS while the remainder are served by Efficiency Vermont.
- The average energy savings in the homes served is 30%, or 30 MMBTUs per year, per project.
- The average total installed measure cost per project is \$7,500.
- Program costs per project for unregulated fuels projects decline as the efficiency market is transformed and project volume increases, from \$2,750 per project in 2014 to \$1,500 per project in 2020. The initial per project cost of \$2,750 is in line with current costs per project for Efficiency Vermont's Home Performance with ENERGY STAR program, including costs for the PACE loan loss reserve. The program cost per project is split fairly evenly between incentive costs and other program costs such as technical assistance and marketing.
- Program costs for VGS projects hold steady at \$2,500 from 2014-2020. This is in line with VGS current program costs, in terms of \$ / MMBTU. Of this cost, approximately \$1,500 is incentive costs and \$1,000 is other program costs such as audits and administration.
- The VGS contribution will continue to be funded by VGS ratepayers at a level sufficient to serve the 200 VGS projects each year.

- The Efficiency Vermont program will continue to be funded at current levels: around \$3.3 million per year from the Heating and Process Fuel Fund (FCM and RGGI revenues).
- Additional funds (up to \$2 million) may be available for thermal efficiency from the GMP CEED Fund, but this funding source is only available in 2013.

Multifamily Budget Development Description

- Projects were distributed across the existing portfolio of multifamily programs to balance:
 - 9,250 rent-restricted and 5,500 privately owned properties (See **Table 13**)
 - Alignment of program strategies to the diversity of property owner needs.
 - Average depth of savings 26% per unit (Some Rent Restricted programs deliver 40% savings, some private owner programs deliver 15% savings. The weighted savings distribution provides an average of 26%, or 27 MMBTU per unit.)

Table 13. Program and project costs for MultiFamily market sector activity in achieving building energy goals

Program Model	Unit Type*	Number of Units		PROJECT		PROGRAM			Total Program and Project Costs
				Total per Unit Project Costs	Owner Project Costs (<i>Non-energy Program, exclusive of incentives</i>)	Incentives	Program Implementation	Total Program Costs	
WAP	RR	3,000	Per unit	\$7,000	\$1,000	\$6,000	-	\$6,000	\$7,000
			Total	\$21,000,000	\$3,000,000	\$18,000,000	-	\$18,000,000	\$21,000,000
WAP	PO	1,175	Per unit	\$7,000	\$1,000	\$6,000	-	\$6,000	\$7,000
			Total	\$8,225,000	\$1,175,000	\$7,050,000	-	\$7,050,000	\$8,225,000
Efficiency Vermont	RR	1,925	Per unit	\$12,000	\$9,500	\$2,500	\$600	\$3,100	\$12,600
			Total	\$23,100,000	\$18,287,500	\$4,812,500	\$1,155,000	\$5,967,500	\$24,255,000
VFEP	RR	4,325	Per unit	\$14,000	\$10,800	\$3,200	\$2,100	\$5,300	\$16,100,000
			Total	\$60,550,000	\$46,710,000	\$13,840,000	\$9,082,500	\$22,922,500	\$69,632,500
VGS	RR	0	Per unit	\$5,000	\$3,500	\$1,500	\$600	\$2,100	\$5,600
			Total	-	-	-	-	-	-
VGS	PO	1,000	Per unit	\$5,000	\$3,500	\$1,500	\$600	\$2,100	\$5,600
			Total	\$5,000,000	\$3,500,000	\$1,500,000	\$600,000	\$2,100,000	\$5,600,000
Efficiency Vermont	PO	3,325	Per unit	\$5,000	\$1,000	\$4,000	\$500	\$4,500	\$5,500
			Total	\$16,625,000	\$3,325,000	\$13,300,000	\$1,622,500	\$14,962,500	\$18,287,500
Total		14,750		\$134,500,000	\$75,997,500	\$58,502,500	\$12,500,000	\$71,002,500	\$147,000,000

* RR = rent-restricted, PO = private ownership

- WAP implementation costs of \$7,000 per unit is inclusive of programmatic costs.
- Vermont Gas Rent Restricted projects are accounted within WAP for the purposes of budgeting. (Because VGS pays for 50% of the cost of natural gas units produced by WAP, both the total budget and total units served are accounted for.)
- Project costs and incentives combine historical production with an increase in the rent restricted sector to reflect the innovative goals presented in the Roadmap for Housing Energy Affordability.
- Historically, there has been an acknowledged double counting of units and savings across the portfolio of energy programs. An extreme example of this would be a natural gas heated, rent restricted unit utilizing Efficiency Vermont MOP, WAP, VFEP, and VT Gas funding, and each program may have claimed savings and or unit production. In order to achieve 14,750 unit goal, this budget assumes one program claims thermal savings for one unit.

Planning and Measurement budget development description

In order to determine the estimated cost for a tracking system of the scope and design the Planning & Measurement subcommittee recommends be adopted, we consulted with VEIC and Vermont Gas, both of which have comprehensive tracking systems in place. VEIC has also recently explored contracting for a more robust tracking system such as EnergySavvy, and as a result had recent market data. Through this outreach we concluded that a system with the capabilities we recommend would cost \$300-325,000 annually and would require approximately an additional \$50,000 in its first year for system setup and design.

The budget for cross-cutting recommendations, which is included in the total for the planning and measurement budget, was estimated as follows:

- The budget for a comprehensive clearinghouse was based on an estimate for the costs of a similar effort conducted in Connecticut, adapted to apply to Vermont.
- The budget for a voluntary labeling scheme was based on the Task Force's best estimates for software, set up, training, and ongoing data management, MLS coordination, and technical assistance.
- The budget for code compliance was taken from the recent Code Compliance Study completed by the Department of Public Service.

Renewable Energy Budget Description

As with energy efficiency, there is a significant opportunity to save Vermonters money and keep money in the local economy through investments in renewable heating systems by Vermont families and businesses. The renewables subcommittee was tasked with determining how such investments could best complement the work recommended by the Task Force on heating

efficiency. The renewables budget, and this section, encapsulates all residential and commercial work recommended by the subcommittee.

To complete this task the subcommittee consulted extensively with experts from across the renewables field, as well as with members of the Commercial & Industrial subcommittee, to understand install costs, necessary incentives, industry capacity and potential ramp rates.

Specifically, the renewables budget funds:

- Slightly less than 10,000 whole-home renewable heating systems, with installs ramping up from approximately 730 in 2014 to 2250 in 2020, as well as 4000 cord and pellet wood stoves and 4500 solar hot water systems.
- Approximately 410 large commercial wood pellet systems, with installs ramping up from 30 in 2014 to 85 in 2020, as well as 14 wood chip systems and 110,000 MMBTUs captured through District Heat hookups.

Information regarding assumptions in renewables budget:

- Incentives for residential systems ramp down from 15% of total system cost in 2014 to 12% in 2020.
- Incentives for commercial biomass systems are set at 25% of the install cost, based on current state law (30 V.S.A. § 209).
- Incentives for school biomass systems are set at 75% of the install cost, also consistent with state law (16 V.S.A. § 3448).

4.6 Financing

As part of its initial work, the subcommittee developed an inventory of current and potential financing resources that could be used to help participants pay for the \$687 million in estimated costs over the 2014-2020 period (see **Table 14** and **Appendix 5** for details). For each financing option, the subcommittee attempted to identify the markets to which the products apply, currently available resources, and other relevant information. Subcommittee members endeavored to make this inventory as thorough as possible. Market segments noted in the inventory are consistent with those employed by other TETF subcommittees (for example, low, moderate, and high incomes) for residential, multifamily, and commercial and industrial audiences.

Table 14. Inventory of existing financing sources, distribution channels, and risk mitigation features

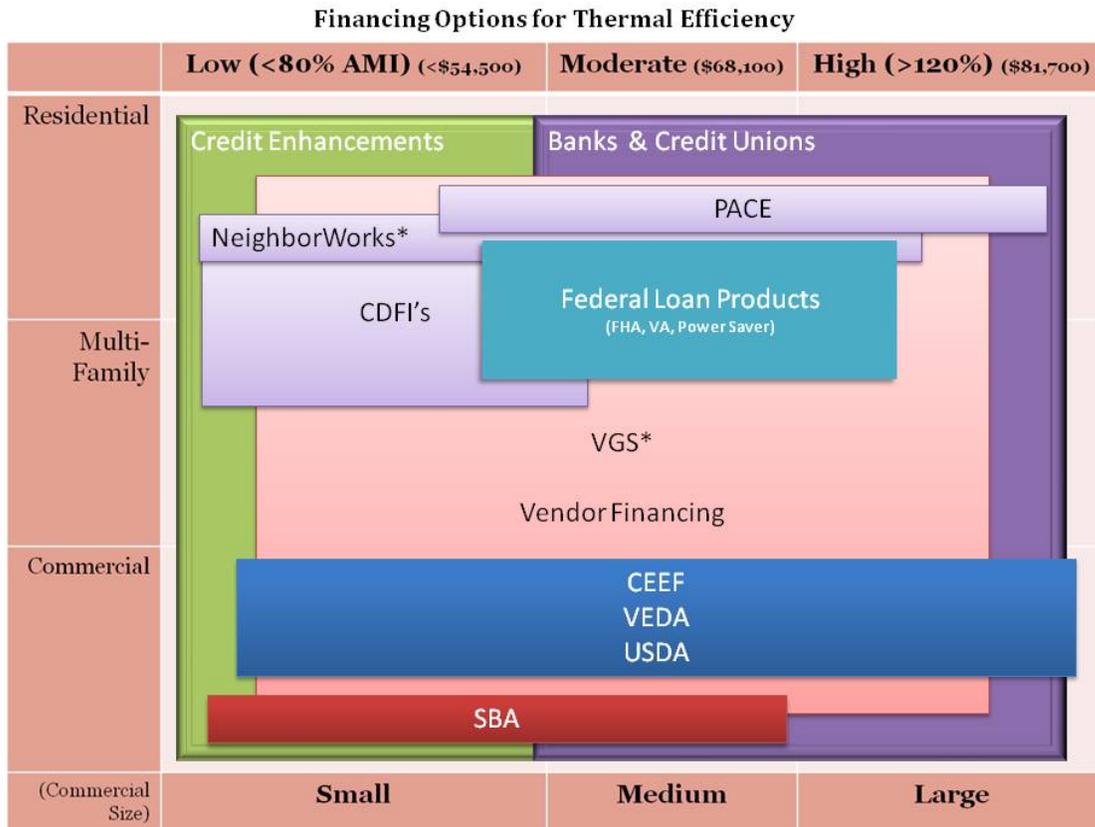
Distribution Channels (Sources of Finance Products & Programs)	Current and Potential Sources of Financing Capital	Credit Enhancement & Risk Mitigation Features
<ul style="list-style-type: none"> • Conventional lending from banks and credit unions (mortgages, home equity loans and personal loans) • Energy-specific loans from banks and credit unions • VEDA business loan programs • Loans from Community Development Finance Institutions (CDFIs) • NeighborWorks loans • Vermont Gas Systems loans • BED commercial loan program • PACE program (residential only) • Vendor financing • State Resource Management Revolving Fund • ESCOs • USDA Rural Development Renewable Energy System and Energy Efficiency Improvement Guaranteed Loan and Grant Program (REAP) • Federal loan products funneled through banks (FHA Power Saver, Fannie Mae & Freddie Mac Energy Efficiency Mortgages) 	<ul style="list-style-type: none"> • Deposits (Banks, Credit Unions) • Philanthropic capital (e.g., CDFIs, PRIs) • Linked deposits • Bond funding (e.g., PABs, QECBs) • Treasurers offices • Private investors / pensions / institutional investors and capital markets • Crowd funding (e.g., small investors) 	<ul style="list-style-type: none"> • Interest rate buy downs • Loan loss reserves • Loan guarantees

During the review of finance options, it became clear that many products serve multiple audiences under variable circumstances and with different criteria. For example, discussions with the representatives of the Vermont Bankers Association and Association of Vermont Credit Unions identified sufficient capital available for energy efficiency upgrades in most market segments, and

that the use of credit enhancements allows service to higher risk customers (e.g., homeowners with lower FICO scores). Some banks and credit unions currently offer products while others are under development. However, the Subcommittee learned that while there is interest in some lending institutions, others have curtailed their offerings due to lack of demand (a phenomenon characteristic of such programs throughout the United States).

Table 15 provides a generalized perspective of certain finance products and the market segments they cover. It is important to note that Vermont Gas Systems and NeighborWorks of Western Vermont offer finance products only in their current service territories. The legend across the top of the figure refers to the income status of residential and multi-family customers. The legend across the bottom of the figure refers to the size of a commercial customer’s building.

Table 15. Sources of financing for all market sectors, by income level and size of project



* Vermont Gas Systems and NeighborWorks of Western Vermont service only limited portions of the state

Table 16 organizes the credit products and other finance strategies (for example, credit enhancements) by segment. See **Appendix 5** for descriptions of programs and products.

Table 16. Credit products available to each market sector, by income level and size of project

	Low (<80% AMI) (≤\$54,500)	Moderate (\$68,100)	High (>120% AMI) (>\$81,700)
Residential	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured Loans • PACE Program Loans • CDFI Loans • Vendor Financing (may be limited) 	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured & Unsecured Conventional Loans • Home Mortgages • Energy Specific Loans • PACE Program Loans • Energy Efficient Mortgages • Power Saver Loans • CDFI Loans • Vendor Financing 	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured & Unsecured Conventional Loans • Home Mortgages • Energy Specific Loans • PACE Program Loans • Energy Efficient Mortgages • Power Saver Loans • Vendor Financing
	• Credit Enhancements (e.g., LLRs)		
Multi-Family (2+ units; Owners of rental properties but not renters)	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured Loans • CDFI Loans • Vendor Financing (may be limited) • Municipal Revolving Loan Funds 	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured & Unsecured Conventional Loans • Energy Specific Loans • Energy Efficient Mortgages • Power Saver Loans • Municipal Revolving Loan Funds • CDFI Loans • Vendor Financing • Municipal Revolving Loan Funds 	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Secured & Unsecured Conventional Loans • Energy Specific Loans • Energy Efficient Mortgages • Power Saver Loans • Municipal Revolving Loan Funds • CDFI Loans • Vendor Financing • Municipal Revolving Loan Funds
	• Credit Enhancements (e.g., LLRs)		
Commercial	<ul style="list-style-type: none"> • Subsidized Loans (e.g., IRBD) • Commercial Loans • VEDA Loans & Guarantees • USDA Loan Guarantee Program • CDFI Loans • SBA Loan Guarantee Program • Vendor Financing • Leasing • Municipal Revolving Loan Funds 	<ul style="list-style-type: none"> • Commercial Loans • VEDA Loans & Guarantees • USDA Loan Guarantee Program • CDFI Loans • SBA Loan Guarantee Program • Vendor Financing • Leasing • Municipal Revolving Loan Funds 	<ul style="list-style-type: none"> • Commercial Loans • VEDA Loans & Guarantees • USDA Loan Guarantee Program • Energy Service Companies • Vendor Financing • Leasing • Municipal Revolving Loan Funds • Private Capital Markets (e.g., tax equity, bonding)
(Commercial Size)	Small	Medium	Large

Each of these finance products reaches its intended customer through one or more **distribution channels** including banks or credit unions, community development finance institutions, government agencies and finance authorities, municipal governments (PACE, revolving loan funds), vendors and community service organizations.

Sources of capital form another key consideration. Many of these are conventional and well-understood (if not well-utilized), but several offer potential new sources of capital that tap private markets. Examples of potential new sources of capital include Private Activity Bonds (PABs), Qualified Energy Conservation Bonds (QECBs), linked deposits, treasury investments, crowd funding and philanthropic institutions. Recent interest in lowering the cost of capital has focused attention on the need to develop secondary market options into which local capital providers may re-package and sell loan products to achieve economies of scale. Moving forward towards the legislative goals

for thermal efficiency will undoubtedly require access to private capital using a variety of such vehicles and approaches.

4.6.1 Recommendations: Financing

The subcommittee recognized that there are many existing sources of financing capital that are currently being under-utilized to finance energy improvements, such as home equity loans and secured and unsecured consumer loans. The barriers to driving demand for these products have been explored both in Vermont and nationally, through reports such as the 2011 *Financing Residential Energy Efficiency in Vermont*⁶⁹ commissioned by the High Meadows Fund, and *Driving Demand for Home Energy Improvements*⁷⁰ from the Lawrence Berkeley National Laboratory. According to the High Meadows Fund report, lack of demand for energy financing products is similar to the lack of demand for energy improvements in general and include a combination of debt aversion, lack of information about the benefits of energy efficiency improvements and consumers' perception that the energy efficiency upgrade process is difficult.⁷¹ Other sections of the TETF report provide recommendations related to addressing many of these barriers (for example, enhanced customer support to walk through the project management and financing processes; enhanced marketing efforts to convey the financial benefits of thermal efficiency investments).

Above and beyond existing financing sources, the subcommittee identified a set of new or under-utilized finance products and sources of capital with potential to help meet a portion of the TETF goals. The subcommittee assessed and then grouped the options into three tiers representing those most likely to offer near term benefits descending through others that would need additional development or consideration prior to deployment. The subcommittee determined that it would be best to identify a set of potential new financing options rather than just one in recognition that there are many potentially complementary finance tools that may developed to meet the needs of particular customers. To this end, there are several options in Tier One. The subcommittee suggests exploring options from Tier Two as well. The items in the bottom tier do not appear likely or worth exploring given various challenges at this point.

Participants recognized that many of these options are being developed in other jurisdictions, meaning that it is possible to observe how they roll out and learn from those with greater resources to carry these products to market.

The intention for the group, as with other subcommittees of the TETF, was to seek consensus on recommendations. Although substantial agreement emerged on the recommendations, support was not unanimous. Upon submitting the set of finance options shown below to members of

⁶⁹ <http://www.highmeadowsfund.org/storage/research/VLS-IEE%20Energy%20Efficiency%20Financing%20Study%20Final.pdf>

⁷⁰ <http://drivingdemand.lbl.gov/>

⁷¹ Page 18, section on "Lack of Demand for Energy Efficiency Improvements"

the TETF for consideration, 16 of 17 responding organizations supported the list with one organization strongly opposing. Comments from participants recognize that there are many details that need to be understood, and that providers need the flexibility to use the tools that are most appropriate for their market. No written comment from the strongly opposing organization was provided.

Tier One

1. **Private activity bonds** – Bonds used to finance an IRS-defined set of activities, including qualified residential rental projects, public educational facilities and green building / sustainable design projects.
2. **Energy-aligned leases or green leases** – Commercial leases that specify how costs and benefits of energy improvements will be shared.
3. **On-bill financing** – Finance provided to customers repaid through the utility or fuel bill; the assessment may or may not stay with the meter or house.
4. **Energy-efficient mortgages (EEMs) and energy improvement mortgages (EIMs)** – Mortgages that consider energy savings as income in calculating the debt-to-income ratio and allow the inclusion of energy improvement costs to be rolled into the purchase mortgage.
5. **Public purpose performance contracting** – A variation on Energy Service Contracting through which smaller and/or less profitable non-residential buildings benefit from comprehensive energy upgrades; might include aggregation strategies to bundle groups of buildings.
6. **Private financing with performance guarantees** – Loan products backed by a performance guarantee should a retrofitted building fail to live up to its cost savings projections.

Tier Two

1. **Bonds** – Greater use of state allocation of tax subsidy bonds such as Qualified Energy Conservation Bonds (QECBs).
2. **Expanded PACE program** to include commercial sector including multi-family properties.
3. **Linked deposits** – A mechanism through which the state provides financial incentive for private lending institutions to make more efficiency/renewables loans.
4. **Crowd funding** – A new investment strategy intended to generate many small investments authorized through the federal JOBS Act of 2012.

5. **Managed Energy Service Agreements (MESA) and Efficiency Service Agreements (ESA)**
– Like power purchase agreements (PPAs), but for energy efficiency products and / or services (e.g., energy-efficient furnaces).

Tier Three

1. **Lending / loan purchase program / secondary market** – A mechanism through which the state or other financial institutions buy private loans.

Energy Action Now's *Mobilizing Capital to Transform Vermont's Energy / Economy* report also contains financing-related recommendations. While the EAN report's scope extends well beyond thermal efficiency (including, for instance, transportation), a number of its recommendations are germane to the TETF report. Their key financing recommendations are:

- A. Broaden the financial resources / mechanisms used for financing purposes (e.g., through more use of private activity bonds).
- B. Augment the knowledge of Vermont's financial community regarding energy financing needs and mechanisms.
- C. Coordinate and expand policy directives. Recommendations in this area germane to the TETF include support for on-bill financing, green leases, expansion of PACE to include commercial and industrial property, and increased funding for the Weatherization Assistance Program.

These recommendations can be reviewed in their entirety in the EAN *Mobilizing Capital* report, which is available at www.eanvt.org.

4.6.2 Conclusion: Financing

Whereas there appear to be many financing products poised and available for multiple markets, buildings and customer types, they are significantly under-used for energy efficiency improvements. As has been pointed out in multiple reports and through the survey that the lender associations from subcommittee conducted of their members, consumer demand is not sufficient to drive new approaches to financing energy efficiency. A significant part of any effort in support of the TETF goals will need to be the enlistment and engagement of lenders to offer financing for participants. Partnerships between program administrators and lenders will be a key component of a successful initiative. But consumer interest must first be galvanized by other program activities, public policies, customer outreach and sales and financial incentives addressed in this report. Funding for these incentives and other program support and promotional activities are covered in the funding section below.

4.7 Public Funding

Once the other subcommittees had developed their programs and budgets, the Finance and Funding Subcommittee combined them to determine total needs. The Subcommittee established principles that served as the basis for brainstorming and prioritizing funding options.

4.7.1 Principles for public funding

The Subcommittee developed a set of principles, and then included them in a survey to the full Task Force for review and feedback. That input was incorporated in this final set of principles. The set of principles was not prioritized or weighted, but the Subcommittee considered all of them in deriving the funding options. The principles for public funding options follow.

1. Funding is sustainable and sufficient to meet the state’s mandated goals.
2. Funding levels are also dynamic to ramp up and down over time as needed.
3. The level of funding balances short-term costs with the benefits of providing long-term affordability to all Vermonters; mechanisms will be put in place to minimize negative financial impacts on low income Vermonters.
4. Funding source, like program delivery, is equitable across non-electric fuels⁷² and by customer classes (residential, commercial, etc.); cross-subsidization between fuels and customer classes is minimized; equitable treatment for in-state and out-of-state fuel providers is addressed.
5. Mechanisms that are administratively efficient to create and implement, simple, and auditable are preferred.
6. The collection mechanism, sources, and uses of public funding are transparent.
7. Price signals should support state energy policy goals.
8. Support the vibrancy of Vermont communities and competitiveness of Vermont businesses.

⁷² From the *2011 Comprehensive Energy Plan*, volume 1, page 5: “The economic impact analysis regarding electric efficiency completed for the Department of Public Service makes clear that Vermont should *not* trade electric efficiency dollars collected from ratepayers for all-fuels efficiency—those dollars are bringing tangible and important benefits to the state tied to the electric load reductions achieved. Instead, Vermont must identify ways to unlock private financing options and then identify the proper amount and use of a secure, sustainable source of funding tied to the fuels the efficiency measures are addressing.”

http://publicservicedept.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%201%5B1%5D.pdf

9. Public funding is used in ways that leverage private sources of capital where possible, in order to get the best return on each public dollar invested.
10. Public funding is used only to the extent that it is needed to mobilize capital and meet private market shortcomings.
11. Protect existing stable taxes for the Low Income Weatherization Program.

4.7.2 Packaging of funding options

As part of its discussion of the pros and cons of the funding options, the Subcommittee suggests that no one single option should be pursued alone. In order to address some of the principles of sustainability, equity, low income protection and price signals--and to spread the risk--the Subcommittee suggests moving forward with a package of multiple funding options. This approach was also taken in recognition of the fact that there was not clear consensus on a single approach and that multiple tools might be required to raise the necessary funds.

4.7.3 Funding options

The following funding options were identified as those that could meet the Task Force goals and the principles outlined above. The subcommittee assessed and ranked the options and then grouped the options into three categories of preference--high, medium and low--based on those rankings, Subcommittee discussion and survey feedback from the entire Task Force. Note that there were some dissenters who did not support any of these funding mechanisms.

Options listed in the "high" category were deemed to most closely match the overarching principles and be most promising for further consideration by policy-makers. Options in the "medium" category showed some alignment with the overarching principles but in many cases required more review before rising to the top tier. Options in the "low" category did not meet enough of the overarching principles to rise to the level of worth additional review.

4.7.4 High preference

1. **Fossil fuel excise tax to fund energy efficiency.**⁷³ An excise tax is an indirect tax on listed items. In this case, fossil fuels would be considered the targeted taxable items, including the following: fuel oil, kerosene, propane, coal and natural gas. The Subcommittee determined that all fossil fuels should be subject to the same tax, using the same basis, either BTU energy content or CO₂ carbon content.

The difference is very small in terms of whether a tax is based on BTUs or CO₂ of any particular fuel. There will be some relatively minor differences that should be addressed

⁷³ Could also be called *Thermal Systems Benefit Charge*.

as the details of administering the tax is worked out, but in the end there is very little impact on the cents per gallon (or therm).⁷⁴

Basing the excise tax on just fossil fuels would mean that biomass and biofuels would be exempt. This was a conscious decision due to the fact that biomass is renewable, generally local, and should be encouraged, in addition to the fact that it would be administratively challenging to assess cord wood. The tax would be assessed on the percentage of petroleum fuel in biodiesel blended heating oil, also known as BioHeat. For instance, if gallon of fuel oil is assessed a tax of \$0.098, a B-20 BioHeat Blend (20% biodiesel, 80% fuel oil) would be assessed a tax of \$0.0784 ($\$0.098 \times 80\%$).

Any excise tax should be based on “site” and not “source” energy. That is, the assessment should be determined based on the energy delivered in the tank or at the meter in the building, not including any energy used in extraction, processing, transportation, delivery, etc. to get that fuel to the building. Though a source energy approach may provide a more comprehensive measurement of the characteristics of a particular source of energy, the calculations needed to support such an approach are highly complex and in some cases controversial. Broader issues of source energy might be better addressed through discussions related to the Total Energy Study. A consistent approach in addressing energy costs and savings at the site level should also be applied to electricity when replacing fossil fuels with electric heat pumps or with renewable sources.

Electricity is already assessed a “systems benefit charge” at a significantly higher level than what is currently being contemplated for these thermal efforts, and has all of the Efficiency Vermont and Burlington Electric Department programs already addressing this sector. For this reason, electricity was not included under this proposed excise tax.

Vermont Gas Systems (VGS) also currently raises more than \$2 million annually for natural gas energy efficiency efforts through its rates. While the subcommittee acknowledged this contribution to thermal efficiency and did not want to impose double taxation, they did want to make sure all fossil fuels are treated fairly. Towards this end, the subcommittee suggests that natural gas be treated the same way as all fossil fuels. In this approach, the excise tax would be based on BTUs or carbon, and natural gas should have the same assessment. If this assessment amount is less than VGS’ current efficiency funding, then only an additional statewide thermal contribution would be necessary. However, if the amount levied in order to raise the statewide goal requires an assessment higher than VGS’ current efficiency budget, then we suggest that the

⁷⁴ Because there is so little coal used in Vermont, it is not included in the TETF analysis, but should be included in any final assessment. The relative BTU and CO₂ impacts of coal compared to other fuels are not yet determined.

additional amount raised from natural gas be in line with the other fuels in order to support this statewide effort. VGS has raised concerns to this approach.⁷⁵

Regulating currently unregulated fuels was considered but dismissed due to the perceived hurdles and likely opposition involved.

This mechanism rose to the top tier of preferred options because it was highly-aligned with most of the key principles. In particular, if properly constructed, it will provide a path to fund thermal efficiency that is equitable and transparent. One downside of this mechanism is that if it is used to augment funding to the WAP, these excise tax-based WAP funds might have different rules and reporting requirements which may present a burden for WAP. VFDA has also noted objections to this mechanism.⁷⁶

Table 17 and **Table 18** provide an example of the cent / unit of fuel to raise \$10, \$20, and \$30 million using BTUs and CO₂ as the basis, on estimated current use of each fuel.

Table 17. Effects of excise tax on raising funds, (MMBTU-based)

Fuel	Unit	Tax / Unit		
		To Raise \$10 million	To Raise \$20 million	To Raise \$30 million
Fuel oil	gallon	\$0.041	\$0.081	\$0.122
Kerosene	gallon	\$0.040	\$0.080	\$0.120
Propane	gallon	\$0.027	\$0.054	\$0.081
Natural gas	therm	\$0.029	\$0.059	\$0.088

Table 18. Effects of excise tax on raising funds (CO₂-based)

Fuel	Unit	Tax / Unit		
		To Raise \$10 million	To Raise \$20 million	To Raise \$30 million
Fuel oil	gallon	\$0.045	\$0.090	\$0.136
Kerosene	gallon	\$0.044	\$0.088	\$0.132
Propane	gallon	\$0.026	\$0.052	\$0.078
Natural gas	therm	\$0.024	\$0.048	\$0.071

⁷⁵ VGS has expressed concerns that the excise tax approach has the potential to unnecessarily complicate a funding structure that has been in place for 20 years. They also requested that if such an excise tax approach is implemented, that any additional money raised from natural gas customers be applied toward natural gas efficiency to minimize cross subsidies between fuel types.

⁷⁶ Comments provided by VFDA state the following objections to this funding mechanism being included in this report: The TETF didn't examine the consequences of creating this tax; extracting \$267 million in taxes will have a significant impact on the state's economic health; and an energy tax will hurt low income individuals and businesses.

2. ***Energy efficiency tax credit.*** A Vermont Tax Credit program for Energy Efficiency investments represents a vehicle for bringing private investment directly into a subset of projects or programs that support the state's long-term energy efficiency goals. An Energy Efficiency Tax Credit program could potentially work very well as a funding source for projects that already utilize tax credits such as the Vermont State Housing Tax Credit and the Downtown Credit, as well as complementing other investment sources such as the Low Income housing Tax Credit and the Rehabilitation (Historic) tax Credit programs, as well as a complement to other non-tax credit funding sources. A Vermont Energy Efficiency Tax Credit program could also be used as a vehicle to support deeper energy retrofits for thermal measures in addition to providing a resource base for biomass, solar and other renewables installations. It could also be used in conjunction with the excise tax described above.

A statewide Energy Efficiency Tax Credit would be approved by the Vermont legislature with a credit allocation amount for one or more years. The Energy Efficiency Tax Credit would allow capital investments to be made in energy efficiency improvements by individuals or investors and then have that tax credit approved portion of the investment credited to the individual or investor against their state tax liability for one or more years depending on how tax credit is structured. This mechanism could also allow personal tax credits when individuals donate funds to nonprofits to help with qualifying energy projects. Additionally, a mechanism could be set up for nonprofits to take the tax credits directly as a grant.

The State would administer the tax credit through an approved entity directed by the state. Applicants would apply for the tax credit and be awarded a tax credit certificate which would be utilized to claim the credit through the annual tax submittal process. Individuals would utilize the credit through their personal income tax filing process. Larger tax credits may be sold to tax credit investors (typically financial institutions) who would use the tax credit against their state tax liability.

Tax credits have been used successfully to fund building improvements, particularly in the multifamily sector, which is why this option is ranked highly. It is also attractive from the standpoint that tax credits function as a carrot (incentive) as opposed to a stick (tax/fee/etc.). Tax credits would not provide the entirety of program funding, but could address one or more discrete areas and might be a funding source of up to around \$2 million. One challenge with tax credits is that they can be complex to administer and implement, so as a result would likely only be utilized by a subset of customers. In addition, because utilization of tax credits results in reduced General Fund revenues, policy-makers will need to adjust already tight budgets to accommodate them.

4.7.5 Medium preference

- 3. *Increase the Gross Receipts Tax (GRT).*** Currently Vermont imposes a 0.5% tax on the “gross receipts” dollar sales of fuel oil, kerosene, propane, natural gas, electricity, and coal. This tax raised \$7.9 million in 2011. All of these funds are directed at low-income homeowners, with most spent to support the low-income WAP Trust Fund. Some of these funds have also been allocated to LIHEAP. Raising this tax to 1.0% would raise approximately \$15.9 million. Increasing it to 2% would raise approximately \$31.6 million.

Any changes to the GRT to redirect a new amount to fund non-low-income TETF efforts would need to be carefully considered in order not to jeopardize what is now the primary funding source for helping low-income Vermonters heat their homes. Some members also suggested stricter controls on the administration and Legislature to reduce or eliminate regular allocations of GRT to fund.

Based on the full Task Force survey, several suggestions emerged to move the GRT up to the “high preference” category. At the same time, caution was urged about opening up the GRT for fear of WAP modifications or funding losses. The subcommittee decided to leave the GRT at the top of the “medium preference” category, suggesting that it would be the next option in line after the fuel excise tax.

This mechanism has the benefit of being in place and successfully used for many years to fund the Weatherization Trust Fund. Thus, the process of changing the rate, and expanding its scope beyond low-income Weatherization, would be incremental and easily understood. The reason a GRT increase does not fall into the top tier of options is its lack of transparency (it does not show up on the bill), as well as lack of equity (a large portion of it comes from electricity sales). GRT revenues have also proved vulnerable to legislative re-direction in the past, most recently to LIHEAP, to make up for decreases in federal funding of LIHEAP.

- 4. *Remove sales tax exemption.*** No sales tax is currently levied on residential fuels or on fuels sold for use in manufacturing. **Table 19** presents the effects of removing the sales tax exemption and re-imposing the 6% statewide sales tax.

Table 19. Effects of a 6% statewide sales tax resulting from residential sales

Fuel	Total Residential Sales	6% Sales Tax
Fuel oil	\$ 276,410,999	\$ 16,584,659.91
Kerosene	\$ 27,672,035	\$ 1,660,322.11
Propane	\$ 184,213,974	\$ 11,052,838.43
Natural gas	\$ 47,740,000	\$ 2,864,400.00
Electricity	\$ 299,531,067	\$ 17,971,864.01

Additionally, the exemption for electricity, fuel oil, natural gas, propane, and other fuels sold for use in manufacturing totals \$13.7 million.

If electricity were exempt, since it is already assessed a systems benefit charge, the total raised would be in excess of \$30 million, before including manufacturing fuels.

The primary issue with the sales tax option is that these funds would typically go into the general fund and would need to be appropriated to TETF efforts annually.

This mechanism would provide a robust level of funding to address program needs. It would be equitable, and it meets the principle that price signals on energy should be used to support state policy goals (that is, higher costs for fossil fuels support the State goal for fossil fuel reduction). It would be transparent, in that the sales tax would show up as a line item on the bill. It might potentially be viewed more favorably by policy-makers because it could be seen as the removal of a tax exemption, as opposed to the imposition of a new tax or fee. There may however be policy concerns raised by this approach, because sales tax exemptions are generally provided for items that are generally considered necessities of life, e.g., food, clothing, medicine.

5. ***“Ceiling mechanism.”*** Although an excise tax-type mechanism could serve as the collection vehicle for this concept, the idea is to impose such a tax only when fuel prices drop below a certain “ceiling” rate, and the increment is then captured for efficiency programs. For example: if the ceiling is set at \$4.25 / gallon and market prices go down to \$4.00 / gallon, then the customer continues to pay \$4.25, with the \$0.25 increment going to efficiency.

This mechanism would work only if fuel prices were to go down. Although there are some indications that fossil fuel prices might decline in the coming years, these projections are uncertain and in any case volatile, due to the inherent nature of fossil fuels as a global marketplace commodity. However, there are mechanisms that could set the ceiling at a higher rate, or ratchet the ceiling up on a periodic schedule to ensure funds were captured.

This option would be problematic in that revenues in any given year would be unpredictable and variable, which would make long-term planning and implementation very challenging. In addition there would be mixed incentives for fuel dealers to reduce their prices in response to declining wholesale prices.

This option would meet goals related to equity across fuel types. The ceiling version of this mechanism could help to address any short-term cost impacts because it would be suspended if fuel prices rose above a certain specified level. On the downside, the

ceiling mechanism could be complex to administer and to explain to the public. It may also not represent a reliable funding source, since availability would be depended upon fluctuating commodity prices.

There is another purpose to having a floor below which the price of fossil fuels will not fall. This reduces the risk factor of falling prices negating the cost effectiveness of energy efficiency or fuel change measures. Removing this risk factor has the potential of both raising revenue and increasing adoption of these measures.

6. **Energy efficiency resource standard (EERS):** An EERS would create an energy efficiency obligation on all suppliers of unregulated fuels, much like the EERS used in other states for electricity and / or gas and, starting in 2014, all across Europe for all fuel types. Each fuel dealer would be required to achieve an established percentage of savings per year (1% or 1.5% or some other required amount, with some ramping up over time) of their previous year's sales (weather normalized). This mechanism would give fuel dealers control and a means to change their business model (probably in many cases partnering with home performance contractors). Those that don't like it or do not want to get into the efficiency business (even through partnerships) could opt out of acquiring those savings by paying a fixed \$ per MMBTU of obligation to another entity to essentially acquire it for them. This would be billed, appropriately, as an efficiency obligation rather than a tax. No money would go to or through the state Treasury.

Although the subcommittee found this concept intriguing, they felt that it needed more thought and development before relying on it for a funding mechanism. As the Department and stakeholders engage in the Total Energy Study, this idea could be considered further.

This mechanism would provide an equitable approach for efficiency investments by extending the utility-model efficiency resource obligation to unregulated fuels. The approach could help to create an environment that spurs private sector innovation, since the obligation is on the fuel provider if they wish to fulfill it directly. However administration of this mechanism could be complex, may not be transparent, and could be administratively difficult for some energy service providers to comply with.

4.7.6 Low preference

7. **Expand the Energy Efficiency Charge.** Expanding the electrical Energy Efficiency Charge to cover thermal efficiency and increase collections to cover the thermal efficiency requirements could be administratively convenient as it would simply be a modification of the existing funding source for electric efficiency. However, such an approach would run counter to the funding principles related to equity (cross-fuels subsidies) and

sending price signals (it would represent increasing the cost of electricity to discourage the use of fossil fuels). It would also undermine the long-standing regulatory foundation of the EEC as a mechanism for providing least-cost electric utility services.

8. **Regional Greenhouse Gas Initiative (RGGI).** RGGI funds have recently provided between \$1 - \$2 million per year to Vermont to be spent on thermal efficiency. Adjustments to the cap and pricing could potentially increase this amount. If revenues from RGGI do increase, the committee recommends that those revenues be dedicated to thermal efficiency, as they are now. However, due to the uncertain nature of these funds, the fact that their existence and funding level is really outside of Vermont's hands, and the lack of alignment with a number of key principles (for example, sustainability and transparency), this option was placed low on the preference list.
9. **General Fund.** Use of the General Fund could very broadly meet goals of equity, as it represents collection of revenue from society at large for what could be described as a societal good. However, this mechanism does not appear to meet some of the other key principles, particularly related to stability given the many other pressures on the General Fund and the need to renew the appropriation each year.
10. **Federal funding.** This option was not preferred given the fiscal climate which makes any additional federal funding highly unlikely. Sufficient federal funding for Weatherization and LIHEAP may also not be forthcoming in the future.

4.7.7 Additional funding considerations

The subcommittee also addressed the principles and other relevant issues in more depth. Issues that the subcommittee felt worthy of highlighting in order to make sure that policy makers take them into consideration are covered in more detail below and include low income and equity across fuels.

Low-income. The concern was expressed that raising the cost of fuel through the excise tax or gross receipts tax would represent an additional burden on low- and very-low-income people. While they would also benefit from the expansion of the Weatherization programs, they would feel any fuel cost increase to a greater degree than higher income people. A key consideration for any revenue-raising plan is to avoid adding a burden on those who can least afford it.

There are ways to raise funds from fossil fuels while ensuring that low- and very-low-income people not become additionally burdened in the process. One example would be to create an "Energy Tax Rebate Form" that lower income people could file with their state tax forms. This rebate would be designed to refund the amount of tax that income eligible people would have paid in a thermal fuel tax. Another example could be to use the Renters Rebate program along with adjustments to property tax income sensitivity rules to counter any negative effect. In

planning for the fuel taxes, a certain extra amount would have to be raised to cover the cost of these additions to the low income safety net.

Whatever the ultimate funding mechanisms, there should be consideration of the impact on low-income Vermonters and provisions made to exempt or reduce any increased tax burden on them.

Equity across fuels. One of the funding principles states “Funding source, like program delivery, is equitable across non-electric fuels and by customer classes (residential, commercial, etc.); cross-subsidization between fuels and customer classes is minimized; equitable treatment for in-state and out-of-state fuel providers is addressed.” This principle engendered a good deal of discussion, especially regarding natural gas and the unregulated delivered fuels (fuel oil, propane and kerosene).

The subcommittee acknowledged the contribution to thermal efficiency programs currently made by Vermont Gas Systems and its customers. They also felt that VGS customers should contribute equitably to statewide thermal efforts that come out of these recommendations since they, like all Vermonters, will benefit from these statewide initiatives. Such benefits to VGS could include work force development, quality assurance, standards setting, marketing and promotion, etc. To this end, the subcommittee suggests levying the same funding tax on VGS customers as on all other fossil fuel customers. However, the final amount levied needs to take into account VGS’ current thermal efficiency funding⁷⁷ and net that amount out against any new funding tax. Once the final funding mechanisms are determined, the details of VGS’ contribution needs to be worked out.

The subcommittee also discussed taxing unregulated fossil fuels. While they acknowledged that the funds raised and spent will never be exactly in balance, they did suggest striving for that balance whereby, for example, funds raised from oil heat would be spent on oil-heated buildings. In this way, fuel dealers and their customers could significantly benefit from funds they raise, and should be spent on increasing the thermal efficiency of these buildings (for example, on increasing air-sealing and insulation levels), as well as encouraging the installation and servicing of more efficient equipment. Fuel dealers are poised to play an important role in the delivery of thermal efficiency services and they and their customers should benefit from the funds they raise.

4.7.8 Conclusion for public funding considerations

Raising \$267 million in new funding for program costs and incentives over this 7-year period represents a major financial commitment on the part of the State. However, this investment

⁷⁷ Approximately \$2.2 million in 2011.

combined with current funding will leverage \$687 million in private sector financing and investment, stimulating job creation, lender activity, and the recycling of funds in Vermont's economy, instead of sending Vermonters' money out of state (and likely out of the country) to pay for fossil fuels. These public and private investments will result in a net present value of over **\$2 billion** in heating fuel savings to Vermonters.

With Vermonters spending over \$600 million a year to heat their homes and businesses with fossil fuels, it is more critical than ever that state leaders take advantage of opportunities to lower Vermonters' heating costs, circulate millions of dollars in our local economy, create jobs improving our housing stock, and lower the environmental impact of the building sector. The benefits to individuals who participate, Vermont's economy and our environment will be significant and are well worth the investment.

5. Planning and Measurement

The charge given to the Planning and Measurement (P&M) Subcommittee was to recommend systems to measure progress; track results and benefits; and develop interim benchmarks and a roadmap to meet the State's building efficiency goals. Specific tasks were:

- Assessing where Vermont currently stands relative to the statutory goals for improving the energy efficiency of Vermont homes and other buildings (including non-program participants)
- Assessing the relationship between electric and thermal efficiency measures to ascertain electric savings gained from implementing thermal efficiency measures and vice versa
- Developing a tracking process to ensure the state will have an accurate count of how many buildings have been improved and an accurate picture of the extent and cost/benefits of those improvements (including non-program participants)
- Recommending a designated entity to be responsible for measuring progress and making the information publicly available
- Developing a timeline, which includes interim benchmarks, for meeting the state's building efficiency goals

5.1 Assessing Where Vermont Currently Stands

This task was assigned to the Regulatory Assistance Project, which prepared a similar model to the model used to generate total fuel costs and savings presented in the 2011 report, *Affordable Heat*.⁷⁸ The various subcommittees developed program impacts and program budgets. The model

⁷⁸ *Affordable Heat: Whole-Building Efficiency Services for Vermont Families and Businesses*. Regulatory Assistance Project, June 2011; <http://www.raponline.org/document/download/id/4439>

developed by RAP integrates those programs, estimates the value of savings from the programs, and develops a cost benefit ratio as well as other program effectiveness metrics.

5.2 Assessment of the Relationship between Electric and Thermal Efficiency Measures

The subcommittee assessed the relationship between electric and thermal efficiency measures to ascertain electric savings gained from implementing thermal efficiency measures and vice versa. In particular:

- What are the main ways electrical savings are generated if a HPwES project is completed?
- What peak reduction can we assume in kW based on thermal efficiency?
- What is the characterization of HVAC at the residential level when looking at:
 - Penetration
 - Run hour baseline
 - Standard efficiency of stock

The assessment determined that while the benefits of thermal efficiency measures do provide additional opportunities for electric savings (kWh) and demand reduction (kW), the results are relatively insignificant in terms of the benefits provided, especially when compared to the overall benefits generated when thermal improvements are made.

- The MAXIMUM savings potential (kWh) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 800 kWh / year, which represents \$96 / year electrical savings (@ \$0.12/kWh)
- The EXPECTED savings potential (kWh) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 554 kWh / year, which represents \$66 / year electrical savings (@ \$0.12/kWh)
- The MAXIMUM Peak reduction (kW) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 0.15 kW. Since most Vermont homes do not have central A/C the actual impact is smaller.

For further details, refer to **Appendix 6: Thermal Efficiency vs. Electrical Savings**.

5.3 Developing a Tracking Process

5.3.1 An overview of the recommendations

During the assessment phase, committee members reviewed what kinds of tracking take place now, and who reports to whom. Depending on the program, reports are typically due in December or January, although the Weatherization program reports are due in May. **Table 20** presents the details.

The P&M Subcommittee’s recommendations for tracking “in-program” and “out-of-program” activity and the party responsible for overseeing that tracking, are presented in the next section. The criteria below are just that – criteria for deciding on the tracking system and entity responsible for overseeing the tracking process. The P&M Subcommittee felt it was beyond its purview to pick specific entities / vendors, and rather opted to lay out recommendations on what should be considered when they are chosen.

The Thermal Efficiency Task Force has grouped thermal work broadly into two categories: “in-program” and “out-of-program.” In-program work encompasses all work done through an established “program” (Weatherization, VGS’s efficiency work, Efficiency Vermont’s thermal efficiency work, etc.), and has been tracked by the entities overseeing these programs. This work is frequently, though not always, substantial (significant efficiency work, a heating system upgrade, etc.). *In-program* work is defined as all work done through a program supported by the state to meet the state’s thermal energy goals. This includes all State-supported incentive and financing programs. It does not include incidental or DIY work motivated by State action that is not easily tracked. *Out-of-program* work encompasses all other thermal work done in the state, does not involve incentive money, has not been tracked and generally covers less comprehensive work (replacing windows, installing some insulation bought at the local hardware store, etc.).

In addition to the specific recommendations below, as with all aspects of the thermal efficiency work the state is undertaking, tracking of work should be done with an eye towards maximizing the overall program benefits, and the funding of the tracking program should remain both stable and adequate to do the job. While tracking and measurement could be seen as an “extra” that’s not integral to the thermal energy work the State is advancing, they are in fact critical to ensuring that we’re achieving our goals as effectively as possible. We also recommend the results of the State’s tracking be publically available both in a format easily accessible to the average Vermonter and in a more detailed, technical format. Those publicly available data should be aggregated and completely anonymous, and should not be presented in such a way as to provide individual level data.

Table 20. Thermal efficiency reporting

Ref	Organization	TYPE OF WORK SUPPORTED			REPORTING						
		Shell	Heating System	Demographic	What constitutes participant	Multiplier to reduce for double counting across programs	Savings Methodology	Who Claims	Sent to	Reporting Cycle	Report Due
1	EVT - Home Performance - HPWES	Yes	Yes	SF	Engaged a BPI contractor and completed a shell project	none	From Actual as considered retrofit	EVT	PSB	Jan 1 - Dec 31	Dec
2	EVT -MF Custom Retrofit and Major Rehabilitation (Gut Rehab)	Yes	Yes	MF	completed shell project	none	MF Retrofits - From Actual , MF Major Rehabilitation - above Code	EVT	PSB	Jan 1 - Dec 31	Jan
3	EVT - Building Performance	Yes	Yes	Commercial, larger Multifamily and Mixed Use	completed shell project	none	From Actual	EVT	PSB	Jan 1 - Dec 31	Dec
4	BED	Yes		SF		none	From Actual	BED	PSB	Jan 1 - Dec 31	Dec
5	VGS	Yes	Yes	SF/MF	By building retrofit/shell or by equipment only if installed separately	none	Shell - From Actual , Heating Replacement above baseline	VGS	PSB	Jan 1 - Dec 31	April 1st
6	VGS	Yes	Yes	Commercial	Project, may contain several end uses	none	Shell - From Actual , Heating - above code for the equipment basis but based on actual usage.	VGS	PSB	Jan 1 - Dec 31	April 1st
7	VFEP	Yes	Yes	MF	completed shell project	EVT claims MMBTU and projects completed	From Actual	EVT their portion of funding, VFEP remainder??	PSB	Jan 1 - Dec 31	Dec
8	Wx (all 5)	Yes	majority is emergency and is not tracked - new system will soon track	SF / MF	completed shell project	none	From Actual as considered retrofit	Wx - OEO	OEO		May
9	NWWVT	Yes	If included in a HPWES project.	SF		EVT and NW do not overlap in MMBtu savings - we each may claim the project however	From Actual	EVT a portion - NW all	PSB for EVT, DOE for NWWVT	Jan 1 - Dec 31	Dec
10	GMP	Yes	Yes	SF		GMP and EVT do not overlap in MMBtu savings we each may claim the project	From Actual	EVT and GMP proportionally	PSB	Jan 1 - Dec 31	Dec
11	Non Program Activity - examples	Yes	Yes	SF mostly			n/a	No one	na	na	na
	Town Energy / DIY	Yes	Yes				n/a	No one	na	na	na
	VFDA - proxy for FD out of programs		Yes	SF/MF			From Actual	No one	na	na	na

5.3.2 Recommendations: Tracking system

Tracking System: In-Program. The Planning & Measurement Subcommittee agreed that the following recommendations should guide the design of a tracking system for in-program activity, going forward.

“Must haves” for the tracking system:

- **Ability to aggregate / track savings by unit, in addition to by job**
 - The State’s 80,000 upgrades goal represents the total units served, not the total jobs done. Ideally, the system will be able to track not just by job, but by unit as well. For instance, if a single unit (home, building) is weatherized in 2014 and has a solar hot water system installed in 2017, we would want to know not just about each job, but about the total savings for that unit. Statewide, we want to be able to track the total number of units served as well as the total number of jobs done. This could be accomplished by location-based tracking (using GIS coordinates or address, for example).
- **Compatible with existing tracking / ability to include jobs done to date**
 - The tracking system should be able to import jobs done to date from Efficiency Vermont, VGS, etc., so that the state can track the total work done, benefits, etc., not just the work done after the tracking system is adopted. Ideally, this could be done through a bulk data import, and if feasible would also be able to feed into the sort of by-unit tracking described above, so that units initially served prior to adoption of the tracking system that have subsequent work done to them will not be double counted.
- **Ability to receive inputs from multiple programs** (Efficiency Vermont, VGS, etc.)
 - The system should be able to accept input from many different programs. While it will likely not be the place where all the state’s programs initially report their work, it should be able to be used as a primary reporting tool if program administrators choose, and it should be able to accept data imports from all programs that don’t use it as their primary reporting tool.
- **Stability / expected longevity**
 - The system should be designed and maintained by an entity that is expected to be around indefinitely or should be able to be transferred to maintenance & ownership by the State/another entity, or both. We don’t want to be in a situation down the road where we’re forced to switch tracking systems due to a vendor going out of business.
- **Ability to accept inputs of multiple types of work**
 - The system should be able to track comprehensive efficiency work, fuel switching, renewables and heating system upgrades.
- **Ability to track fuel, energy, economic and global warming savings**
 - The tracking system must be capable of tracking all types of impacts the State is interested in collecting data on, including, at a minimum, fuel savings, economic

savings (including incentive cost and total project cost) and reduced carbon pollution, consistent with state policy, and should be able to track these savings cumulatively, annually and projected over the life of the improvements made.

- **Ability to customize for Vermont**
 - The system should be customizable for Vermont’s specific circumstances. Wood stoves, or pellet boilers are uncommon in much of the country, for example, but we’d obviously need to take them into account in any tracking system that would be truly comprehensive for Vermont.
- **Ability to incorporate information on new technologies as they become viable**
 - If high percentage biodiesel blends, grass pellets or other emerging heating technologies become more common in Vermont we would want the ability to add them into the tracking system down the road.
- **The tracking system should be able to incorporate any other necessary inputs to track progress towards the State’s thermal energy goals.**

Features that, while valuable, are not necessary

- **Tracking by job, contractor**
 - The tracking system will, ideally, be useful not just for after-the-fact tracking of progress towards state goals, but will also be useful for individual contractors to track the progress of the jobs they’re working on. In addition to providing a valuable service for Vermont companies (in particular smaller ones that could not otherwise afford this sort of software capability), this will also allow the State and program administrators to more easily and quickly identify best practices, problem areas and outstanding performers. Put another way, the system should not just be designed to allow us to understand what happened after the fact; it should help us to understand what is happening as we go so that we can make our programs as effective and efficient as possible. This sort of tracking should be optional for individual contractors, but all contractors should be encouraged to participate.
- **Tracking of incentives**
 - The tracking system should be able to track reserved and expended incentive dollars for multiple programs in real time, so that program administrators and the State can make deliberate decisions on incentive and funding levels before issues arise. Program administrators should be able to use the statewide tracking system to manage the incentive dollars allocated to their program, but they should not be required to use the system in this way if they have other, internal mechanisms to do so.
- **Standardized score, compatibility with future building labeling**
 - One way to drive “energy fitness” of buildings is to get information about it out into the market; when homes that are more efficient and cost less to heat reliably sell for more than their less efficient, more expensive equivalents,

Vermonters will have yet another incentive to make these investments. In order to facilitate this, the tracking system should incorporate a rating that would make that valuation more likely, and the ratings for units with jobs done should be incorporated into the MLS system and made available to appraisers. At a minimum, be able to provide data that would be compatible with such a rating system down the road.

Tracking System: Out-of-Program

- Due to the difficulty of tracking efficiency activity not associated with any state incentive program (*out-of-program activity*” in TETF parlance), rather than attempting to track each and every out-of-program job, in real time or otherwise, if feasible and cost-effective the State should conduct periodic studies to determine the approximate level of out of program activity that has occurred. If this sort of analysis is either not feasible or not cost-effective in the short term, the State should continue to monitor the possibility of incorporating such analysis longer term. Once implemented, this work should be updated annually or biennially.

5.3.3 Recommendation: Energy measurement

The subcommittee recommends co-listing equivalent kWh and MMBTU measurement units when documenting aggregate energy use, energy savings and statewide energy goals. The importance of providing both units of measurement is to maximize meaningful usage context for participants and stakeholders, while providing the broader context of being able to normalize energy usage across sectors. An additional benefit of co-listing the measurement units is the assurance that energy costs and savings are not inappropriately characterized by application of an average value of a single measurement unit to Vermont’s entire energy use portfolio. Utilizing two measurement units will provide greater context.

Whereas the lifecycle impact of the various fuel sources is an important issue that needs to be addressed, the subcommittee recommends that characterizations regarding energy production not be initially included in this measurement process. We further recommend that this issue be addressed by the State within three years, possibly through the work of the Climate Cabinet or through the ongoing Total Energy Study discussions, and if and when accepted methods for tracking the lifecycle impact of the different heating fuels used in Vermont are determined, that information should be incorporated into this tracking system.

5.3.4 Recommendation: A designated entity

If a State entity is not chosen, there should be a competitive selection process. Criteria for the party responsible for overseeing and implementing tracking:

- **Stability / expected longevity**

- Just as with the tracking system, the party responsible for overseeing tracking going forward needs to be one that isn't going anywhere.
- **Existing expertise**
 - The responsible party should ideally have existing & historic expertise in program tracking and thermal energy and efficiency
- **Well respected**
 - The party should be one that is well respected, especially among decision makers and the major players in the thermal energy realm in the state.
- **Ability to provide constructive feedback**
 - Data on jobs done, savings achieved, etc. is valuable, but ultimately feedback needs to be provided to the parties implementing thermal energy programs so that they can optimize their work. The party responsible for tracking work done may also be an appropriate entity to provide this feedback.

6. Conclusion

Vermonters have a significant opportunity to save on their heating costs by weatherizing their homes and businesses. By weatherizing Vermont's homes and businesses at a faster pace, more money can stay within the Vermont economy and the risk to all Vermonters of fuel or weather volatility is lessened.

Investing in thermal efficiency improvements can greatly reduce heating energy usage in a building. Using today's fuel prices, savings from thermal efficiency investments in a home translate into approximately **\$1,000 per year every year** over the lifetime of the investment, increasing as fuel prices rise.⁷⁹ Every year that the State neglects to make these investments represents a lost opportunity in terms of costs to individual Vermonters, businesses, property owners, and the Vermont economy as a whole.

In recognition of the challenges faced in heating our homes and businesses, and the opportunities associated with those improvements, the Legislature enacted building efficiency goals in the 2007-2008 legislative session through Act 92 (10 V.S.A. § 581). The State is not on track to achieve these goals. If the current trajectory is followed, only approximately about half of the 80,000 housing units goal will be achieved by 2020.

⁷⁹ Current Fuel Prices: See December Vermont Fuel Price Report, Department of Public Service. Fuel price forecast: see footnote 2. Savings estimates: See Residential Single-family Market section of this report. Savings for a fuel oil customer are approximately \$965; Kerosene \$1,074; propane \$1,135; natural gas \$550.

This report was created by the Thermal Efficiency Task Force to present specific actions and initiatives for how the State can meet its building efficiency goals, improve its economic security, create local jobs, and reduce its impact on the environment. Many of the recommended initiatives will require both financing (private dollars) and funding (public dollars). These investments will save money and energy, create jobs, and support the Vermont economy. They will also reduce Vermont's dependence on fossil fuels and reduce the State's greenhouse gas emissions environmental impact, while increasing the State's energy security.

The Public Service Department modeled the job impacts from the incremental investments recommended in this report, and found that nearly 800 job-years are created over the life of the measures. The incremental programs described in this report have a benefit-to-cost ratio of well over 2 to 1, meaning that for every dollar spent on efficiency programs, Vermonters will have more than two dollars of discretionary income to spend on other things besides heating their homes.

The recommendations outlined in this report are expected to provide the following economic benefits:

- Over \$2 billion NPV benefit will be provided from directly reducing Vermonters heating bill costs over the life of the efficiency and renewable energy measures installed, when combined with current funding. The total program (current and incremental funding, private and public costs) benefit cost ratio is 2.23 to 1. Specifically, \$6.40 in benefits is provided for every \$1 in public investment.
- Provide over \$1.4 billion NPV benefits from *incremental* efficiency and renewable investments recommended by the Task Force. The total program (private and public costs) direct benefit cost ratio is 2.05 to 1, whereas \$6.18 in overall benefit is provided for every \$1 in public investment.
- Provide a total NPV benefit of \$927 million through efficiency investments alone (not including renewable energy). The total program (private and public costs) direct benefit cost ratio is 2.69 to 1, while \$5.80 in overall benefit is provided for every \$1 in public investment.

To improve Vermont's economic security, create local jobs, and reduce our impact on the environment we must also make a fundamental shift in how we heat our homes and businesses. Making our buildings more comfortable and energy efficient should continue to be the first and best strategy for reducing our reliance on fossil fuels and the economic and environmental costs associated with them.

Appendixes

Appendix 1:
**Market Segment Assessment Details for Residential, Multifamily, and
Commercial & Industrial**

Inventory of Vermont Energy Efficiency & Renewable Energy Programs

A. Inventory of Vermont Residential Energy Efficiency & Renewable Energy Programs

Compiled from Vermont’s Comprehensive Energy Plan, the Regulatory Assistance Project report, “Affordable Heat,” as well as other reports and the knowledge of the stakeholders involved in the Thermal Efficiency Taskforce.

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SUMMARY

Vermont has traditionally focused its energy efficiency efforts on regulated electricity and natural gas. Until recently, residential energy efficiency programs targeted at unregulated fuels (chiefly fuel oil, propane, kerosene, and biomass) have been limited in scope, with the notable exception of the Weatherization Program for income-eligible Vermonters. However, thermal efficiency represents a

majority of the energy savings opportunity in many buildings, particularly in the residential sector. The result is that much of the potential energy efficiency saving opportunities remain unaddressed.

This appendix provides an overview of the existing thermal efficiency programs and initiatives that are currently available to residential customers, including both single-family homes and multifamily buildings, in Vermont. It also reviews the energy-related codes and standards that apply to the residential sector. The role of energy service providers, such as building performance contractors, fuel dealers and renewable energy system installers is also critical, and is covered in Section 2.3.

PROGRAMS AND INITIATIVES

1. EFFICIENCY VERMONT

Primarily funded by electric ratepayers through a systems benefit charge, Efficiency Vermont has historically leveraged some thermal energy efficiency measures through the use of its electrical funding in cases where electricity is used for heating, or where efficiency saves both electricity and non-electric energy. When Act 92 passed in 2008, Efficiency Vermont obtained funding from FCM and RGGI auction revenues under the Heating and Process Fuel (HPF) Efficiency Program, as well as the GMP Energy Efficiency Fund, to expand its thermal efficiency programs. These programs include Home Performance with ENERGY STAR (HPwES), Building Performance, and multifamily programs.

a. Home Performance with ENERGY STAR (HPwES) and Building Performance

Home Performance with ENERGY STAR	Funding Source	Heating and Process Fuels
	Implementation	Efficiency Vermont
	Customers	1-4 unit residential homes & apartments
Building Performance	Funding Source	Heating and Process Fuels (HPF)
	Implementation	Efficiency Vermont
	Customers	5+ unit residential homes, small commercial, and mixed use buildings

Home Performance with ENERGY STAR is a national program administered by the U.S. Department of Energy (DOE), but implemented on a state and local level across the county. HPwES uses a systematic approach to identify energy efficiency opportunities in homes on a whole-building basis. Efficiency Vermont is the program sponsor for HPwES in Vermont. VT HPwES works with a strong Vermont network of certified, independent contractors who perform the actual retrofit work, which VT HPwES supports through financial incentives, training, technical assistance, QA/QC, and other services.

Vermont's HPwES program started in 2005, and treated less than 100 units per year in its early years. Since obtaining HPF funding in 2008, the program has grown steadily to serve more than 900 homes in 2013.

To participate in VT HPwES, contractors must be certified by the Building Performance Institute (BPI) to perform whole-building efficiency work. The HPwES program provides contractor training, technical assistance, marketing support, and other incentives, and also performs quality assurance on a percentage of completed projects. Efficiency Vermont 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 80 in 2012.

Customers who wish to participate in the program select from the list of certified 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, 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% in terms of energy savings.

Until June 2012, Efficiency Vermont offered up to \$2,500 in incentives per household to help Vermonters pay for energy efficiency home improvements completed by a certified HPwES contractor. Actual incentive levels depend on the measures installed, and the average incentive was \$1,700 per project. Because of limited HPF funds, these incentives were reduced in 2012 to an average of \$1,200 per project, with a cap of \$2,000 per project.

Efficiency Vermont incentives are paid upon the successful completion of qualifying projects. Additional federal residential energy efficiency tax credits were also available in 2010 and 2011 for HPwES projects. Many Vermont lenders offer low-interest loans that can be used for energy projects like HPwES. Vermont Gas customers are also eligible for HPwES, but VGS pays the incentives for projects with natural gas savings.

Building Performance is a complementary program offered by Efficiency Vermont and serving multifamily buildings of five or more units, as well as commercial and mixed-use buildings. Building Performance began as a pilot expansion of the HPwES program in 2010,, funded with HPF funds. The goal was to provide commercial and multifamily property owners the benefit of comprehensive services provided through the HPwES program, and provide trained BPI contractors the technical tools and financial incentives to successfully work for non-residential customers. From a building science perspective, these small building types behave like a home (and in many cases may have been a single family home at one point), but actually have a multifamily, small commercial, or mixed use occupant.

For market consistency, the Building Performance program utilizes the same incentive structure and implementation process as HPwES. The significant difference between the incentives is an increased project maximum. Because of limited HPF funds, the Building Performance has not been heavily promoted, and the incentive cap was reduced from \$7,500 to \$5,000 per project in 2012. To date, the program has served 78 projects, and saved over 4,300 MMBtu. Specific to multifamily, the program has worked in 16 apartments, and saved 887 MMBtu.

b. Multifamily programs

i. Comprehensive “Checklist” program:

Comprehensive Checklist	Funding Source	Electrical
	Implementation	Efficiency Vermont
	Customers	5+ unit residential apartments, mixed use, condominium buildings with common hallways. Affordable and market rate housing.

This multifamily program predates the creation of Efficiency Vermont, and was originally designed as a pilot program. The original objective was to implement comprehensive energy efficiency improvements in new and existing multifamily affordable housing properties. The program, commonly referred to as “the Checklist,” required a comprehensive set of energy efficiency measures in a project, using the electrical savings to leverage thermal efficiency improvements including increased insulation levels, air sealing, boiler efficiency, controls, and ventilation. In new construction projects, Efficiency Vermont also provided an ENERGY STAR label for the building; Vermont is a national leader in completion of certified ENERGY STAR units within its affordable multifamily housing projects. The Checklist program, funded with electric rate payer dollars, provided substantial technical assistance to multifamily projects, including:

- Identify and set energy goals with owners, developers, and design teams
- Support interpreting energy requirements (ENERGY STAR, Checklist, Code, etc.)
- Document review, including project plans and submittals for compliance with owner and program goals
- On-site contractor meeting to ensure energy efficiency measures are clear and prioritized, and site inspection procedures are understood
- Construction inspections, including pre-sheetrock air sealing inspections to ensure compliance with air tightness goals.
- Final inspections including blower door testing for air tightness
- ENERGY STAR certification (when appropriate)
- Incentive of \$500/unit and \$500 for each set of qualifying common area laundry machines.

Multifamily program requirements were significantly updated in 2012, to reflect market, baseline, and industry changes. Efficiency Vermont’s intention was to include a corresponding incentive payment increase in to reflect the rising program requirements, however due to HPF funding constraints the incentive was only raised to \$850/unit. The updates reflected these changes:

- ENERGY STAR Version 3
- Residential Building Energy Standards (updated November 2011)
- Commercial Building Energy Standards (updated January 2012)

- Customer needs (reflective of a market transforming to the point where previous Checklist requirements had predominantly become standard operating procedures)
- Funder prerequisites, including publishing of the “Roadmap to Energy Affordability” and updated funder standards (VT Housing and Conservation Board, VT Housing Finance Agency, etc.)

While the Comprehensive Checklist program began as an affordable housing initiative, the requirements and incentives have been applied to all multifamily housing projects that Efficiency Vermont has been involved with, including new condominium buildings with common hallways, and market rate multifamily buildings. By treating all projects consistently, all market actors (designers, engineers, contractors, etc.) receive consistent messaging with respect to building science, requirements, inspections, and incentives; ultimately supporting transformation goals of the multifamily market.

The Checklist program is also available to customers of Burlington Electric Department and Vermont Gas Systems. Implementation, savings analysis, and incentives are processed through BED for Burlington projects and coordinated with VGS for natural gas customers.

ii. Equipment Replacement

Custom Equipment Replacement	Funding Source	Heating and Process Fuels or Electrical (measure dependent)
	Implementation	Efficiency Vermont
	Customers	5+ unit residential apartments, mixed use, condominium buildings with common hallways. Affordable and market rate housing.
Standard Rebate Form	Funding Source	Heating and Process Fuels or Electrical (measure dependent)
	Implementation	Efficiency Vermont
	Customers	Residential apartments, mixed use, condominium buildings with common hallways. Affordable and market rate housing.

Efficiency Vermont provides two avenues to support residential rental property owners making targeted improvements to their rental properties:

1. Custom: Historically, these have included measures ranging from fuel switches, ventilation improvements, and building wide lighting retrofits to water conservation strategies and controls. Currently, projects falling outside of Weatherization or the Building Performance program may be receive custom analysis, savings estimates, recommendations, and incentives.
2. Standard Rebate Form – Many private property owners prefer to make improvements to their apartments at time of tenant turnover. Efficiency Vermont’s “Rental Property Owner Rebate Form” provides prescriptive incentives to property owners installing new boilers and water conservation devices (as well as ventilation, refrigeration, and lighting).

2. BURLINGTON ELECTRIC DEPARTMENT

Burlington Electric Department (BED)	Funding Source	Heating and Process Fuels funding and Burlington Electric Department Ratepayers
	Implementation	Burlington Electric Department
	Customers	Single family homes and apartments buildings served by Burlington Electric Department

Burlington Electric Department (BED) offers a whole-building Home Performance with ENERGY STAR program that is very similar to the VT HPwES 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 (WAP) to offer electric efficiency measures to low-income consumers consistent with Efficiency Vermont, and with Vermont Gas Systems on whole-building retrofits.

A majority of BED’s residential customers (over 60%) live in rental units so BED has designed energy efficiency services to meet the needs of renters and rental building owners as well as owner-occupied dwellings. Most rental units in Burlington are separately metered (over 85%) and tenants pay electric costs directly. BED’s residential rental customers typically also purchase their own space heating and hot water heating fuel from Vermont Gas Systems, which provides the vast majority of those services in Burlington. About 95% of rental units in Burlington use natural gas for space and domestic hot water heating.

In general, to help reduce energy costs for both tenants and rental building owners, BED offers rebates for new, energy-efficient refrigeration and ventilation equipment, as well as free lighting and water conservation equipment for existing rental properties. BED also lets customers know about incentives for switching from electric space heat, electric hot water tanks and electric clothes dryers to natural gas fired options. Such fuel switching can provide substantial savings. Additional weatherization services are available through Vermont Gas Systems or the Champlain Valley Office of Economic Opportunity (CVOEO).

As described above, BED has a very limited non-VGS multifamily population. BED has a very strong sense of where the non-VGS served-housing is in Burlington and it tends to be in single-family (including condos) neighborhoods in parts of the new North End and a small section of the South End. The Public Service Board (PSB) permits BED to use RGGI/FCM funds to provide thermal services to unregulated fuel (primarily oil and propane) customers, but not to natural gas customers. Should BED encounter a non-VGS, multifamily property, they serve it under their existing thermal program and approved budgets.

In addition to BED’s programs, the City of Burlington has a long-standing time-of-sale ordinance that sets a minimal standard for energy efficiency in rental properties. The ordinance is implemented by BED. The requirements of the ordinance are minimal, and effectively ensure code compliance for insulation levels.

3. VERMONT GAS SYSTEMS

Vermont Gas (VGS)	Funding Source	Vermont Gas ratepayers
	Implementation	Vermont Gas
	Customers	Single family homes and apartments buildings served by natural gas

VGS provides natural gas service to about 45,000 customers in Chittenden and Franklin counties and offers whole-building retrofit and equipment replacement energy efficiency programs. The VGS programs cover the residential, multifamily, commercial, and industrial sectors, and VGS collaborates with Efficiency Vermont, the Weatherization Assistance Program, and BED to implement comprehensive solutions. VGS offers cash rebates, incentives, technical assistance, audits, reduced interest rate financing, and other measures. Additionally, VGS provides project management and post completion inspections. In 2011, VGS installed whole-building efficiency measures for 171 residential projects and 20 commercial and industrial projects. In addition, VGS's equipment replacement programs served 1,525 residential projects and 51 commercial and industrial projects.

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 0.5 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 evaluates existing insulation levels, building air-tightness, heating system efficiency, and identifies electric savings measures. At the time of the audit, customers are offered free compact fluorescent bulbs installed in all high use light fixtures. Building owners are provided with a report summarizing the audit results, detailing 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 one third of the installed cost of the recommended measures and provides a reduced interest loan through a local credit union for the balance. In multi-family properties of up to 4 units where the tenant pays the gas bill, the incentive to the owner is 50% of the installed cost. In 2011, 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 10 years

Low-income customers are referred to CVOEO 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 at typically 50% of installed measure cost.

Table A1-1. VGS Incentives

Incentives for VGS Comprehensive Programs	
Single Family 1-4 units, Owner pays gas bill	33% of installed cost rebated Low interest loan available for remaining balance
1-4 units, Tenants pay gas bill	50% of installed cost rebated to Owner Low interest loan available to Owner for remaining balance
5+ units	Custom analysis through commercial program, typical rebates of \$10/mcf of calculated savings
Low Income	Customers served through CVOEO; receiving full cost of measures. (VGS pays 50% of service.)

Additionally, for most heating system upgrades in both single and multifamily buildings, VGS offers prescriptive incentives: for boilers \$400 (87%+ AFUE) and \$600 (92.1%+ AFUE with outdoor reset), and for furnaces \$100 (90-92% AFUE), \$300 (92.1-93.9% AFUE), or \$400 (94%+ AFUE). Alternatively, VGS offers financing through the Green Mountain Credit Union of up to \$10,000 for high efficiency heating systems. In the few instances where heating system replacement proves to be cost-effective based on custom screening, VGS pays the same percentages as for shell upgrades.

VGS also works cooperatively with the city of Burlington’s time-of-sale ordinance. When a rental property is sold, and the tenants pay for natural gas for heat, they must meet minimum property efficiency standards. In these cases, if the owner participates in the VGS Residential Retrofit Program, this satisfies those requirements.

4. WEATHERIZATION ASSISTANCE PROGRAM (WAP)

Weatherization Assistance Program (WAP)	Funding Source	U.S. Department of Energy Vermont Weatherization Trust Fund
	Implementation	Office of Economic Opportunity
	Customers	Single family homes and apartments buildings. Occupants earn less than 60% of median income

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 Vermont 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 Vermont Weatherization Trust Fund. In addition, the program historically received between \$1 and \$2 million per year from the U.S. DOE, and in 2009 received a one-time infusion of \$16.8 million from the American Recovery and Reinvestment Act (ARRA), which was spent by the end of 2012. In 2013, for the first time, Vermont WAP received no funding from DOE, and was entirely dependent on the state’s Weatherization Trust Fund.

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 also 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.

WAPs serve low income Vermonters in both single family homes as well as multifamily buildings (including developments of larger than 5 units). To be eligible for WAP services, Vermonters must earn less than 60% of the area median income or 60% of the state median income, whichever is lower. 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 Vermont 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 (see **Table A1-2**). 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; WAP officials estimate savings levels are even higher today.

WAP in Vermont is successful both in terms of service quality and scope. Yet a large number of qualifying residences remain untreated, and a great many low-income families are paying more for energy than they should. Several WAP agencies maintain customer waiting lists of up to two years.

To temporarily fill the funding gap caused by the loss of DOE and ARRA funding, in 2012 the Department of Public Service negotiated an agreement with Green Mountain Power that provides an additional \$10

million in Weatherization funding over the next two years as a result of the merger between Green Mountain Power (GMP) and Central Vermont Public Service (CVPS), which was approved by the Public Service Board in June 2012.

Table A1-2. Funding Sources for and Number of Housing Units Served by Vermont’s Weatherization Program, 2006–11

YEAR	DOE	WTF	ARRA	TOTAL	No. Units
2006-07	\$1,227,269	\$5,464,119		\$ 6,691,388	1402
2007-08	\$1,065,077	\$5,686,763		\$ 6,751,840	1427
2008-09	\$1,210,986	\$6,544,229		\$ 7,755,215	1570
2009-10	\$1,700,892	\$3,565,311	\$4,203,134	\$ 9,469,337	1832
2010-11	\$930,633	\$3,581,418	\$6,896,669	\$11,408,720	1722
2011-12	\$848,868	\$5,154,980	\$4,564,359	\$10,568,207	1403

Source: Geoff Wilcox, Office of Economic Opportunity

5. VERMONT FUEL EFFICIENCY PARTNERSHIP (VFEP)

VT Fuel Efficiency Partnership (VFEP)	Funding Source	Currently: Heating and Process Fuels (through Efficiency Vermont) Additional historic sources: Regional Greenhouse Gas Initiative (through the Dept. of Public Services), American Recovery and Reinvestment Act, and Energy Efficiency and Conservation Block Grants
	Implementation	Central Vermont Community Action Council (CVCAC)
	Customers	Residential apartments, 80% of median income. (VFEP is currently not available to VT Gas customers due to HPF funding source.)

The Vermont Fuel Efficiency Partnership (VFEP) is an initiative of Central Vermont Community Action Council (CVCAC) in partnership with the State’s regional Weatherization Assistance Programs and Efficiency Vermont. VFEP collaborates with HomeOwnership Centers, Vermont Housing Conservation Board, the Community Land Trust network, private housing providers, lenders, and state agencies to improve the energy efficiency of affordable multifamily housing.

VFEP was formed in 2009 and provides incentives for “deep energy retrofits,” primarily in multi-family buildings whose tenants are income-eligible for WAP or are slightly above that income level (up to 80% of the area median income). The energy retrofits are intended to go beyond what WAP and other efficiency programs have incentivized, to achieve savings of 25% or more. Multifamily 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 has received funding from RGGI, Efficiency Vermont, and grants from the federal ARRA Energy Efficiency and Conservation Block Grants.

Funding for VFEP has declined sharply since the high point in the last half of 2011. ARRA stimulus funds, via the Energy Efficiency & Conservation Block Grant, augmented initial RGGI funds. A continuing contract with EVT utilizes Heating & Process Fuels funds (whose source is RGGI revenues after 2010, and the Forward Capacity Market). VFEP’s original DPS contract ended December 2011; EECBG ends August 2012; and EVT-HPF funds were 30% lower in 2012 than 2011. Between late 2011 and late 2012, funding will have dropped 80%.

From startup to 12/31/2011, VFEP provided services to 124 buildings with 1,066 units, and achieved the following results:

- 45% energy savings on average in the buildings served
- Program costs of \$4.7 million (for the period, including all support and admin)
- \$3.83 energy expense saved (over 25-year period) for every \$1 VFEP program cost

6. VERMONT SMALL SCALE RENEWABLE INCENTIVE PROGRAM

VT Small Scale Renewable Energy Incentive Program	Funding Source	Clean Energy Development Fund (CEDF) Central Vermont Public Service (CVPS) Green Mountain Power (GMP) U.S. Department of Energy (DOE)
	Implementation	VT Energy Investment Corporation
	Customers	Residential, Multifamily, Commercial

The Vermont Small Scale Renewable Energy Incentive Program was originally established pursuant to Renewable Energy Legislation passed by the Vermont State Legislature during the Spring of 2003. The program offers incentives on renewable energy systems installed by approved installers, known as Vermont Solar, Wind and Hydro Partners. Funding for this program has come from the Clean Energy Development Fund (CEDF), CVPS, GMP, and through DOE secured by Senator James Jeffords for the VT Department of Public Service Wind Development Program and the ARRA of 2009. Funding in 2013 is not expected to be sufficient to meet the demand.

The Clean Energy Development Board modified the program design for the 2012 program year. The key changes include:

- Incorporation of a “right-sized” incentive adder to the incentive amount for those customers that have taken steps to ensure that their renewable energy systems are not oversized, given the potential to reduce electric load through efficiency
- Encouraging well-sited wind projects through the return to an incentive that depends partially on actual production, rather than only on the power capacity of the unit.
- Lowering of the incentive levels for PV in response to lower PV costs and strong demand.

- Limitation of higher special customer incentives to low-income housing non-profits, municipalities, and public schools.

7. NEIGHBORWORKS OF WESTERN VERMONT (NWWVT)

NeighborWorks® of Western Vermont (NWWVT) is a not-for-profit housing organization, one of five similar homeownership centers in Vermont. In June 2010, NWWVT won a \$4.5 million grant for its proposal to save energy, create jobs retrofitting homes in Rutland County, and test a model for community-based outreach. The grant was awarded by the U.S. DOE under an ARRA grant program.

Though this DOE grant, NWWVT established a Heat Squad that provides a layer of customer outreach and assistance to support customers in completing Home Performance with ENERGY STAR projects. NWWVT does outreach and marketing, supports customers in scheduling an energy audit and finding a contractor, checks in along the way to see if they need assistance, and offers low-interest loans to interested customers. Heat Squad customers are eligible for standard HPwES incentives. NWWVT also works with contractors on customer service, sales, and business development, and offers equipment loans and a temporary labor pool known as LaborWorks to help contractors expand their businesses. Over the three-year grant period, NWWVT plans to conduct 2,000 comprehensive energy audits and help 1,000 residents complete substantial retrofits. As of November 2012, the NWWVT Heat Squad had completed more than 500 retrofits in Rutland County.

8. TOWN ENERGY COMMITTEES

Town energy committees have been established all over the state to promote energy conservation, efficiency and renewable energy development at the grassroots level. Currently, there are over a hundred town energy committees across Vermont. The Vermont Energy and Climate Action Network (VECAN) serves to support and coordinate many of these committees. Some Vermont communities have elected to appoint an energy coordinator and energy committees as 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. Energy committees can serve the community by helping suggest specific goals and objectives, and helping to implement strategies that can foster sustainable development that benefits the community as a whole. The reach of the town energy committees at the grassroots level makes them a useful conduit to promote and implement home energy efficiency initiatives.

9. VERMONT ENERGY EDUCATION PROGRAM (VEEP)

The Vermont Energy Education Program (VEEP) has long provided energy literacy education and curricula in Vermont schools, to students ranging from elementary school to high school. VEEP aims to reach up to 10,000 students per year, and will be expanded in the coming years through the Efficiency Vermont Energy Literacy Project (ELP) and other Efficiency Vermont/VEEP programs, including the

Whole School Energy Challenge and the upcoming K-12 Energy League. The ELP builds upon VEEP's long-standing success in promoting a deep understanding among the children it reaches of what energy is and how to use it efficiently. The new federal Green Ribbon Schools program may, in coming years, add to these education efforts.

10. DO-IT-YOURSELF ENERGY EFFICIENCY HOME IMPROVEMENTS

Many Vermonters are interested in doing their own energy efficiency home improvements. To support these do-it-yourself (DIY) homeowners, in 2010 CVCAC designed and implemented a pilot program around DIY energy efficiency. The objective of the pilot was to determine whether homeowners, given proper education and support, could make significant home energy efficiency improvements, comparable to those that would have been made by a professional contractor.

Through the pilot, CVCAC offered a series of Weatherization Skillshops to deliver in-depth training to DIY homeowners. The Skillshops offered a day-long curriculum, with a building science foundation followed by hands-on skills-building. The content covered in the Skillshop included the necessary tactics for air-sealing and insulating attics and basements, as well as air-sealing techniques for doors and windows.

Homeowners then worked under the guidance of a participating Home Performance with ENERGY STAR contractor to complete the work, and were eligible for an incentive from Efficiency Vermont. 24 homeowners completed projects through the DIY program in 2010. In 2011, the program was expanded, and DIY homeowners working under the guidance of a HPWES contractor continue to be eligible for standard Efficiency Vermont incentives.

11. BUILDING ENERGY STANDARDS

Vermont has both residential (RBES) and commercial (CBES) building energy standards. The residential energy code has been in effect since 1997 and the commercial energy code since January of 2007. RBES and CBES apply to all new construction projects; additionally, building components altered during certain renovation projects must be brought into compliance with the code. RBES applies to all residential buildings three stories and less. RBES also typically applies to common areas of multifamily buildings (including hallways, laundries, storage, etc.) three stories and less as they support the buildings predominant residential use. CBES applies to all commercial buildings and multifamily buildings four stories and greater.

Both residential and commercial standards are based on the widely used International Energy Conservation Code (IECC) produced by the International Code Council. The IECC is updated every three years, and Vermont statute calls for an energy code update process to begin promptly thereafter. The update process consists of the formation of a stakeholder working group that makes recommendations for enhancements to the code, which is then adopted following any modifications made as a result of wider participation in a state rulemaking process. There is no statewide enforcement mechanism or inspection process to enforce energy codes, but builders, architects, and engineers certify that buildings

meet codes, and building owners have a right of action to recover damages if the codes are not met. A 2009 RBES Compliance Analysis found a technical compliance rate of 72%; studies by the Department of Public Service are under way that will update the RBES compliance rate and assess the CBES compliance rate.⁸⁰ The city of Burlington is the state's lone enforcement exception; energy criteria are verified in the city's building inspections for new construction.

A new RBES based on the 2009 IECC was adopted July 1, 2011, with an effective date of October 1, 2011. A new CBES was adopted October 3, 2011, with an effective date of January 3, 2012, and is based on the 2009 version of the IECC.

In 2012, the DPS completed a statewide energy code compliance plan for achieving 90% compliance with the energy codes by February 1, 2017. The plan addresses how to best implement ongoing training related to energy code updates, unified energy code enforcement measures, a process to evaluate and report annual rates of energy code compliance, and short- and long-term funding mechanisms for implementation.

Vermont's building energy standards generally provide the baselines for utility efficiency programs to measure their respective energy savings (including Efficiency Vermont, Burlington Electric Department, and Vermont Gas.

12. APPLIANCE AND EQUIPMENT STANDARDS

The U.S. government has established efficiency standards for many types of appliances and HVAC equipment. 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.

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.

13. 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."

"Best available 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. Because of Act 250, and subsequently the Residential and Commercial energy codes, 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, 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. Efficiency Vermont, Burlington Electric Department, and Vermont Gas Systems actively assist customers in compliance with Act 250 criteria.

If and when the DPS recommends above-code efficiency improvements for an Act 250 permit to be granted, the agency needs to ensure that recommendations are consistent and applied evenly to provide predictability to the builders, architects, and engineers who plan and construct efficient, affordable buildings.

Efficiency Vermont collaborated with the New Buildings Institute Inc. to create a Core Performance Guide, Vermont Edition, designed to reduce energy use in new buildings by 20% to 30% compared with the Vermont Commercial Energy Code (based on the IECC 2004 and ASHRAE 90.1–2004). Core performance requirements are most appropriate for new buildings and major renovations, but can be applied to smaller projects.

B. Commercial & Industrial Thermal Efficiency Programs Available in Vermont

As Developed by the Commercial and Industrial Subcommittee

[1] The Vermont Gas Systems Commercial Retrofit Program is designed to reduce natural gas consumption and peak day demand by encouraging VGS' commercial and industrial customers (building owners or occupants) to install cost-effective, natural gas-saving space, water and/or process heating and cooling measures. Vermont Gas has prescriptive rebates and custom incentives for gas saving measures. Items for rebate include: high efficiency furnaces, water heaters, unit heaters, infrared heaters, boilers, and CO2 sensors. Custom rebate items include but not limited to: High efficiency Steam or Hot Water Boilers > 300 MBH, Variable Flow Kitchen Hood Controls, Heat Recovery Ventilation, Direct Digital Controls for: Reduced Equipment Run Hours Space Temperature Setback Demand control Ventilation, De-Stratification Fans, Waste Water Heat Recovery, Condensing Tankless Water Heaters and Steam Trap and System upgrades. Current budget is ~\$140,000 for retrofit incentives and rebates. Free technical assistance and walk through energy audits are performed to assist natural gas customers with their prospective energy projects.

[2] VGS Small Commercial Customer Financing Pilot amounts up to \$10,000. VGS will buy down the interest rate the in a similar manner to the residential loan program and prepay the interest to Green Mountain Credit Union. This is available to small commercial rate equipment replacement and retrofit customers consisting of but not limited to:

1. Churches
2. Restaurants
3. Small convenience stores/Delicatessens
4. Conversion homes to business offices
5. Bed and Breakfasts

[3] DOE Engineering Universities free energy audit program. VGS facilitates in its territory, assisting qualifying industrial facilities with obtaining a free energy audit from DOE sponsored Engineering Universities. Small- and medium-sized manufacturers may be eligible to receive a no-cost assessment provided by DOE Industrial Assessment Centers (IACs). Teams conduct the energy audits to identify opportunities to improve productivity, reduce waste and save energy. On average, manufacturers identify about \$55,000 in potential annual savings. Manufacturers may be eligible to receive an IAC assessment if they meet these criteria:

- Within Standard Industrial Codes (SIC) 20-39
- Located less than 150 miles of a participating university (Industrial Assessment Center Locations)
- Gross annual sales below \$100 million
- Fewer than 500 employees at the plant site
- Annual energy bills more than \$100,000 and less than \$2.5 million
- No professional in-house staff to perform the assessment

[4] USDA Grant/loans for energy efficiency equipment. The Rural Energy for America Program (REAP) provides financial assistance to agricultural producers and rural small businesses in rural America to purchase, install, and construct renewable energy systems; make energy efficiency improvements to non-residential buildings and facilities; use renewable technologies that reduce energy consumption; and participate in energy audits, renewable energy development assistance, and feasibility studies. See http://www.rurdev.usda.gov/BCP_ReapResEei.html for details.

VGS facilitates small companies obtaining USDA Grant/loans for energy efficient equipment (all areas of Vermont qualify since every city is smaller than 50,000 population). Vermont Gas Systems will refer customers to these programs but will let the owner pay for and hire as needed to complete the application. Limited to 'small rural' businesses and agricultural producers.

[5] State Resource Management Revolving Fund (SRMRF) - The 2004 session of the general assembly amended the statutes to establish a State Resource Management Fund to be administered by the Commissioner of Buildings and General Services. This fund is to be used for financing resource conservation measures under criteria for project selection established by the Commissioner of Buildings and General Services that will generate a life cycle cost benefit to the State. Resource conservation measures include but are not limited to equipment replacement, studies, weatherization, and the construction of improvements affecting the use of energy resources. Cost of the conservation measures will be repaid to the fund according to schedules established by the Commissioner of Buildings and General Services with the concurrence of the Commissioner of Finance and Management (Sec 168(b) of Title 29 of the Vermont Statutes Annotated). Policy and Procedures can be found here: <http://bgs.vermont.gov/adminpolicies/policy33>

[6] Vermont Small Scale Renewable Energy Incentive Program offers incentives on small renewable energy systems installed by Vermont Solar, Wind, and Hydro partners. These incentives are available to commercial customers as well as residential customers. An "Efficiency Adder" is available to increase the incentive amount if efficiency improvements have been recently made or an audit has been performed. See <http://www.rerc-vt.org/incentives/> for more details.

[7] The Vermont Business Energy Conservation Loan Program is a joint-effort between Efficiency Vermont and the Vermont Economic Development Authority. Vermont businesses (including non-profits) involved in manufacturing (or processing and assembly of products), hospitality, services, farms and retail are eligible, as long as they are 51% owned by US Citizens. Projects must improve the energy efficiency of the building, and improvements to thermal envelope, power, heating, ventilation and cooling systems, lighting, and energy efficiency HVAC equipment are generally eligible. In addition, companies who conduct energy audits would be eligible for loans on equipment needed to carry out their work. Efficiency Vermont will verify the cost-effectiveness of the proposed efficiency upgrades as part of the application process. Loan applicants are encouraged to also apply for [Efficiency Vermont](#) incentives to lower the overall amount of the loan.

[8] Efficiency Vermont C&I Heating Equipment for Replacement and New Construction – This service promotes high-efficiency boiler and furnace heating systems at the time of replacement and in new construction projects through technical support, financial incentives, and promotion by suppliers and contractors/installers. Systems up to 500 MBh in size are eligible for standardized incentives of \$2/MBh. Larger systems can access technical support and incentives through the customized project process. Budget for 2012 is \$167,000, which is expected to provide technical support and incentives for 70 projects generating an estimated 5,300 MMBTU in savings.

[9] Efficiency Vermont C&I Wood Biomass Heating Equipment Efficiency Vermont offers central heating system rebates for high-efficiency, wood biomass and wood chip boilers and furnaces in commercial, agricultural and institutional installations. Smaller wood pellet boilers and furnaces (<= 300 MBh) are eligible for standardized rebates of \$1,000 per system. Larger commercial pellet and wood chip systems, including district heating systems and large commercial systems, can access incentives through a customized project approach. The budget for 2012 is \$44,000, which is expected to provide technical support and financial incentives for an estimated 13 projects resulting in 150 MMBTU savings.

[10] Efficiency Vermont Building Performance retrofit services – small business focus. Building Performance is founded on the model of Home Performance with ENERGY STAR to provide comprehensive, whole-building thermal and mechanical upgrades. Many small businesses are housed in converted homes and have thermal properties similar to single family residences currently served by the Home Performance with ENERGY STAR contractor network. Building Performance uses the same network of trained contractors to provide quality services. Efficiency Vermont currently offers up to \$5,000 per building to help owners pay for energy efficiency improvements completed by a participating BPI certified contractor. Building size limit is up to 10,000 sq. ft. and does not include certain buildings types such as grocery and restaurants that include more complex systems beyond HVAC. The budget for 2012 is \$162,000, which is expected to provide technical support and financial incentives for an estimated 30 projects resulting in 1,080 MMBTU in savings.

[11] Efficiency Vermont Dairy Farm Heat Recovery unit replacement – This service promotes new and replacement efficient heat recovery units specific to use at dairy farms. These units capture waste heat produced in the milk refrigeration process and use that waste heat to preheat water used in the dairy's clean-up processes. This heat recovery unit strategy is designed to overcome financial barriers dairy farmers face in adopting and continuing to use this technology. Efficiency Vermont provides technical assistance and incentives to reduce first costs, which represent a significant barrier to many farmers given cash-flow constraints faced by many of them. The 2012 budget is \$72,700, which is expected to provide technical support and financial incentives for an estimated 16 projects resulting in 530 MMBTU in savings. Current incentive levels are set at \$1,000 per unit.

[12] Efficiency Vermont C&I Custom Measures – This custom service provides the flexibility to add measures as new and existing technologies present opportunities for savings and as potential changes in program funding allow. Custom measures are selected based on their potential for MMBtu savings, maximizing comprehensiveness, cost-effectiveness, and available budget. For approved measures, Efficiency Vermont will provide technical support and incentives through the custom project approach.

The 2012 budget is \$140,000 which is currently limited to reducing diesel consumption for snow making by incentivizing more efficient snow guns at ski areas resulting in an estimated savings of 2,000 MMBTU.

[13] Vermont Superintendents Association – School Energy Management Program (VSA-SEMP) - Energy Assessments and Reports. This is a service that is provided to all K-12 Vermont schools, public and private. An energy assessment and report equivalent to an ASHRAE Level I audit that evaluates operational improvements as well as more capital intensive energy projects is performed at no charge to the schools. Efficiency Vermont is the primary funder for this aspect of VSA-SEMP's program.

[14] Pre-Feasibility Evaluation of Biomass Conversion for K-12 Schools – this service is provided by VSA-SEMP at no charge to the schools. VSA-SEMP will assist the schools that are considering a conversion to chips or pellets by evaluating the site and performing a Life Cycle Cost analysis of the biomass option. This service is funded by a grant from the Biomass Energy Resource Center.

[15] School Construction Aid Program –Vermont Department of Education – this program provides 30% construction aid to public school districts, but with the current program suspension, it only applies to school districts that are merging or are getting emergency aid. The school districts that meet the narrow criteria would also be eligible for 75% construction aid for renewable energy systems that pass a life cycle cost test.

[16] Energy Efficiency Loan Program – Efficiency Vermont - Finding the money in a timely way to invest in energy efficiency projects is a challenge for a number of business customers. With the help of a DOE grant awarded to VEIC and the DPS, starting in 2013, this loan program will use private capital and federal QECB bonds to create a self-sustaining finance offering that will make loans available to Vermont businesses for which access to capital is needed. Part of the DOE grant will be used to establish a loan loss reserve, which will be used to entice financial partners to gain experience with making loans to businesses for energy efficiency improvements. The experience gained in partnership with key financial institutions will establish a basis for expanding the financial options available for businesses to make cost effective energy improvements. Efficiency Vermont expects to have financing available for a wide range of customers and projects (both electric and thermal) for loans amounts of \$25,000 and higher by the first quarter of 2013. An additional loan program is also in development for 2013, which will provide loans from \$5,000 - \$30,000 for small business and smaller projects.

Appendix 2:
Potential Energy Provider Partnership Models

Appendix Two: Potential Energy Service Provider Partner Models

Energy/Fuel Service Provider Partnership Models

This chart captures potential partnership models between Retrofit Service Providers (Home Performance and Building Performance) and Energy/Fuel Service Providers (Fuel dealers, HVAC contractors, and Renewable contractors) in the cases where additional opportunities are recognized within a project. The partnership models are being defined to support the Thermal Efficiency Task Force objectives of significantly increasing the number of retrofit projects within VT and reducing the average fuel consumption and cost. It is recognized that the models must provide benefit to the service providers in order to be successful.

Model 1 Energy/Fuel Service Providers as General Contractor

Description Energy/Fuel Service Providers serve as the general contractor
 Energy/Fuel Service Provider performs energy audit if BPI certified.
 Retrofit contractor performs energy audit and shell work.
 Service Provider contractor performs HVAC and/or Renewable work

Challenges	Possible Solutions
Service Providers without BPI certification or equivalent training may not be able to distinguish situations with high potential for energy savings through retrofit work.	Train Service Providers on opportunity identification outside of their specialty. Provide BPI training and certification.
Without retrofit experience, it may be challenging for a non-HPwES GC to explain the work scope to the customer.	Provide HP program training. Develop cross-market partnerships.

Model 2 Retrofit Service Providers as General Contractor

Description HP contractor performs energy audit and shell work
 Contracts out HVAC and/or Renewable work

Challenges	Possible Solutions
HP contractors may not be able to recognize high potential equipment efficiency improvement opportunities .	Train HP contractors on opportunity identification outside of their specialty. Develop cross-market partnerships.

Model 3 3rd Party Auditor and GC

Description A small set of Energy auditors with knowledge of all programs and measure types could GC jobs for all services
 Could deliver consistent customer messaging about all services
 Could create a comprehensive energy plan
 Could GC or pass along work to appropriate groups

Challenges	Possible Solutions
Auditor is accountable for Health & Safety and customer satisfaction but not completing any of the work	Partnerships would require resolution agreement. Liability would need to be clearly defined.

Model 4 Referrals only

Description Partner Service Provider contact information is provided to the customer when opportunities are identified.

Challenges	Possible Solutions
Customer loses "one stop shop" experience	

Appendix 3:
Available Training Certifications

Appendix Three: Available Trainings Certifications

CERTIFICATIONS and CLASSES			
Knowledge Area	Certification / Class	Knowledge / Ability	VT Certifications
Residential retrofit	Building Performance Institute - Envelope Professional	Advanced shell diagnostics	~100
Residential retrofit	Building Performance Institute - Building Analyst	Building science fundamentals, combustion testing	~100
Residential retrofit	Building Performance Institute - Heating Professional	HVAC testing	~100
Small business retrofit	Building Performance partner through Efficiency Vermont	Methodology to extend BPI training to small business	~15
Large business retrofit			
Oil system install & maintenance	NORA Silver Technician	Install, maintain, combustion, testing	556
Oil system efficiency	NORA Gold Technician		200
Oil systems & home efficiency	NORA Energy Conservation Analysts		70
Natural gas system install & maintenance	State of VT, Natural Gas Certification	Install, maintain, combustion, testing	State of VT, And fuel gas code
Contractors & VGS service techs.	State of Vermont Electrical License	Install, maintain, combustion, testing	State of VT, And fuel gas code
VGS Residential Auditors	BPI Building Analyst Certified	Install, maintain, CAZ testing, efficiency test	BPI
Comprehensive home retrofit	State of VT, Natural Gas Certification	Install, maintain, CAZ testing, efficiency test	State of VT, And fuel gas code
Heating systems	Introduction to Heating Systems for BPI contractors	System basics, operation, efficiency opportunity recognition.	175
Heating system / house	Maximize thermal efficiency without sacrificing safety, reliability, or comfort	How to evaluate energy conservation investments.	110
Solar hot water	BSR Solar Hot Water Workshops - REY approved solar thermal installer course.	Solar hot water design and installation	
Solar hot water	HeatSpring Solar Hot Water Workshops - REY approved solar thermal installer course.	Solar hot water design and installation	
Solar hot water	Viesmann - Solar Hot Water Workshops - REY approved solar thermal installer course.	Solar hot water design and installation	
Photovoltaic	HeatSpring PV design and installation	PV design and installation	
Photovoltaic	IBEW PV design and installation	PV design and installation	
Photovoltaic	SUNY PV design and installation	PV design and installation	
Photovoltaic	Solar Fest PV design and installation	PV design and installation	
Photovoltaic	SEBAME PV design and installation	PV design and installation	
Geothermal	HeatSpring Geothermal design and installation	Geothermal design and installation	
Geothermal	IGSHPA Geothermal design and installation	Geothermal design and installation	

Training resource centers

Vermont Technical College
 Vermont Works for Women – Energy, Fresh ReSource
 Vermont Green
 Labor Works of NeighborWorks
 VFDA

Appendix 4:
Detailed Budget

Maximum Potential Scenario
All Sectors Compiled

	2014	2015	2016	2017	2018	2019	2020	Total
Natural Gas Savings								
Annual MMBtu acquired	46,550	43,475	51,225	51,750	62,900	62,900	62,900	389,700
Annual units served	275	306	344	400	475	475	475	2,750
Specify how "units" are counted:								
Propane, Fuel Oil, Kerosene Savings								
Annual MMBtu acquired	230,162	314,672	384,153	441,747	471,134	477,300	485,214	2,804,380
Annual units served	7,133	9,066	10,285	11,378	12,502	12,795	13,222	76,979
Specify how "units" are counted:								
Total Savings								
Annual MMBtu acquired	278,712	364,147	435,378	493,497	534,034	540,200	548,114	3,194,080
Annual units served	7,408	9,373	10,629	11,778	12,977	13,270	13,697	79,129
Specify how "units" are counted:								

	2014	2015	2016	2017	2018	2019	2020	Total
Natural Gas Costs								
Incentives	\$ 1,409,540	\$ 1,460,023	\$ 1,513,743	\$ 1,592,573	\$ 1,762,670	\$ 1,762,670	\$ 1,762,670	\$ 11,324,897
Participant costs (financed and self-funded)	\$ 4,487,719	\$ 4,638,556	\$ 4,817,819	\$ 5,092,890	\$ 5,734,456	\$ 5,734,456	\$ 5,734,456	\$ 36,190,292
Other program costs (technical assistance, marketing, etc.)	\$ 1,212,050	\$ 990,225	\$ 1,016,576	\$ 1,092,400	\$ 1,105,995	\$ 1,105,995	\$ 1,105,995	\$ 7,637,315
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 5,847,268	\$ 6,098,579	\$ 6,331,562	\$ 6,686,403	\$ 7,512,125	\$ 7,512,125	\$ 7,512,125	\$ 47,515,188
Total program costs (incentives plus other program costs)	\$ 2,621,598	\$ 2,458,249	\$ 2,530,319	\$ 2,686,053	\$ 2,889,664	\$ 2,889,664	\$ 2,889,664	\$ 18,962,212
Propane, Fuel Oil, Kerosene Costs								
Incentives	\$ 25,249,797	\$ 33,862,957	\$ 35,851,092	\$ 37,879,350	\$ 37,659,100	\$ 36,596,600	\$ 36,421,100	\$ 248,019,994
Participant costs (financed and self-funded)	\$ 51,907,487	\$ 65,347,383	\$ 80,452,528	\$ 94,481,852	\$ 109,863,027	\$ 119,107,527	\$ 129,379,027	\$ 650,484,650
Other program costs (technical assistance, marketing, etc.)	\$ 11,542,733	\$ 12,275,746	\$ 13,800,478	\$ 14,017,587	\$ 14,686,062	\$ 14,243,562	\$ 13,251,062	\$ 93,817,229
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 77,157,284	\$ 98,710,340	\$ 116,303,620	\$ 132,311,001	\$ 147,522,126	\$ 155,704,126	\$ 165,796,126	\$ 893,504,624
Total program costs (incentives plus other program costs)	\$ 36,792,530	\$ 45,630,703	\$ 49,651,570	\$ 51,896,336	\$ 52,345,161	\$ 50,840,161	\$ 49,672,161	\$ 336,037,223
Total Costs								
Incentives	\$ 26,659,345	\$ 34,022,980	\$ 37,364,035	\$ 39,472,923	\$ 39,441,769	\$ 38,379,269	\$ 38,203,769	\$ 254,344,091
Participant costs (financed and self-funded)	\$ 56,345,206	\$ 69,985,939	\$ 85,270,347	\$ 99,524,482	\$ 115,597,482	\$ 124,941,982	\$ 135,109,482	\$ 686,674,921
Other program costs (technical assistance, marketing, etc.)	\$ 12,754,703	\$ 13,273,571	\$ 14,817,054	\$ 15,110,067	\$ 15,792,056	\$ 15,343,556	\$ 14,357,056	\$ 101,454,544
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 83,004,551	\$ 104,008,920	\$ 122,635,102	\$ 138,997,405	\$ 155,039,252	\$ 163,223,252	\$ 173,313,252	\$ 941,019,012
Total program costs (incentives plus other program costs)	\$ 39,416,129	\$ 48,096,951	\$ 52,181,889	\$ 54,582,990	\$ 55,233,826	\$ 53,738,826	\$ 52,560,826	\$ 355,799,495
Natural Gas Revenue								
Currently available program funding	\$2,078,874	\$2,148,848	\$2,281,969	\$2,357,003	\$2,997,964	\$2,997,964	\$2,997,964	\$16,605,587
Incremental funding needed	\$542,725	\$309,400	\$298,350	\$334,050	\$290,700	\$290,700	\$290,700	\$2,356,625
Propane, Fuel Oil, Kerosene Revenue								
Currently available program funding	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$10,280,000	\$71,960,000
Incremental funding needed	\$26,512,530	\$35,358,703	\$39,371,570	\$41,616,936	\$42,065,161	\$40,560,161	\$39,392,161	\$264,877,223
Total Revenue								
Currently available program funding	\$12,358,874	\$12,428,848	\$12,511,969	\$12,632,003	\$12,877,964	\$12,877,964	\$12,877,964	\$88,565,587
Incremental Public Funding needed	\$27,055,285	\$33,648,103	\$39,669,920	\$41,950,986	\$42,855,861	\$40,850,861	\$39,682,861	\$267,233,848
Total Investment (Incentives, Participant Costs plus Other Program Costs)	\$55,759,335	\$118,082,891	\$137,452,236	\$154,107,471	\$170,831,308	\$178,570,808	\$187,670,308	\$1,042,474,357

Leverage Ratios (Total Investment/Public Funding)	2.5	2.8	2.5	2.7	3.0	3.4	3.7	2.9
Participant Costs/Public Funding	1.4	1.5	1.6	1.6	2.1	2.3	2.6	1.9
Participant Costs/Total Investment	59%	59%	62%	65%	69%	70%	72%	66%

Incremental Funding Needed by Program

	2014	2015	2016	2017	2018	2019	2020
Commercial	\$367,672	\$1,020,426	\$2,032,639	\$2,795,799	\$2,785,799	\$2,795,799	\$2,795,799
Res Market	\$3,575,000	\$4,825,000	\$5,700,000	\$6,200,000	\$7,700,000	\$6,325,000	\$4,950,000
Res LI	\$7,240,000	\$8,752,000	\$9,760,000	\$10,264,000	\$10,768,000	\$10,768,000	\$10,768,000
Multifamily	\$5,770,250	\$9,061,344	\$8,873,281	\$8,591,188	\$8,215,063	\$8,215,063	\$8,215,063
Renewables	\$7,974,000	\$10,799,000	\$12,134,000	\$12,800,000	\$11,747,000	\$11,617,000	\$11,024,000
Energy Service Professionals	\$300,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Planning and Measurement & Cross Cutting	\$1,828,333	\$1,113,333	\$1,070,000	\$1,210,000	\$1,040,000	\$1,040,000	\$1,040,000
Total	\$27,055,285	\$33,648,103	\$39,669,920	\$41,950,986	\$42,855,861	\$40,850,861	\$39,682,861

Jobs (16 jobs per \$1 million of public funding)	433	571	635	671	678	654	635	4276
Indirect Economic Effects (\$1.6 million for \$1 million spent)	\$43,280,400	\$57,060,964	\$63,471,872	\$67,121,578	\$67,769,378	\$65,361,378	\$63,492,570	\$427,574,157

Maximum Potential Scenario

Sector: Commercial

	2014	2015	2016	2017	2018	2019	2020
Natural Gas Savings							
Annual MMBtu acquired	29,550	29,850	30,850	30,250	39,900	39,900	39,900
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired	43,750	76,563	114,844	143,555	143,555	143,555	143,555
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Total Savings							
Annual MMBtu acquired	73,300	106,413	145,694	173,805	183,455	183,455	183,455
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Natural Gas Costs							
Incentives	\$ 327,048	\$ 330,648	\$ 328,118	\$ 323,573	\$ 400,170	\$ 400,170	\$ 400,170
Participant costs (financed and self-funded)	\$ 735,219	\$ 826,681	\$ 874,694	\$ 952,830	\$ 1,331,956	\$ 1,331,956	\$ 1,331,956
Other program costs (technical assistance, marketing, etc.)	\$ 244,325	\$ 245,075	\$ 251,976	\$ 258,430	\$ 270,295	\$ 270,295	\$ 270,295
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 1,062,268	\$ 1,157,329	\$ 1,202,812	\$ 1,276,403	\$ 1,732,125	\$ 1,732,125	\$ 1,732,125
Total program costs (incentives plus other program costs)	\$ 571,374	\$ 575,724	\$ 580,094	\$ 582,003	\$ 670,464	\$ 670,464	\$ 670,464
Propane, Fuel Oil, Kerosene Costs							
Incentives	\$ 688,297	\$ 1,204,520	\$ 1,806,780	\$ 2,258,475	\$ 2,258,475	\$ 2,258,475	\$ 2,258,475
Participant costs (financed and self-funded)	\$ 2,334,237	\$ 4,084,914	\$ 6,127,371	\$ 7,659,214	\$ 7,659,214	\$ 7,659,214	\$ 7,659,214
Other program costs (technical assistance, marketing, etc.)	\$ 659,375	\$ 803,906	\$ 1,205,859	\$ 1,507,324	\$ 1,507,324	\$ 1,507,324	\$ 1,507,324
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 3,022,534	\$ 5,289,434	\$ 7,934,151	\$ 9,917,689	\$ 9,917,689	\$ 9,917,689	\$ 9,917,689
Total program costs (incentives plus other program costs)	\$ 1,347,672	\$ 2,008,426	\$ 3,012,639	\$ 3,765,799	\$ 3,765,799	\$ 3,765,799	\$ 3,765,799
Total Costs							
Incentives	\$ 1,015,345	\$ 1,535,168	\$ 2,134,898	\$ 2,582,048	\$ 2,658,644	\$ 2,658,644	\$ 2,658,644
Participant costs (financed and self-funded)	\$ 3,069,456	\$ 4,911,595	\$ 7,002,065	\$ 8,612,044	\$ 8,991,170	\$ 8,991,170	\$ 8,991,170
Other program costs (technical assistance, marketing, etc.)	\$ 903,700	\$ 1,048,982	\$ 1,457,835	\$ 1,765,754	\$ 1,777,619	\$ 1,777,619	\$ 1,777,619
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 4,084,801	\$ 6,446,763	\$ 9,136,963	\$ 11,194,092	\$ 11,649,814	\$ 11,649,814	\$ 11,649,814
Total program costs (incentives plus other program costs)	\$ 1,919,046	\$ 2,584,150	\$ 3,592,733	\$ 4,347,802	\$ 4,436,263	\$ 4,436,263	\$ 4,436,263
Natural Gas Revenue							
Currently available program funding	\$571,374	\$575,724	\$580,094	\$582,003	\$670,464	\$670,464	\$670,464
Incremental funding needed	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding	\$980,000	\$980,000	\$980,000	\$980,000	\$980,000	\$980,000	\$980,000
Incremental funding needed	\$367,672	\$1,028,426	\$2,032,639	\$2,785,799	\$2,785,799	\$2,785,799	\$2,785,799
Total Revenue							
Currently available program funding	\$1,551,374	\$1,555,724	\$1,560,094	\$1,562,003	\$1,650,464	\$1,650,464	\$1,650,464
Incremental funding needed	\$367,672	\$1,028,426	\$2,032,639	\$2,785,799	\$2,785,799	\$2,785,799	\$2,785,799

Maximum Potential Scenario

Sector: Market-Rate Single-Family Residential

	2014 Total	2015 Total	2016 Total	2017 Total	2018 Total	2019 Total	2020 Total
Natural Gas Savings							
Annual MMBtu acquired	17,000	17,000	17,000	17,000	17,000	17,000	17,000
Annual units served	200	200	200	200	200	200	200
Specify how "units" are counted:	unit = project or set of projects saving 30% in one single-family home. VGS equipment replacement are not comprehensive projects so are included in savings totals, but not in unit counts						
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired	75,000	97,500	120,000	142,500	165,000	165,000	165,000
Annual units served	2,500	3,250	4,000	4,750	5,500	5,500	5,500
Specify how "units" are counted:							
Total Savings							
Annual MMBtu acquired	92,000	114,500	137,000	159,500	182,000	182,000	182,000
Annual units served	2,700	3,450	4,200	4,950	5,700	5,700	5,700
Specify how "units" are counted:							
Natural Gas Costs							
Incentives	\$785,000	\$785,000	\$785,000	\$785,000	\$785,000	\$785,000	\$785,000
Participant costs (financed and self-funded)	\$3,615,000	\$3,615,000	\$3,615,000	\$3,615,000	\$3,615,000	\$3,615,000	\$3,615,000
Other program costs (technical assistance, marketing, etc.)	\$310,000	\$310,000	\$310,000	\$310,000	\$310,000	\$310,000	\$310,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$1,385,000	\$1,385,000	\$1,385,000	\$1,385,000	\$1,385,000	\$1,385,000	\$1,385,000
Total program costs (incentives plus other program costs)	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000
Propane, Fuel Oil, Kerosene Costs							
Incentives	\$3,125,000	\$4,062,500	\$4,000,000	\$4,750,000	\$5,500,000	\$4,537,500	\$4,125,000
Participant costs (financed and self-funded)	\$15,625,000	\$20,312,500	\$26,000,000	\$30,875,000	\$35,750,000	\$36,712,500	\$37,125,000
Other program costs (technical assistance, marketing, etc.)	\$3,750,000	\$4,062,500	\$5,000,000	\$4,750,000	\$5,500,000	\$5,087,500	\$4,125,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$18,750,000	\$24,375,000	\$30,000,000	\$35,625,000	\$41,250,000	\$41,250,000	\$41,250,000
Total program costs (incentives plus other program costs)	\$6,875,000	\$8,125,000	\$9,000,000	\$9,500,000	\$11,000,000	\$9,625,000	\$8,250,000
Total Costs							
Incentives	\$3,910,000	\$4,847,500	\$4,785,000	\$5,535,000	\$6,285,000	\$5,322,500	\$4,910,000
Participant costs (financed and self-funded)	\$19,240,000	\$23,927,500	\$29,615,000	\$34,490,000	\$39,365,000	\$40,327,500	\$40,740,000
Other program costs (technical assistance, marketing, etc.)	\$4,060,000	\$4,372,500	\$5,310,000	\$5,060,000	\$5,810,000	\$5,397,500	\$4,435,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$20,135,000	\$25,760,000	\$31,385,000	\$37,010,000	\$42,635,000	\$42,635,000	\$42,635,000
Total program costs (incentives plus other program costs)	\$7,970,000	\$9,220,000	\$10,095,000	\$10,595,000	\$12,095,000	\$10,720,000	\$9,345,000
Natural Gas Revenue							
Currently available program funding	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000	\$1,095,000
Incremental funding needed	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000	\$3,300,000
Incremental funding needed	\$3,575,000	\$4,825,000	\$5,700,000	\$6,200,000	\$7,700,000	\$6,325,000	\$4,950,000
Total Revenue							
Currently available program funding	\$4,395,000	\$4,395,000	\$4,395,000	\$4,395,000	\$4,395,000	\$4,395,000	\$4,395,000
Incremental funding needed	\$3,575,000	\$4,825,000	\$5,700,000	\$6,200,000	\$7,700,000	\$6,325,000	\$4,950,000

Maximum Potential Scenario

Sector: Residential Low Income

	2014	2015	2016	2017	2018	2019	2020	Per Unit
Natural Gas Savings								
Annual MMBtu acquired	1,500	1,500	1,500	1,500	1,500	1,500	1,500	30
Annual units served	50	50	50	50	50	50	50	
Specify how "units" are counted:								
Propane, Fuel Oil, Kerosene Savings								
Annual MMBtu acquired	51,000	57,300	61,500	63,600	65,700	65,700	65,700	30
Annual units served	1,700	1,910	2,050	2,120	2,190	2,190	2,190	
Specify how "units" are counted:								
Total Savings								
Annual MMBtu acquired	52,500	58,800	63,000	65,100	67,200	67,200	67,200	30
Annual units served	1,750	1,960	2,100	2,170	2,240	2,240	2,240	
Specify how "units" are counted:								
Natural Gas Costs								
Incentives	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$5,200
Participant costs (financed and self-funded)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other program costs (technical assistance, marketing, etc.)	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$2,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$260,000	\$5,200
Total program costs (incentives plus other program costs)	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$7,200
Propane, Fuel Oil, Kerosene Costs								
Incentives	\$8,840,000	\$9,932,000	\$10,660,000	\$11,024,000	\$11,388,000	\$11,388,000	\$11,388,000	\$5,200
Participant costs (financed and self-funded)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other program costs (technical assistance, marketing, etc.)	\$3,400,000	\$3,820,000	\$4,100,000	\$4,240,000	\$4,380,000	\$4,380,000	\$4,380,000	\$2,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$8,840,000	\$9,932,000	\$10,660,000	\$11,024,000	\$11,388,000	\$11,388,000	\$11,388,000	\$5,200
Total program costs (incentives plus other program costs)	\$12,240,000	\$13,752,000	\$14,760,000	\$15,264,000	\$15,768,000	\$15,768,000	\$15,768,000	\$7,200
Total Costs								
Incentives	\$9,100,000	\$10,192,000	\$10,920,000	\$11,284,000	\$11,648,000	\$11,648,000		\$10,400
Participant costs (financed and self-funded)	\$0	\$0	\$0	\$0	\$0	\$0		\$0
Other program costs (technical assistance, marketing, etc.)	\$3,500,000	\$3,920,000	\$4,200,000	\$4,340,000	\$4,480,000	\$4,480,000		\$4,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$9,100,000	\$10,192,000	\$10,920,000	\$11,284,000	\$11,648,000	\$11,648,000		\$10,400
Total program costs (incentives plus other program costs)	\$12,600,000	\$14,112,000	\$15,120,000	\$15,624,000	\$16,128,000	\$16,128,000		\$14,400
Natural Gas Revenue								
Currently available program funding	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	
Incremental funding needed	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Propane, Fuel Oil, Kerosene Revenue								
Currently available program funding	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	\$5,000,000	
Incremental funding needed	\$7,240,000	\$8,752,000	\$9,760,000	\$10,264,000	\$10,768,000	\$10,768,000	\$10,768,000	
Total Revenue								
Currently available program funding	\$5,360,000	\$5,360,000	\$5,360,000	\$5,360,000	\$5,360,000	\$5,360,000	\$5,360,000	
Incremental funding needed	\$7,240,000	\$8,752,000	\$9,760,000	\$10,264,000	\$10,768,000	\$10,768,000	\$10,768,000	

Maximum Potential Scenario
Sector: Multi-Family

	2014	2015	2016	2017	2018	2019	2020
Natural Gas Savings*							
Annual MMBtu acquired	500	1,125	1,875	2,000	4,500	4,500	4,500
Annual units served	25	56	94	150	225	225	225
Specify how "units" are counted:	Apartments						
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired	37,000	56,175	55,125	53,550	51,450	51,450	51,450
Annual units served	1,350	2,056	1,969	1,913	1,830	1,830	1,830
Specify how "units" are counted:	Apartments						
Total Savings							
Annual MMBtu acquired	38,300	57,300	57,000	56,550	55,950	55,950	55,950
Annual units served	1,375	2,063	2,063	2,063	2,063	2,063	2,063
Specify how "units" are counted:	Apartments						
Natural Gas Costs *							
Incentives	\$ 37,500	\$ 84,375	\$ 140,625	\$ 225,000	\$ 337,500	\$ 337,500	\$ 337,500
Participant costs (financed and self-funded)	\$ 87,500	\$ 196,875	\$ 320,125	\$ 525,000	\$ 787,500	\$ 787,500	\$ 787,500
Other program costs (technical assistance, marketing, etc.)	\$ 15,000	\$ 33,750	\$ 56,250	\$ 90,000	\$ 135,000	\$ 135,000	\$ 135,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 120,000	\$ 214,900	\$ 357,000	\$ 540,000	\$ 817,500	\$ 817,500	\$ 817,500
Total program costs (incentives plus other program costs)	\$ 52,500	\$ 118,125	\$ 196,875	\$ 315,000	\$ 472,500	\$ 472,500	\$ 472,500
Propane, Fuel Oil, Kerosene Costs							
Incentives	\$ 5,602,500	\$ 8,325,938	\$ 8,170,313	\$ 7,936,875	\$ 7,625,625	\$ 7,625,625	\$ 7,625,625
Participant costs (financed and self-funded)	\$ 7,121,250	\$ 10,582,969	\$ 10,385,196	\$ 10,088,438	\$ 9,692,813	\$ 9,692,813	\$ 9,692,813
Other program costs (technical assistance, marketing, etc.)	\$ 1,167,750	\$ 1,795,406	\$ 1,702,969	\$ 1,654,913	\$ 1,589,438	\$ 1,589,438	\$ 1,589,438
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 12,723,750	\$ 18,908,906	\$ 18,555,469	\$ 18,025,313	\$ 17,318,438	\$ 17,318,438	\$ 17,318,438
Total program costs (incentives plus other program costs)	\$ 6,770,250	\$ 10,061,344	\$ 9,873,281	\$ 9,591,188	\$ 9,215,063	\$ 9,215,063	\$ 9,215,063
Total Costs							
Incentives	\$ 5,640,000	\$ 8,410,313	\$ 8,310,938	\$ 8,161,875	\$ 7,963,125	\$ 7,963,125	\$ 7,963,125
Participant costs (financed and self-funded)	\$ 7,208,750	\$ 10,779,844	\$ 10,713,281	\$ 10,613,438	\$ 10,400,313	\$ 10,400,313	\$ 10,400,313
Other program costs (technical assistance, marketing, etc.)	\$ 1,182,750	\$ 1,769,156	\$ 1,759,219	\$ 1,744,313	\$ 1,724,438	\$ 1,724,438	\$ 1,724,438
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 12,848,750	\$ 18,190,156	\$ 18,024,219	\$ 18,775,313	\$ 18,448,438	\$ 18,448,438	\$ 18,448,438
Total program costs (incentives plus other program costs)	\$ 6,822,750	\$ 10,179,469	\$ 10,070,156	\$ 9,906,188	\$ 9,687,563	\$ 9,687,563	\$ 9,687,563
Natural Gas Revenue							
Currently available program funding	\$52,500	\$118,125	\$196,875	\$315,000	\$472,500	\$472,500	\$472,500
Incremental funding needed	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
Incremental funding needed	\$5,770,250	\$9,061,344	\$8,873,281	\$8,591,188	\$8,215,063	\$8,215,063	\$8,215,063
Total Revenue							
Currently available program funding	\$1,052,500	\$1,118,125	\$1,196,875	\$1,315,000	\$1,472,500	\$1,472,500	\$1,472,500
Incremental funding needed	\$5,770,250	\$9,061,344	\$8,873,281	\$8,591,188	\$8,215,063	\$8,215,063	\$8,215,063

* Natural gas energy savings and costs are estimates; historical savings and costs are not available from Vermont Gas for the multifamily sector.

Maximum Potential Scenario
Sector: Renewables

	2014	2015	2016	2017	2018	2019	2020
Natural Gas Savings							
Annual MMBtu acquired	-	-	-	-	-	-	-
Annual units served							
Specify how "units" are counted:							
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired	22,612	27,134	32,684	38,542	45,423	51,595	59,509
Annual units served	1,583	1,900	2,266	2,595	2,974	3,267	3,634
Specify how "units" are counted:							
Total Savings							
Annual MMBtu acquired	22,612	27,134	32,684	38,542	45,423	51,595	59,509
Annual units served	1,583	1,900	2,266	2,595	2,974	3,267	3,634
Specify how "units" are counted:							
Natural Gas Costs							
Incentives	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Participant costs (financed and self-funded)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Other program costs (technical assistance, marketing, etc.)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Propane, Fuel Oil, Kerosene Costs							
Incentives	\$ 6,994,000	\$ 9,838,000	\$ 11,214,000	\$ 11,910,000	\$ 10,887,000	\$ 10,787,000	\$ 11,024,000
Participant costs (financed and self-funded)	\$ 26,827,000	\$ 30,367,000	\$ 37,940,000	\$ 45,809,000	\$ 56,761,000	\$ 65,043,000	\$ 74,898,000
Other program costs (technical assistance, marketing, etc.)	\$ 980,000	\$ 950,000	\$ 920,000	\$ 890,000	\$ 860,000	\$ 830,000	\$ 800,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 33,821,000	\$ 40,205,000	\$ 49,154,000	\$ 57,719,000	\$ 67,648,000	\$ 75,830,000	\$ 85,922,000
Total program costs (incentives plus other program costs)	\$ 7,974,000	\$ 10,788,000	\$ 12,134,000	\$ 12,800,000	\$ 11,747,000	\$ 11,617,000	\$ 11,824,000
Total Costs							
Incentives	\$ 6,994,000	\$ 9,838,000	\$ 11,214,000	\$ 11,910,000	\$ 10,887,000	\$ 10,787,000	\$ 11,024,000
Participant costs (financed and self-funded)	\$ 26,827,000	\$ 30,367,000	\$ 37,940,000	\$ 45,809,000	\$ 56,761,000	\$ 65,043,000	\$ 74,898,000
Other program costs (technical assistance, marketing, etc.)	\$ 980,000	\$ 950,000	\$ 920,000	\$ 890,000	\$ 860,000	\$ 830,000	\$ 800,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ 33,821,000	\$ 40,205,000	\$ 49,154,000	\$ 57,719,000	\$ 67,648,000	\$ 75,830,000	\$ 85,922,000
Total program costs (incentives plus other program costs)	\$ 7,974,000	\$ 10,788,000	\$ 12,134,000	\$ 12,800,000	\$ 11,747,000	\$ 11,617,000	\$ 11,824,000
Natural Gas Revenue							
Currently available program funding	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Incremental funding needed	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Incremental funding needed	\$7,974,000	\$10,788,000	\$12,134,000	\$12,800,000	\$11,747,000	\$11,617,000	\$11,824,000
Total Revenue							
Currently available program funding	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Incremental funding needed	\$7,974,000	\$10,788,000	\$12,134,000	\$12,800,000	\$11,747,000	\$11,617,000	\$11,824,000

Maximum Potential Scenario

Sector: Energy Service Providers

	2014	2015	2016	2017	2018	2019	2020
Natural Gas Savings							
Annual MMBtu acquired							
Annual units served							
Specify how "units" are counted:							
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired							
Annual units served							
Specify how "units" are counted:							
Total Savings							
Annual MMBtu acquired	-	-	-	-	-	-	-
Annual units served							
Specify how "units" are counted:							
Natural Gas Costs							
Incentives							
Participant costs (financed and self-funded)							
Other program costs (technical assistance, marketing, etc.)	\$ 76,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 76,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500	\$ 25,500
Propane, Fuel Oil, Kerosene Costs							
Incentives							
Participant costs (financed and self-funded)							
Other program costs (technical assistance, marketing, etc.)	\$ 223,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 223,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500	\$ 74,500
Total Costs							
Incentives	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Participant costs (financed and self-funded)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Other program costs (technical assistance, marketing, etc.)	\$ 300,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 300,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000
Natural Gas Revenue							
Currently available program funding							
Incremental funding needed	\$76,500.00	\$25,500.00	\$25,500.00	\$25,500.00	\$25,500.00	\$25,500.00	\$25,500.00
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding							
Incremental funding needed	\$223,500	\$74,500	\$74,500	\$74,500	\$74,500	\$74,500	\$74,500
Total Revenue							
Currently available program funding	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Incremental funding needed	\$300,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000

Maximum Potential Scenario

Sector: Planning & Measurement and Cross-Cutting

	2014	2015	2016	2017	2018	2019	2020
Natural Gas Savings							
Annual MMBtu acquired							
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Propane, Fuel Oil, Kerosene Savings							
Annual MMBtu acquired							
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Total Savings							
Annual MMBtu acquired							
Annual units served							
Specify how "units" are counted:	Commercial Sector estimating only mmbtus, not number of units						
Natural Gas Costs							
Incentives							
Participant costs (financed and self-funded)							
Other program costs (technical assistance, marketing, etc.)	\$ 466,225	\$ 283,900	\$ 272,850	\$ 308,550	\$ 265,200	\$ 265,200	\$ 265,200
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 466,225	\$ 283,900	\$ 272,850	\$ 308,550	\$ 265,200	\$ 265,200	\$ 265,200
Propane, Fuel Oil, Kerosene Costs							
Incentives							
Participant costs (financed and self-funded)							
Other program costs (technical assistance, marketing, etc.)	\$ 1,362,108	\$ 829,433	\$ 797,150	\$ 901,450	\$ 774,800	\$ 774,800	\$ 774,800
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 1,362,108	\$ 829,433	\$ 797,150	\$ 901,450	\$ 774,800	\$ 774,800	\$ 774,800
Total Costs							
Incentives	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Participant costs (financed and self-funded)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Other program costs (technical assistance, marketing, etc.)	\$ 1,828,333	\$ 1,113,333	\$ 1,070,000	\$ 1,210,000	\$ 1,040,000	\$ 1,040,000	\$ 1,040,000
Total installed measure costs (participant costs plus incentives, but not other program costs)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total program costs (incentives plus other program costs)	\$ 1,828,333	\$ 1,113,333	\$ 1,070,000	\$ 1,210,000	\$ 1,040,000	\$ 1,040,000	\$ 1,040,000
Natural Gas Revenue							
Currently available program funding							
Incremental funding needed	\$466,225	\$283,900	\$272,850	\$308,550	\$265,200	\$265,200	\$265,200
Propane, Fuel Oil, Kerosene Revenue							
Currently available program funding							
Incremental funding needed	\$1,362,108	\$829,433	\$797,150	\$901,450	\$774,800	\$774,800	\$774,800
Total Revenue							
Currently available program funding	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Incremental funding needed	\$1,828,333	\$1,113,333	\$1,070,000	\$1,210,000	\$1,040,000	\$1,040,000	\$1,040,000
P&M subcommittee funding needed	\$375,000	\$325,000	\$325,000	\$325,000	\$325,000	\$325,000	\$325,000
Cross Cutting Recommendations							
Clearinghouse	\$300,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000
Voluntary Labeling	\$300,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000
code study	\$170,000			\$170,000			
compliance implementation (from code compo	\$683,333	\$563,333	\$520,000	\$490,000	\$490,000	\$490,000	\$490,000
Total	\$1,828,333	\$1,113,333	\$1,070,000	\$1,210,000	\$1,040,000	\$1,040,000	\$1,040,000

Appendix 5:
Finance Products and Mechanisms

List of Funding and Finance Mechanisms from EAN Guidance Document

Members of the Finance and Funding Subcommittee reviewed the following options generated by the Energy Action Network.⁸¹ Please refer to the primary source for descriptions of each item. A subset of these options pertains to thermal energy efficiency. This subset informed the inventory shown in **Table 14** and the final set of recommendations listed in the Finance section of this report.

1. Government as first adopter
2. Tax levies
3. Tax breaks or rebates for certain kinds of investments
4. Tolls and user fees
5. Green bonds
6. Private activity bonds
7. Partnering with federal government on research, development and demo projects
8. Regional collaboration
9. Greater use of state allocation of tax subsidy bonds (QECBs)
10. Lending/loan purchase program/secondary market
11. Linked deposits
12. Alternate finance authority to provide debt, lease finance and equity (Green Bank, green bonds, green CDFI)
13. Crowdfunding
14. Auction mechanisms
15. Energy-Efficient and Energy Improvement Mortgages
16. Energy-aligned leases/Green Leases
17. Power Purchase Agreements (PPAs) / 3rd party owner
18. Managed Energy (MESA) and Efficiency Service Agreements (ESA)
19. Public Purpose Performance Contracting (including aggregation)
20. One-stop package – the Solar Tracker/Sun Commons approach
21. Efficacy insurance/performance guarantees
22. Repayment guarantees
23. On-bill financing (OBF)
24. Expanded PACE (property-assessed clean energy) districts
25. Community-based energy development
26. Cooperative ownership

⁸¹ *Mobilizing Capital to Transform Vermont's Energy/Economy: A Guidance Document*, prepared for the Energy Action Network by Nancy Wasserman and Bob Barton, Catalyst Financial Group, Inc., October 2012. Available for download at www.eanvt.org.

Finance Products and Mechanisms

Each of the current and potential finance products shown in **Table 16 – Credit Products** as well as others described below are available to discrete markets and geographies, with variable criteria for accessing the resource. This list is not exhaustive, but represents the major types of finance products available in Vermont or elsewhere. The following descriptions provide a sense of the product and the resources available.

1. Banks and Credit Unions

In addition to traditional secured and unsecured loan products (e.g., mortgages, home equity loans, etc), some lending institutions offer reduced rate financing for energy efficiency home improvements. The report “Financing Residential Energy Efficiency” prepared by the Institute for Energy and the Environment at Vermont Law School⁸² explores some of these products and issues associated with increasing the availability of credit in more detail. A survey of banks and credit unions conducted by the subcommittee showed that few of these institutions were offering or marketing specialized loan products, as demand for them appeared relatively low.

2. Community Development Finance Institutions (CDFIs)

CDFIs offer a range of finance products primarily to commercial interests that have difficulty obtaining credit from commercial sources. Some CDFIs in the state offer or are planning to offer energy efficiency specific products to their customers.

3. Commercial Energy Efficiency Finance Program (CEEF)

Vermont Energy Investment Corporation is leading a US DOE funded program to help stimulate the participation of commercial lenders in the energy efficiency market. This program hopes to generate new lending opportunities in 2013 for commercial customers in Vermont.

4. Federal Loan Products

Eighteen national, regional and local lenders are participating in a two-year pilot program that offers qualified borrowers in certain parts of the country low-cost loans to make energy-saving improvements to their homes. Backed by the Federal Housing Administration (FHA), these new PowerSaver loans will offer homeowners up to \$25,000 to make energy-efficient improvements of their choice, including the installation of insulation, duct sealing, replacement doors and windows, HVAC systems, water heaters, solar panels, and geothermal systems. FHA's Energy Efficient Mortgage program (EEM) helps homebuyers or homeowners save money on utility bills by enabling them to finance the cost of adding energy efficiency features to new or existing housing as part of their FHA insured home purchase or refinancing mortgage. Energy Improvement Mortgages (EIMs) are also available currently from Fannie Mae and Freddie Mac, although there appears to be a lack of awareness and support for these products.

⁸² *Financing Residential Energy Efficiency in Vermont*, Marianne Tyrell, Rebecca Wigg and Colin Hagan. Institute for Energy and the Environment, July 2011. <http://www.vermontlaw.edu/Documents/VLS-IEE%20Energy%20Efficiency%20Financing%20Study%20Final.pdf>

5. NeighborWorks of Western Vermont

NeighborWorks offers affordable loans to participants in its HEAT Squad program. Loans average about \$11,000 with loans ranging up to \$15,000 unsecured at 4.99% with ten-year terms. For loans beyond that, a lien is placed on the property. The program currently has a 5% loan loss reserve fund to help protect the participants.

6. Property Assessed Clean Energy (PACE)

PACE authorization exists currently in Vermont for residential property owners. There is interest in expanding PACE eligibility to multifamily and mixed-use investment properties to fund long-term energy efficiency improvements. The benefits of PACE financing include long loan terms where the loans are attached to the property instead of an individual or investor. These benefits will be particularly advantageous for multifamily investment properties, which are burdened by split incentive barriers and efficiency measures with long paybacks. While expected to be utilized primarily by private property owners, non-profit affordable housing owners as well as private property owners should both be eligible for PACE financing.

7. Small Business Administration

The SBA offers a range of loans to businesses that may be used for a variety of purposes, potentially including energy efficiency as part of a fit-up for commercial space.

8. USDA Rural Development Renewable Energy System and Energy Efficiency Improvement Guaranteed Loan and Grant Program

Small companies can obtain USDA grant and loan guarantees for energy efficient equipment (all areas of Vermont qualify since every city is smaller than 50,000). The program provides financial assistance to agricultural producers and rural small businesses to purchase, install, and construct renewable energy systems; make energy efficiency improvements; use renewable technologies that reduce energy consumption; and participate in energy audits, renewable energy development assistance; and conduct feasibility studies. The program is not available to nonprofit entities.

9. The Vermont Business Energy Conservation Loan Program (VEDA and EVT)

This joint effort between Vermont Economic Development Authority and Efficiency Vermont serves Vermont businesses (including non-profits) involved in manufacturing (or processing and assembly of products), hospitality, services, farms, and retail, as long as they are 51% owned by U.S. citizens. Projects must improve the energy efficiency of the building, and improvements to thermal envelope, power, heating, ventilation and cooling systems, lighting, and energy efficiency HVAC equipment are generally eligible. In addition, companies that conduct energy audits would be eligible for loans on equipment needed to carry out their work. Loan applicants are encouraged also to apply for Efficiency Vermont incentives to lower the overall amount of the loan.

10. Vermont Gas Systems

Vermont Gas Systems (VGS) provides reduced interest rate financing to its customers in Chittenden and Franklin counties. VGS typically rebates 33% of the installed cost of the recommended measures and provides a reduced interest loan through a local credit union for the balance. In multi-family properties up to four units where the tenant pays the gas bill, the incentive to the owner is 50% of the installed cost. VGS offers its customers loans at 0% interest for up to three years, 2% interest for up to five years or 4% interest for up to seven years. Small commercial customers may borrow up to \$15,000. They also offer financing through the Green Mountain Credit Union of up to \$10,000 for high efficiency heating systems. In the few instances where heating system replacement proves to be cost effective based on custom screening, VGS pays the same percentages as for shell upgrades. VGS will buy down the interest rate the in a similar manner to the residential loan program and prepay the interest to Green Mountain Credit Union.

11. Energy Service Companies

Energy Service Companies (ESCOs) are businesses that provide audits, 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.

The traditional ESCO model can be very effective at implementing projects for institutions with complicated or strained budget or investment structures (such as public schools, public housing authorities, etc). Because ESCOs design their projects to ensure positive cash flow, these projects include just the most cost effective measures. Therefore, program managers should carefully consider this option when deep energy retrofit savings are the goal. Energy efficiency measures are typically more expensive when implemented through an ESCO model because the company must include overhead costs that insure the guaranteed energy saving estimates, measure and verify energy savings throughout the contract period, and provide an 'investment grade' energy audit.

12. Public Purpose Energy Service Company (PPESCO)

Public purpose ESCOs are intended to serve smaller buildings and market segments where the economics are not necessarily as profitable. While providing the benefits of traditional ESCO's, a PPESCO would: fund all cost effective measures, rather than those with the greatest return on investment;

include renewables; and provide a long-term financing structure to enable cash flow positive benefits to affordable housing providers. VEIC has been developing a model PPESCO, and anticipates piloting the model in 2013, targeting the affordable housing sector. In addition to affordable housing, it is anticipated that it would work for municipal, university, school and hospital buildings in Vermont.

13. State Resource Management Revolving Fund (SRMRF)

The 2004 session of the general assembly amended the statutes to establish a State Resource Management Fund administered by the Commissioner of Buildings and General Services (BGS). This fund is used for financing resource conservation measures under criteria for project selection established by the Commissioner of BGS that will generate a life cycle cost benefit to the State. Resource conservation measures include but are not limited to equipment replacement, studies, weatherization and the construction of improvements affecting the use of energy resources. Cost of the conservation measures will be repaid to the fund according to schedules established by the Commissioner of BGS with the concurrence of the Commissioner of Finance and Management. Resources are only available to state agencies.

14. Green Revolving Funds

State and private colleges and the University of Vermont have established Green Revolving Funds, which treat energy efficiency opportunities as investment portfolios rather than operating costs, comparing the returns to other investment vehicles. The Sustainable Endowment Institute (SEI) has issued a report on the value of this approach to institutions of higher education. The University of Vermont has established a \$13 million Green Revolving Fund, the largest to date in the country, as tracked by the Billion Dollar Challenge of the SEI. The State College system has set up a \$2 million fund, the first by any state college system in the country.

15. Vendor Financing

Many companies such as home products centers will offer financing for products used to retrofit home and business properties. In addition, some companies that offer advanced, energy efficient products will provide direct financing to their customers.

16. Affordable Multifamily Housing Funding

The majority of Vermont's low income multifamily major rehabilitation and new construction projects incorporate multiple funding sources, including Low Income Housing Tax Credits (LIHTC), Housing and Urban Development (HUD), Community and Development Block Grants (CDBG), and Rural Development (RD), among many others. Within Vermont, sources of funding for low income multifamily housing projects include the Vermont Housing and Conservation Board (VHCB) and the Vermont Housing Finance Agency (VHFA).

Many of these funding sources have incorporated energy efficiency or renewable energy requirements over the last several years. These requirements, while not necessarily at odds with each other, are not consistent, and typically do not include additional funding to implement the energy efficiency measures. As such, affordable housing developers are required to implement deeper energy efficiency measures, which will ultimately help their low-income residents, but without the corresponding funding to defray

the (typically) higher installation costs. These requirements may include ENERGY STAR, Enterprise Green Communities, Home Builders, LEED, etc. There is genuine concern on behalf of affordable housing advocates that production volume of new or renovated housing may be reduced due to the increased cost of energy efficiency measures.

17. Down Town Development Grants

Tax credits and grants may be available to help support upgrades to commercial, mixed use, and apartment buildings located in Vermont's "Designated Downtowns," including energy efficiency improvements. The program supports general rehabilitation, code compliance, and exterior improvements and may be combined with the federal Historic Preservation Tax Credit program. Both programs enhance the historic character of Vermont and use The Secretary of the Interior's Standards for Rehabilitation to assure changes are sensitive and appropriate. For specific advice on a project, staff is available to meet on site and discuss how the Standards apply to individual projects. (http://accd.vermont.gov/strong_communities/opportunities/revitalization/downtown)

18. Vermont Healthy Homes Program

This program provides assistance to reduce lead and other home health and safety hazards to income eligible homeowners, or property owners renting to income eligible tenants. Sixty three percent of Vermont's owned homes and fully 74% of rentals were built before 1979 when lead based paint was commonly used. Because the energy efficiency retrofits required to achieve the State's energy goals will require significant work in these older homes, a robust lead program is essential to keeping our families healthy during and after the retrofit work. The following services are available at no cost to the owners of eligible properties through the Program (<http://www.vhcb.org/lead.html>):

- Testing of all painted surfaces
- Risk assessment and specification development
- Bidding assistance and project management
- Dust sampling and lab analysis
- Lead Poisoning Safety Education

Appendix 6:
Thermal Efficiency vs. Electrical Savings

Thermal Efficiency vs. Electrical Savings

Assessment of the Relationship between Electric and Thermal Efficiency Measure

TASK: Assessing the relationship between electric and thermal efficiency measures to ascertain electric savings gained from implementing thermal efficiency measures and vice versa. In particular -

1. What are the main ways electrical savings are generated if a HPwES project is completed.
2. What peak reduction can we assume in KW based on thermal efficiency (broken out a bit by detail – i.e. HVAC)
3. Characterize HVAC at the residential level that looks at:
 - Penetration
 - Run hour baseline
 - Standard efficiency of stock

LIMITATIONS OF ANALYSIS: This analysis did not investigate the potential *increases* to electricity consumption from the implementation of thermal efficiency measures. For example, increases in electricity could result from implementation of ground source and air source heat pumps either as a renewable energy or thermal efficiency services recommended in this plan. This analysis also did not investigate the relationship between electric and thermal efficiency measures in the commercial sector.

SUMMARY OF RESULTS: While the benefits of thermal efficiency measures do provide additional opportunities for electric savings (kWh) and demand reduction (kW), the results are relatively insignificant in terms of the benefits provided - especially when compared to the overall benefits generated when thermal improvements are made.

- The MAXIMUM savings potential (kWh) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 800 kWh/yr , which represents \$96/yr electrical saving (@ 0.12 c/kWh)
- The EXPECTED savings potential (kWh) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 554 kWh/yr , which represents \$66/yr electrical saving (@ 0.12 c/kWh)
- The MAXIMUM Peak reduction (kW) if we assume 100% penetration of traditional heating systems and 100% utilization of 3 ton AC units is 0.15 kW. Since most Vermont homes do not have central A/C the actual impact is smaller.

QUESTION 1 : What are the main ways electrical savings are generated if a HPwES project is completed?

- Reductions and characterizations in operation for the following equipment generates electrical savings and demand reduction:
 - o Central A/C units (3 ton)

- Room A/C units (0.7 to 1 ton)
 - Furnace Fans and Blowers
 - Circulation loop pumps
 - Fuel Pumps
- If a central 3 Ton unit was installed in the building, the percentage of A/C electrical savings reductions were roughly equal between heating and cooling (see details in Table A6-1).

QUESTION 2: What peak reduction can we assume in KW based on thermal efficiency?

- Heating Analysis of Savings
 - Based on 8.4 KWH/MMBTU (derived from testing data) and looking at MMBTU savings and costs from HPw/ES projects from the last few years (**Table A6-1**)
 - A Wisconsin Focus on Energy Study and internal analysis of furnace and boiler testing data, suggest that the real number should be more than 8 KWH/MMBTU.

Table A6-1

MMBTU Savings	KWH Save (@ 8KWH / MMBTU)	KWH/FLH	Cost	NPV (all)	NPV (-elec)	Elec NPV benefit
25	211	0.11	\$4,473	\$24,665	\$23,694	4.10%
50	422	0.21	\$6,618	\$51,458	\$49,515	3.92%
100	844	0.42	\$9,792	\$106,062	\$102,176	3.80%
150	1,266	0.63	\$12,313	\$161,262	\$155,433	3.75%
200	1,688	0.84	\$14,487	\$216,779	\$209,007	3.72%
300	2,532	1.27	\$18,217	\$328,377	\$316,719	3.68%
Avg HPwES Proj	39.3	0.17	\$5,780	\$39,967	\$38,438	3.98%

- Cooling Analysis of Savings
 - It's difficult to easily equate thermal shell improvements with reductions in A/C load. To quantify the thermal impacts on A/C electrical savings - VEIC created a "fairly simple" Excel model that allowed for adjustments of the balance points to answer: "How much furnace fan and A/C energy would you save if thermal improvements shifted the heating balance point from 60 degrees to 50 degrees and the cooling balance point from 72 up to 80 degrees?"

- The result of these improvements (assuming 2,000 FLH, a 0.6 KW blower and 3 tons of A/C) was about 800 kWh (heating and A/C) and 0.15 kW of savings. Incrementally, an average HPwES project can save an additional 468kWh per year if a 3 Ton A/C unit is installed.
 - However, when the penetration and type of A/C units installed are factored in, the anticipated savings change significantly.

 - Savings potential (See Attachment A for supporting details)
 - 468 kWh maximum savings when 3 ton unit installed
 - Penetration of A/C units statewide – 34% **
 - Average Size of A/C units – 0.95 Ton (includes small number of 3 Ton units)**
 - Average number of units installed – 1.5 **
 - Effective electrical savings = 76 kWh for typical HPwES
 - Savings per building with A/C – 222 kWh
- ** Nexus report (Attachment A)

Attachment A

From: *Overall Report for Existing Homes in Vermont FINAL*

Submitted to: Vermont Department of Public Service

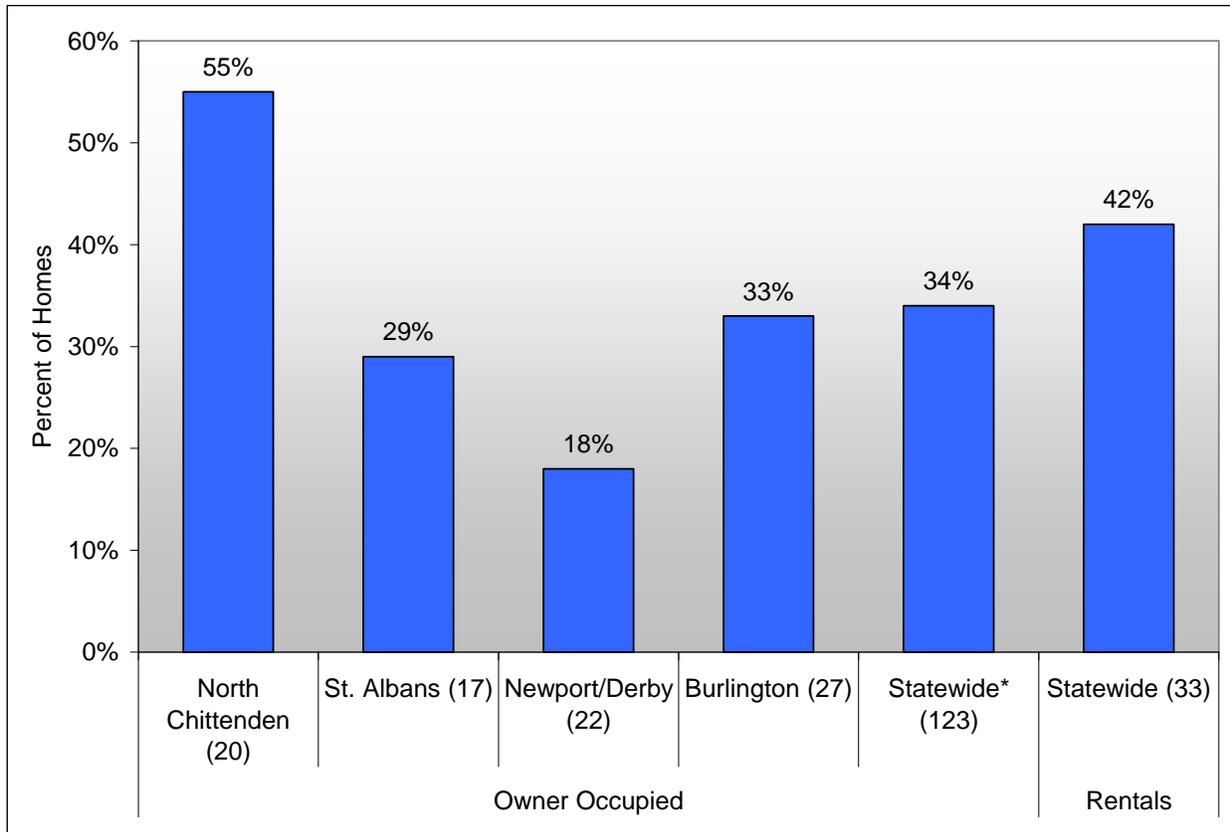
Submitted by: Nexus Market Research, Inc. RLW Analytics, Inc. Dorothy Conant

June 8, 2009

Air Conditioning (page 53)

Statewide, about one-third of owner occupied homes (34%) and two out of five rentals (42%) have a window air conditioning unit (Figure 2-18). Slightly less than two-thirds of these owner occupied homes (61%) and rentals (64%) have a single window air conditioner. Many homeowners report that the units are used a few days during the summer and stored during the winter.

Figure 2-18: Room Air Conditioner Saturation
(all homes)



* Results for the Owner Occupied Statewide column are weighted; all other results are unweighted.

In the 55 homes that do have window air conditioning units, there is an average of about 1.5 units per home with an average age of between four to five years old. The majority of the window air conditioners in owner occupied homes (81% of 53 units) and rental homes (95% of 20 units) are five or less years old. The average size of the units is between 0.7 and 1.0 tons with an average efficiency level of 9.7 EER.

Only two homes have central air conditioning—one has a three ton, 11.9 SEER unit that is thirteen years old and the other has a 2.5 ton, 10.0 SEER unit that is three years old.

Appendix 7: Acronyms

ARRA – American Recovery and Reinvestment Act
AVCU – Association of Vermont Credit Unions
BED – Burlington Electric Department
BGS – Department of Buildings and General Services
BPI – Building Performance Institute
BPPA – Building Performance Professionals Association
CBSM – Community-Based Social Marketing
CDFI – Community Development Finance Institution
CEED – Green Mountain Power’s Community Energy and Efficiency Development fund
CEEF – Commercial Energy Efficiency Finance program
CEDF – Clean Energy Development Fund
CU – Credit Union
DOE – US Department of Energy
EAN – Energy Action Network
EEM – Energy-Efficient Mortgages
EIA – US Energy Information Administration
EIM – Energy Improvement Mortgages
ESA – Efficiency Service Agreement
ESCO – Energy Service Company
EVT – Efficiency Vermont
FCM – Forward Capacity Market
FHA – Federal Housing Administration
FHFA – Federal Housing Finance Agency
GHG – Greenhouse Gas
GRT – Gross Receipts Tax
GSP – Gross State Product
HPwES – Home Performance with Energy Star
HVAC – Heating Ventilation Air Conditioning
IRDB – Interest Rate Buy Down
LIHEAP – Low Income Home Energy Assistance Program
LLR – Loan Loss Reserve
MESA – Managed Energy Service Agreement
MMBTU – Million British Thermal Units
NPV – Net Present Value
NWWVT – NeighborWorks of Western Vermont
OEO – Office of Economic Opportunity
PAB – Private Activity Bonds

PACE – Property Assessed Clean Energy Programs
PPA – Power Purchase Agreement
PPESCO – Public Purpose Energy Service Company
PRI – Program Related Investment
PSD – Public Service Department
QECB – Qualified Energy Conservation Bonds
RAP – Regulatory Assistance Project
REV – Renewable Energy Vermont
RGGI – Regional Greenhouse Gas Initiative
SBA – Small Business Administration
SHPO – State Historic Preservation Office
SRMRF – State Resource Management Revolving Fund
TBTU – Trillion British Thermal Units
USDA – United States Department of Agriculture
VA – Veterans Administration
VBA – Vermont Bankers Association
VEDA – Vermont Economic Development Authority
VEIC – Vermont Energy Investment Corporation
VFDA – Vermont Fuel Dealers Association
VFEP – Vermont Fuel Efficiency Partnership
VGHA – Vermont Green Homes Alliance
VGS – Vermont Gas Systems
WAP – Weatherization Assistance Program
WTF – Weatherization Trust Fund