Triennial Plan
2015 - 2017

Prepared for the Vermont
Public Service Board

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Efficiency Vermont

This document is presented to the Vermont Public Service Board and to the Vermont Public Service Department, in fulfillment of the regulatory requirement to submit an overview of Efficiency Vermont's 2015–2017 performance period strategy for providing electric and thermal energy efficiency services.

Triennial Plan 2015-2017

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1. INTRODUCTION

Efficiency Vermont, the statewide energy efficiency utility, is dedicated to making it simple for Vermont households of all income levels, businesses, institutions, and communities to get the most out of their energy dollars. This document is an overview of Efficiency Vermont's 2015–2017 plan, designed to benefit Vermonters, our state's economy, and our environment through comprehensive energy efficiency services.

In 2015–2017, Efficiency Vermont will be driven by three fundamental aims:

1.1 Empower Vermonters
1.2 Strengthen Vermont's Future
1.3 Ensure Operational Excellence

1.1 EMPOWER VERMONTERS

Efficiency Vermont will design and deliver services that empower Vermonters to take control of their energy use. These services will help customers at critical decision-making moments—such as in new construction projects, during renovations, and in the purchase of efficient equipment—and as they engage in ongoing energy use management. Efficiency Vermont will serve Vermonters by:

- gaining awareness of customers' needs and priorities, and the obstacles they face in taking energy-saving actions;
- engaging them at their current level of interest in energy efficiency and motivating them to increase their involvement;
- providing the technical information, analysis, and guidance they need to easily make independent, informed decisions about their immediate and ongoing energy use, and
- ensuring their access to the resources they need to take cost-effective, energy-saving actions in their homes, businesses, institutions, and communities.

In this performance period, while continuing to work directly with customers to help them acquire savings across energy uses, Efficiency Vermont will increase its impact through strategic expansion of efforts in three areas of focus, as discussed in greater depth in this Plan: 1) Effectiveness in Dynamic Markets; 2) Customer Empowerment through Data, and 3) Collaboration to Benefit All Vermonters.

1.1.1 Effectiveness in Dynamic Markets

Vermont's residential and business markets are dynamic. Numerous factors—as broadly impactful as an economic downturn or as personal as a decision to expand a business—can alter a customer's level of interest in or ability to take energy-saving actions. Efficiency Vermont's ability to help Vermonters save energy in any market condition will continue to be based in its awareness of customers' changing challenges, priorities, and opportunities through:

- long-term relationships with the state's largest energy users as well as with owners of medium-sized and small businesses, including farms;
- awareness of new efficient technologies with applicability in Vermont and of adoption levels of existing efficient technologies;
- the application of data-based knowledge, as discussed in Section 1.1.2, and
- partnerships as described in Section 1.1.3.

At Brace Farm in Ferrisburgh, VT, energy-efficient upgrades have saved the Brace family $7,600 and 58,300 kWh per year.

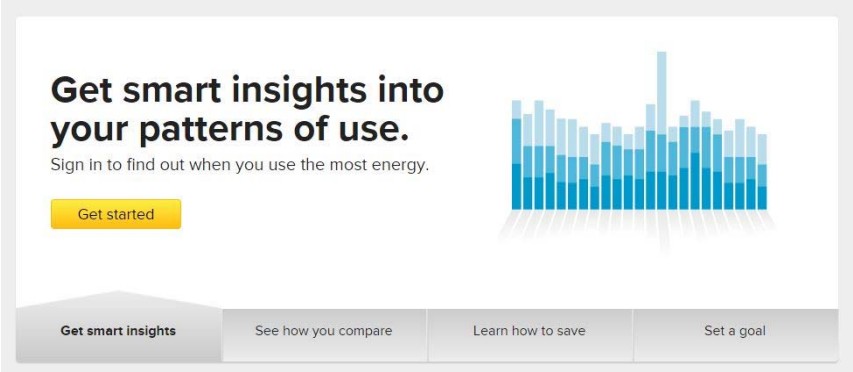
Due to its ongoing awareness of changing market opportunities, Efficiency Vermont will enter this performance period well-positioned to design and implement services that provide continued and deepened value to customers:

- **Increasing adoption of beneficial new technologies**, such as rapidly emerging innovations in efficient lighting and heating systems.
- **Extending account management services to more Vermonters**, to enable more Vermont businesses to benefit from long-term energy management and to incorporate energy considerations into every level of operations.
- **Focusing on the customer**; supporting the customer's realistic path toward effective, comprehensive building improvements, whether through incremental upgrades over time or a whole-building improvement project.
- **Increasing access to financing**; working with financial institutions to bring efficiency within reach for more Vermonters and raising the profile of financing as a tool to bring projects to fruition.
- **Leveraging Vermonters' existing professional and community connections**; reaching Vermonters through their trusted trade and community organizations, media, and events.
- **Customer engagement**; motivating customers to increase action by providing opportunities for engagement, regardless of their past degree of involvement in energy efficiency.

1.1.2 Customer Empowerment Through Data

Through the analysis of increasingly available energy usage data, Efficiency Vermont will deepen its understanding and engagement of customers and empower them with greater ability to manage their energy use:

- **Data analysis and custom analytics tools for businesses:** Through expert analysis of smart meter and / or submeter data—coupled with technical and financial services in support of optimal efficiency improvements—Efficiency Vermont will give commercial facility operators the ability to: 1) monitor electricity consumption of key equipment or of full facilities in order to identify new savings opportunities; 2) predict and reduce peak demand, and 3) aggressively cut power costs through improvements to procedures, control settings, and machinery. NEW!
- **Web-based data access:** Efficiency Vermont will explore the provision of a confidential online portal to enable customers to have easy access to their available energy usage data, along with analysis, guidance, and user-friendly tools, on www.efficiencyvermont.com. NEW!
- **Continual learning and innovation:** Efficiency Vermont will continue to identify and research new ways to apply the analysis of energy usage data and other data to deliver deeper energy savings.
- **Best practices:** Efficiency Vermont will protect confidential customer data through existing effective approaches and through continued vigilance in maintaining awareness and adoption of optimal practices as new methods, technologies, and threats emerge.



Efficiency Vermont's website empowers Vermonters to take control of their energy use through personalized reports and tools.

1.1.3 Collaboration to Benefit All Vermonters

- **Transforming the marketplace:** Benefiting Vermonters by partnering with efficient product and service providers:
  - **Supply chain engagement:** With strong relationships throughout the efficient product supply chain, Efficiency Vermont will begin the performance period well-positioned to further tap this network's potential to deliver reduced-cost, high-efficiency products to the Vermont marketplace:
    - Efficiency Vermont will build upon its innovative approaches with equipment distributors and other supply chain partners to substantially increase the ability of commercial customers to purchase discounted, high-quality efficient equipment with applicability across markets.
    - Efficiency Vermont will partner with manufacturers, suppliers, retail chain stores at the corporate level, and local retailers throughout Vermont to reduce retail purchase

costs, ensure product quality and availability, and provide the public with knowledgeable salespeople.

- **Service-provider partnerships:** To enable more Vermonters to turn to their local building-improvement, construction, renovation, and equipment installation / repair contractors for expert help in improving the efficiency of their homes and businesses, Efficiency Vermont will expand its network of efficiency service providers receiving training and certification services and technical and promotional support. NEW!

- **Utility partnerships:** Efficiency Vermont will work closely with Vermont's distribution utilities to ensure coordination of services and identification of joint ventures in order to increase value to customers.
- **Support for Vermont's energy goals:** Efficiency Vermont will provide information and analysis to policy makers, state agencies, and other key stakeholders in support of energy forecasting, advancing the State's policy goals, and keeping all stakeholders and policy makers informed of Efficiency Vermont's activities.

1.2 STRENGTHEN VERMONT'S FUTURE

The energy savings acquired through Efficiency Vermont's services not only strengthen the financial outlook for individual customers but also strengthen the economic and environmental future of Vermont as a whole. In the coming performance period, Efficiency Vermont will strive to deepen Vermonters' energy savings, in alignment with the State's energy goals, in order to increase efficiency's positive impact: 1) as an economic driver for Vermont; 2) on Vermont's energy future; and 3) on Vermont's environment.

Tom Mehuron of Mehuron's Market in Waitsfield is saving $9,750 and 91,300 kWh per year after installing energy efficiency upgrades.

Efficiency's power as an economic driver for Vermont:

- Securing jobs and strengthening downtowns and local economies: Most dollars spent on energy leave the state, but the opposite is true for energy efficiency purchases. Energy efficiency investments benefit a range of local service and product providers, such as Efficiency Vermont's partner retailers and building improvement contractors. This business income strengthens bottom lines, provides a competitive edge, creates and protects jobs, and contributes to local tax bases. Every dollar spent on energy efficiency creates a net increase of nearly five dollars of cumulative gross state product.[1]
- Providing least-cost energy use: The cost of reducing the use of a given unit of energy through efficiency is less than the cost of obtaining and distributing that same unit of energy. The cheapest energy is energy that is not used.
- Increasing cash flow for all Vermonters: When Vermonters spend less on energy, they have more money to save, to invest for their future, or to introduce into the state's economy through local purchases.

[1] Source: Vermont Public Service Department's *2011 Comprehensive Energy Plan*, Appendix 5, page 5.

Efficiency's power to strengthen Vermont's energy future:
As Efficiency Vermont helps customers use energy efficiently, Vermonters not only reduce their own costs but also have a deeply beneficial impact on energy demand and management statewide. According to the Vermont Electric Power Company, aggressive energy efficiency in Vermont has resulted in $279 million of transmission and distribution projects being deferred across the region overseen by the Independent System Operator–New England (ISO-NE). These savings benefited all ratepayers, participant and non-participant alike. By lowering statewide energy demand, energy efficiency also plays an important role in Vermont's efforts to reach its goal of obtaining 90% of the state's energy from renewable sources by 2050, established in Vermont's *2011 Comprehensive Energy Plan*.

Efficiency's power to protect Vermont's environment:
Through efficient energy use, Vermonters reduce power plant and heating system emissions that harm our state's environment. A clean environment protects the natural qualities of Vermont that strengthen such economic drivers as agriculture and tourism.

1.3 ENSURE OPERATIONAL EXCELLENCE

To bring maximum benefits to Vermonters, Efficiency Vermont will bring excellence to all aspects of its service efforts through a commitment to ongoing assessment of the efficiency and effectiveness of operational and service delivery systems.

Each year thousands of customers call, email, and chat with the Customer Support Team about how to reduce their energy usage.

- **Service optimization:** Continuous evaluation of services to maintain the optimal balance of technical and / or financial services to deliver maximum benefits to customers
- **Information technology:** Ensuring the security of confidential customer data, supporting optimal delivery of services to customers, ensuring accuracy in all activities, engaging in ongoing efforts to find new efficiencies, and maintaining the ease of use of systems
- **Quality management:** Engaging rigorous protocols for continuous assessment of operations and service delivery, optimizing administrative efficiencies, ensuring impact and effectiveness in markets and customer value, and engaging in key process improvements
- **Planning and reporting:** Maintaining accountability and providing accurate tracking of progress in order to enable performance monitoring and strategy adjustment to optimize service delivery and public benefits
- **New product development:** Introducing a standardized process to enable increased effectiveness, efficiency, and consistency in product design and delivery NEW!

- **Value stream mapping:** Continuing to leverage the value stream mapping process, which has resulted in Efficiency Vermont's receipt of a "Best in Class" award from a third-party audit
- **Consumer engagement studies and market assessments:** An in-depth effort to ensure the delivery of services and products that customers value most

2. ABOUT THIS PLAN

2.1 PLAN DEVELOPMENT

This 2015–2017 Efficiency Vermont Triennial Plan was developed in alignment with:

- the goals of the 2008 Vermont Energy Efficiency and Affordability Act and Vermont's *2011 Comprehensive Energy Plan*;
- Efficiency Vermont's 2015–2017 Quantifiable Performance Indicators established with the Vermont Public Service Board (see Section 5.2), and
- Vermont's Comprehensive Economic Development Strategy, as applicable.

Through the course of the performance period, Efficiency Vermont will refine and revise the services outlined in this Plan as needed to maintain responsible management of funds, to take advantage of changing technological and market opportunities, to utilize feedback gathered through ongoing customer and stakeholder input processes–including a 2014 community forum process (see Section 5.6)–and to maximize benefits to Vermonters.

2.2 PLAN STRUCTURE

The services discussed in this Plan are organized by the budget categories specified by the Vermont Public Service Board in its regulatory processes:

- Resource Acquisition (RA) Budgets: Associated services are discussed in Sections 3.1–3.3.
- Resource Acquisition (RA) Research and Development (R&D) Budgets: Associated services are discussed in Sections 3.3.10 and 5.5.
- Non-Resource Acquisition (NRA) Budgets: Associated services are discussed throughout Section 3.4[2].

RA services are defined as those that directly achieve energy savings. NRA services include those with both an immediate and a long-term impact on Vermonters' ability to cut energy costs. NRA services include those providing necessary support for the operation of Efficiency Vermont. A purpose of this RA / NRA delineation is to provide a high level of transparency regarding Efficiency Vermont activities.

[2] Section 3.4 is titled "Market Advancement Activities".

3. SERVICES FOR 2015-2017

Efficiency Vermont will deliver objective, customer-focused technical, financial, and educational services to help Vermonters overcome barriers to improving the energy efficiency of their homes, businesses, institutions, and municipal facilities. Efficiency Vermont will design its approaches through an awareness of customers' priorities, including both energy benefits and such non-energy benefits as lower operating and maintenance costs, reduced water use, greater building occupant comfort, healthier indoor air, improved light quality, and improved working environments. These non-energy benefits are recognized by the Vermont Public Service Board as factors determining the cost-effectiveness of efficiency investments. Efficiency Vermont's informational and educational services will target Vermonters—regardless of their current involvement in efficiency activities—in order to empower and motivate them through greater awareness, knowledge, and ability to make informed decisions about optimizing their energy use.

3.1 SERVICES TO EXISTING BUSINESS FACILITIES

In the coming performance period, existing commercial, industrial, and institutional facilities will present significant potential for energy reductions.

3.1.1 Vermont's Largest Energy Users

In service to the state's largest energy users, defined by their use of more than 500 megawatt-hours of electricity per year, Efficiency Vermont will continue to take a customized approach, including:

- **Account Management:** Designated Efficiency Vermont staff will establish and maintain long-term, proactive professional relationships with individual businesses. Through this approach, Efficiency Vermont will gain an understanding of companies' particular priorities and be best able to design and deliver customized services. These services will include help in creating comprehensive portfolios of savings opportunities, technical and financial analyses, guidance in developing energy savings plans, financial incentives, assistance in identifying financing options, and guidance in assessing and utilizing energy usage data. Such approaches will be designed to best position businesses to: 1) deepen savings; 2) complete multiple projects over time; 3) utilize best practices in energy use management, and 4) engage in continuous energy improvement, which helps customers look holistically at their energy use to obtain sustainable and verifiable energy savings.
- **Return-on-investment engagement:** Efficiency Vermont will continue to proactively identify and engage those largest energy users whose returns on energy efficiency investments are low.[3] Efficiency Vermont will then identify and address barriers to greater savings, such as lack of capital, lack of perceived value of efficiency, and lack of energy savings opportunities. Solutions will be highly individualized in order to optimize energy and operational benefits and to motivate the customer to engage in long-term energy management.
- **Peak electricity use management:** Through smart meter and submeter data analysis, custom analytics tools, and support for optimal efficiency improvements, Efficiency Vermont will provide targeted Vermont businesses with the ability to anticipate and prevent the use

[3] Low returns on investment are defined as less than 50% within a rolling three-year period. Investments consist of customers' contributions to the Energy Efficiency Charge and to their energy efficiency project costs. Returns consist of financial incentives and lifetime energy savings acquired through energy efficiency projects.

of high levels of energy in small blocks of time, which accrue costly peak demand charges on electric bills. These efforts will be designed both to aggressively cut electricity costs for businesses and to help all Vermonters by improving system reliability, reducing the need for system upgrades in Vermont, and lowering Vermont's share of New England regional transmission costs.

- **Targeted equipment initiatives:** Efficiency Vermont will identify, and provide support for, investments in equipment that present significant savings opportunities within high-use industries or that have broad applicability across business markets. Through such approaches as focused promotions or upstream price negotiations, Efficiency Vermont will leverage resources for optimal benefit to customers.
- **System optimization:** In addition to providing support for equipment replacement, Efficiency Vermont will help large energy users to acquire increased savings from the performance optimization of facility, data center, and process systems through such approaches as benchmarking, auditing, retro-commissioning, retuning, and submeter data analysis.
- **Peer-to-peer exchange:** Efficiency Vermont will continue to act as a catalyst for connections among large businesses and institutions by hosting gatherings of facility owners, managers, and other key decision makers in a range of industries with common challenges and opportunities to foster information exchange and awareness of best practices for energy management.

3.1.2 Small and Medium-Sized Businesses

Efficiency Vermont will design and implement services targeting the particular needs of Vermont's small and medium-sized businesses, including the following:

NEW!

- **Medium-sized business Account Management**; providing the benefits of this approach (described in Section 3.1.1) to businesses using between 100 and 500 megawatts per year
- **Technical guidance and education**; offering information about efficiency opportunities, technologies, and financial solutions through direct customer interaction and strategic outreach via numerous avenues, including business media placements, chambers of commerce, business and trade associations, planning commissions, economic development groups, and utility partners

The owners and staff of Home and Farm Appliance in Rutland with Account Manager Meghan Chambers.

- **Encouraging ongoing involvement;** identifying easy, effective initial measures and guidance on ensuing steps on a continuing path of improved efficiency
- **Thermal efficiency services**; providing financial incentives to qualifying small businesses and residential rental property owners completing efficiency improvements with members of Efficiency Vermont's network of local, certified Building Performance contractors
- **Phone consultations**; helping businesses identify and prioritize savings opportunities and supporting owners through the project process

NEW!

- **Data analysis and segmentation**; optimizing service to this sector by maintaining a deep understanding of such factors as customers' building types, measures that may provide the most benefit to customers, industry segments, and usage
- **Seamless delivery across Efficiency Vermont services**; easing business owners' ability to access Efficiency Vermont's technical and financial support regarding high-efficiency commercial equipment, retail efficient products, building improvements, new construction, and market-specific services, such as those described in Section 3.1.3

3.1.3 Targeted Markets

Efficiency Vermont will continue to develop and deliver services to address the particular needs and challenges of distinct business markets. These markets will be: agriculture, colleges and universities, convenience stores, grocery stores, hospitals, K–12 schools, leased commercial real estate, lodging facilities, municipalities, restaurants, retail stores, ski areas, state buildings, and water and wastewater facilities.

Jason Allbee, a Master Electrician at Brattleboro Union High School, a school that has pledged to reduce energy use.

Through an understanding of the characteristics common within particular markets, Efficiency Vermont will shape effective approaches to acquire greater market penetration than would be achievable through services only at the individual project level. For example, two grocers—one in North Hero and another in Manchester—may have similar time and capital constraints, equipment, degrees of interest in energy efficiency, and connections to trusted service providers, suppliers, and information sources. Awareness of these similarities will enable Efficiency Vermont to design and deliver services that specifically address a market's particular barriers, motivations, and optimal approaches and technologies. Efficiency Vermont will maintain a focus on changing needs and the impact of evolving technologies, economic conditions, consumer demand, and a range of challenges and opportunities particular to specific sectors.

3.1.4 Key Commercial Technologies

Efficiency Vermont will continue to maintain awareness of technologies with the potential to provide significant benefits in a wide range of commercial applications and will engage in efforts to bring these benefits to Vermont's commercial sector. Descriptions of efforts in service to businesses and households that purchase efficient products at retail stores can be found in Section 3.3.2.

In this performance period, Efficiency Vermont will primarily target technologies that offer good opportunities for savings through energy efficiency upgrades. These will include lighting, refrigeration, industrial process equipment, and HVAC (heating, ventilation, and air conditioning) systems—including heat pump technologies, which will be promoted for both commercial and residential use.

Efficiency Vermont will offer financial incentives for the purchase of recommended technologies. Discussion of financial services can be found in Section 3.3.7.

Commercial Lighting

Efficient lighting technologies and design will continue to offer significant savings opportunities owing to their broad applicability across commercial markets. To help Vermonters realize these opportunities, Efficiency Vermont will:

- provide technical guidance and financial support to encourage the adoption of a range of efficient lighting equipment;
- increase efforts designed to deepen adoption of 1) light-emitting diode (LED) technologies; 2) interior and exterior lighting controls; 3) exterior efficient lighting, and 4) efficient street lighting on private sites in addition to municipal streets;
- expand the scope of product supply chain engagement to reduce purchase prices through upstream incentives and to improve targeted product availability;
- partner with lighting distributors, designers, and representatives to leverage their interactions with customers;
- provide efficient lighting technology training and support to lighting designers and service providers;
- monitor and evaluate emerging lighting technologies for possible inclusion in services;
- promote quality lighting products and initiatives in collaboration with the Consortium for Energy Efficiency, DesignLights Consortium, ENERGY STAR, Northeast Energy Efficiency Partnerships (NEEP), and the U.S. Department of Energy.

Heating, Ventilation, and Air Conditioning (HVAC)

Efficiency Vermont's HVAC efforts will be designed to encourage:

- the installation of high-efficiency equipment, including heat pump technologies, hydronic circulator pumps, rooftop air-conditioning units, controls, and oil or liquefied petroleum boilers;
- adoption of qualifying biomass boilers and solar hot water systems (small commercial and residential), and
- the optimization of entire systems. This whole-building approach identifies whether systems are performing well as changes occur in building uses, in occupant needs, and in buildings and systems themselves. The energy savings associated with well-managed HVAC systems can be significant. Specific whole-building practices to be promoted will include ongoing system monitoring and management, monitoring-based commissioning, building retuning, retro-commissioning, benchmarking, and energy system optimization.

Toward these ends, Efficiency Vermont will:

- expand successful partnership models with manufacturers, distributors, and other supply chain partners to increase the ability of customers to purchase discounted, high-quality efficient equipment with applicability across markets and to leverage relationships in the delivery of efficiency information to customers;
- NEW! extend supply chain efforts, including upstream incentives, to an expanded range of technologies;
- continue to evaluate emerging technologies for inclusion in services, and
- maintain involvement with industry trade associations and marketing / buying groups.

Industrial Process Equipment

Efficiency Vermont will work with Vermont manufacturers and other businesses to identify improvements for pumps, motor controls, variable frequency drives, compressed air systems, and process heating and cooling systems. Efforts will include:

- Account Management of large customers;
- supply chain partnerships to increase the adoption of efficient technologies;
- coordination with qualified auditors to take a system-wide or facility-wide approach to equipment auditing;
- deepened engagement with the small and medium-sized business sector, and NEW!
- continued research and service development to deepen market knowledge, to further develop internal processes, and to increase customer engagement and savings.

Combined Heat & Power (CHP)

To promote the use of best practices and best-in-class CHP systems, Efficiency Vermont will engage operators of wastewater treatment, agricultural, industrial, and institutional facilities that have: 1) on-site electricity generation capability and 2) substantial heating needs. Efficiency Vermont's services will include financial support for third-party cost-benefit CHP feasibilities studies, and for CHP systems meeting requirements established by the Vermont Public Service Board.

3.2 SERVICES TO HOMES

3.2.1 Existing Market-Rate Homes

Single-Family Homes

Lynn and Buddy Behrendt of Windham are now more comfortable in their home and they use a cord and a half less wood for heating, which saves $325 annually.

In continued alignment with Vermont's thermal efficiency goal of lowering energy use by 25% in 80,000 homes by 2020, Efficiency Vermont will build upon effective approaches to improve the energy efficiency of existing residential buildings statewide. To help owners make efficient home improvements, Efficiency Vermont will continue to support a network of more than 70 Home Performance with ENERGY STAR contractors. These independent contractors are certified by the Building Performance Institute (BPI) to perform energy audits, diagnose such building problems as excess moisture and ice dams, identify potential health and safety issues, and make cost-effective thermal and electrical efficiency improvements. Efficiency Vermont will provide:

- support for contractor training through Efficiency Vermont's affiliation with BPI;
- advanced program management software that allows both contractors and customers track their projects; NEW!
- marketing and outreach campaigns promoting the benefits of working with Home Performance with ENERGY STAR contractors and informing homeowners about available incentives and financing options;
- tiered financial incentives and financing through financial institutions for homeowners who complete projects with certified contractors; NEW!

- online customer information about Home Performance with ENERGY STAR, easily searchable lists of local contractors, tips for working with contractors, information about thermal improvements and their benefits, and information about available technical and financial services;
- expanded support by phone to help customers understand and complete Home Performance with ENERGY STAR projects and to develop long-term plans to achieve comprehensive energy efficiency improvements.

In the coming performance period, Efficiency Vermont will continue to expand its residential efforts with a view toward enabling more Vermonters to participate in and benefit from taking energy efficiency actions. These efforts will be designed to provide customers with greater ability to approach household energy performance improvement as a process with multiple, often interactive opportunities rather than as a single project. This focus will empower customers to take control of the total energy performance of their homes and to make informed decisions according to their priorities and budgets. Activities will include:

NEW! • development of services for homeowners – particularly for moderate-income households – who are unable to afford whole-house upgrades, in order to improve homes over time by motivating customers to take initial steps and providing a "road map" toward more comprehensive savings;
- addition of more heating contractors, fuel dealers, and hot water system installers to Efficiency Vermont's building improvement contractor network (see Section 3.3.3);

NEW! • exploration of providing customer access to usage data through a confidential portal on www.efficiencyvermont.com, backed by Efficiency Vermont guidance and analysis;
- continued and expanded collaboration with home ownership centers to reach more homeowners, and

NEW! • incorporation of new technologies, such as heat pumps and solar thermal systems, to displace fossil fuel–fired systems.

Multifamily Homes

Efficiency Vermont will help residential renters to benefit from energy efficiency through services designed to motivate rental-property owners to take action. Efficiency Vermont will provide owners with:

- information and education by leveraging relationships with the Vermont Apartment Owners Association, the Vermont Rental Property Owners Association, large property developers, and construction professionals;
- technical and financial support for:
  - the installation of efficient equipment, including the addition of heat pump technologies, and
  - thermal improvements completed by certified BPI contractors.

3.2.2 Existing and New Low-Income Housing

Efficiency Vermont will help low-income households to reduce their energy costs through long-standing partnerships with: 1) low-income housing and service providers, including the Vermont Foodbank and the agencies of Vermont's Weatherization Program; 2) affordable housing funders, including the Vermont Housing and Conservation Board (VHCB) and the Vermont Housing Finance Agency (VHFA), and 3) multifamily housing developers, including Housing Vermont. Services in 2015–2017 will include:

- installation of lighting, appliances, and—as applicable—heat pumps in high-use households; NEW!
- replacement of inefficient refrigerators with new, efficient units in partnership with the Vermont Department of Health's Women, Infants, and Children nutrition program;
- distribution of efficient lighting with multiple partners, including the Vermont Foodbank, Boys & Girls Club, Salvation Army, Habitat for Humanity ReStore, and other organizations that serve low-income Vermonters;
- improvement of the energy efficiency of multifamily buildings housing low-income Vermonters, including targeted comprehensive thermal retrofits leveraging Vermont's Weatherization Program add-on service for electrical savings, in coordination with the Central Vermont Community Action Council in support of the Vermont Fuel Efficiency Partnership;
- increasing the application of design and construction approaches that result in housing that exceeds Vermont's Residential Building Energy Standards and ENERGY STAR specifications by partnering with Vermont's network of nonprofit affordable housing providers;
- providing a high-performance option for modular home buyers in partnership with VHCB, the Champlain Valley Office of Economic Opportunity, the University of Vermont, the High Meadows Fund, the Vermont Community Foundation, and Vermod High Performance Modular Homes (a Vermont home manufacturer); NEW!
- benchmarking energy use in multifamily buildings in collaboration with affordable housing providers; NEW!
- technical and financial support for new construction and major renovations of multifamily properties, and
- identification and implementation of innovative measures in targeted high-performance multifamily buildings to support net-zero goals.

3.3 ACTIVITIES IN SERVICE TO MULTIPLE CUSTOMER SECTORS

While serving specific markets, as described above in Sections 3.1 through 3.2, Efficiency Vermont will also provide services with an impact on multiple sectors. A key element of this cross-sector approach will be Efficiency Vermont's ongoing partnering with the businesses that Vermonters turn to for efficient products and services. These partnerships, although not always evident to the general public, have a profound impact on Vermonters' ability to lower energy use in their homes and places of business. Efforts made with these providers will include coordinated planning, information exchange, training, quality assurance, financial incentives, and promotional activities. These partnerships will enable Vermont homes and businesses to have access to a valuable network of knowledgeable providers while strengthening these providers' bottom line.

Upstream manufacturing partner, Grundfos, supplies high performance circulator pumps used in Efficiency Vermont programs.

3.3.1 New Construction Services

Efficiency Vermont's support for the creation of efficient new buildings will continue to focus primarily on the professionals engaged in architectural design and construction. These include architects, engineers, specialty design service providers, and practitioners of construction trades. Efficiency Vermont will also engage in efforts targeting developers, equipment suppliers, installation contractors, commissioning agents, appraisers, lenders, and real estate agents, as well as certain building owners as key members of project teams, particularly in regard to construction undertaken by institutions, by government agencies, and by large businesses with multiple buildings. In addition, Efficiency Vermont will recognize and publicize exceptional achievement by design and construction practitioners through its annual *Best of the Best* awards for new high-performance buildings and homes.

Business New Construction

Efficiency Vermont will maintain its delivery of services to encourage a comprehensive approach to efficient design, integrating energy efficiency decisions into the process and including energy goals as part of the overall construction strategy from the earliest stages of a project. Efficiency Vermont will strive to provide custom services to more than 350 new construction projects during the performance period, including 10 to 15 per year that establish a net-zero or net-zero-ready building goal.

Bensonwood accepts an award for a new construction project at Burr and Burton Academy's Mountain Campus in Peru.

Key aspects of ongoing efforts will include:

- technical assistance throughout the design, construction, and post-construction phases;
- analytics to evaluate efficiency options;
- NEW! tiered services aimed at meeting specific building performance levels, including net zero;
- financial incentives for efficient approaches, equipment, and building operation systems;
- NEW! post-occupancy energy performance tracking and engagement with building owners to identify ongoing and future savings opportunities, including energy use management;
- leveraging of customer interest in green building, energy performance, and green rating systems such as Leadership in Energy & Environmental Design (LEED);
- training and information provision to a range of key parties involved in new construction projects, and
- continued partnerships with national, regional, and international organizations, such as the American Council for an Energy-Efficient Economy, the Consortium for Energy Efficiency, the Construction Specifications Institute, the Institute for Market Transformation, the International Code Council, and the New Buildings Institute, as well as Vermont trade organizations, as specified in Section 3.3.5.

Residential New Construction

In support of the range of efficiency aims that Vermonters seek in their new homes, Efficiency Vermont will offer technical guidance, financial assistance, and energy rating services in alignment with ENERGY STAR, LEED, green, and net-zero-ready standards. To assist builders and owner–builders in meeting and exceeding Vermont Residential Building Energy Standards while promoting low-load and net-zero building practices, Efficiency Vermont will offer services in support of the construction of homes meeting specific levels of energy performance:

Representatives of O'Hara and Gercke and Pill-Maharam Architects accept an award for their work on the new construction of the Holcombe/Bandler home in Norwich.

- **Efficiency Vermont Certified:** Homes exceeding Vermont code requirements for energy efficiency and receiving certification for Home Energy Rating and Vermont Residential Building Energy Standards. ENERGY STAR certification will also be offered as an option.
- **Efficiency Vermont Certified Net-Zero-Ready High-Performance:** Homes meeting elevated criteria for comprehensive energy efficiency and suitability to achieve net-zero energy use with the incorporation of renewables. In the performance period, Efficiency Vermont will aim to support the annual completion of 30 homes at this tier, increasing to a rate of 40 in the final year of the period. NEW!
- **High-Performance Modular Homes:** Vermont-built modular homes meeting high-performance criteria for low energy use, durability, health, and safety. More information on this effort is provided in the discussion of low-income services in Section 3.2.2.

To advance efficiency in the marketplace, Efficiency Vermont will:

- collaborate with builders, appraisers, lenders, developers, and real estate agents through the Vermont Green Home Alliance, advocating for efficient new construction and promoting the value of efficiency in home sales;
- disseminate information about efficiency through media placements and Efficiency Vermont's *Builder Partner Update*;
- partner with the Home Builders and Remodelers Associations of Vermont through trainings and events, and
- continue outreach efforts with building supply houses and electric utilities, to share information with their customers.

New Construction Information and Education

Efficiency Vermont will provide energy efficiency information and education to professionals and tradespeople involved in new construction and renovation projects through the Energy Code Assistance Center and the annual Better Buildings by Design Conference. Discussion of these efforts can be found in Section 3.4.1.

3.3.2 Retail Efficient Product Services

Efficiency Vermont will provide support for a range of consumer products that meet or exceed efficiency standards set by the U.S. Department of Energy's ENERGY STAR program, including lighting—featuring increased emphasis on LEDs—appliances, air conditioners, dehumidifiers, pool pumps, heat pump water heaters, heat pump clothes dryers, and electronics. Services will NEW!

be designed to motivate product purchases by increasing efficiency knowledge and reducing purchase costs for Vermonters making retail purchases for their homes and businesses. Support will include rebates, buy-downs, and markdowns at the manufacturer and retail level, point-of-purchase information, advertising, promotional and public information activities, and the targeted provision of "efficiency kits" to introduce customers to specific efficient products.

"Saving Is Always In Season" events promote efficient lighting at retailers around the state.

Key to the success of these efforts will be Efficiency Vermont's continuing services to retailers and upstream partners in the product supply chain to ensure the availability of high-quality efficient products in Vermont stores. For example, Efficiency Vermont will seek to maintain partnerships with more than 100 lighting retailers, including hardware, grocery, "big box," and independent stores serving Vermonters at more than 350 locations statewide.

Efficiency Vermont will promote the adoption of heat pump technologies–both for residential and commercial use–through approaches discussed in Section 3.1.4.

3.3.3 Services to Building Improvement Contractors

Efficiency Vermont will work in affiliation with BPI in training Vermont building improvement contractors to identify and address a range of thermal and electric efficiency issues in buildings. With this training, contractors become certified to deliver comprehensive retrofit efficiency services to residences, through Efficiency Vermont's Home Performance with ENERGY STAR program, and / or to small businesses and rental properties, through Efficiency Vermont's Building Performance program.

Efficiency Vermont's efforts will continue to be designed to benefit both participating contractors and their customers:

- Participating contractors will gain a competitive edge by obtaining knowledge, resources, and credentials that enable them to deepen their service offerings and customer base.
- Vermont home and commercial building owners will have access to a statewide network of skilled professionals who are committed to the health, safety, and energy performance of their properties.

Efficiency Vermont will provide certified contractors with ongoing support through extensive program promotion, self-marketing and sales training, listings on www.efficiencyvermont.com, and consumer financial incentives and financing options for projects completed by BPI-certified contractors. Contractors will also receive education credits through Efficiency Vermont's annual Better Buildings by Design Conference (see Section 3.4.1), as well as recognition and publicity for exceptional achievement in efficient retrofit projects through Efficiency Vermont's annual *Best of the Best* awards. Also in support of contractors' efforts to help Vermont homeowners, Efficiency Vermont will continue the provision of software designed to enable:

- homeowners to do a streamlined self-audit and to choose a contractor online, and
- NEW! contractors to enter audit information on job sites through portable electronic devices, calculate energy savings potential, and produce audit reports for customers.

Efficiency Vermont will also continue to coordinate the Efficiency Excellence Network (EEN) in collaboration with the Vermont Fuel Dealers Association. The EEN provides fuel dealers and HVAC contractors with training in home efficiency, enabling them to conduct home energy checkups and to advise customers looking for ways to reduce their heating bills. EEN members will coordinate with Home Performance with ENERGY STAR contractors, who will provide customers with more in-depth services, including the delivery of home energy improvements. In this performance period, Efficiency Vermont will expand the EEN to support a broader range of contractors to provide knowledgeable energy efficiency referrals or services to Vermont businesses and homes.

3.3.4 Services to Equipment Supply Chain Partners & Technicians

The ability of Vermonters to take energy-saving actions relies on the commitment and knowledge of individuals and companies at each stage of the product supply chain. In the 2015–2017 period, Efficiency Vermont will further strengthen the marketplace by building upon relationships with manufacturers, distributors, suppliers, retailers, installers, and service technicians through:

- engagement with manufacturers, distributors, and suppliers to reduce equipment costs, ensure Vermont product availability to contractors and consumers, and reduce lead times for product ordering;
- collaboration with manufacturers regarding emerging and rapidly advancing efficiency technologies, such as lighting technologies;
- Account Management of Vermont stores in retail chains, targeting store owners, managers, and staff to ensure implementation of promotional agreements established at the corporate level;
- assistance to independent and chain retailers, including merchandising support, guidance on efficient product differentiation on the sales floor, and product knowledge training;
- training and support for installers, to help them increase the use of new, efficient technologies and approaches;
- promotional work focusing on targeted products, including efficient electronics and LEDs;
- leveraging of a relationship with Heating, Air-conditioning, and Refrigeration Distributors International, a trade association representing more than 475 distributors and close to 500 suppliers, manufacturers, and service vendors, to maintain awareness of the needs of the HVAC supply chain, and NEW!
- education credits for HVAC system designers, equipment installers, and service technicians through Efficiency Vermont's Better Buildings by Design Conference (see Section 3.4.1), and recognition and publicity for exceptional achievement by HVAC system designers through Efficiency Vermont's annual *Best of the Best* awards for efficient new construction and major renovation projects.

3.3.5 Trade Association Partnerships

In addition to engaging in direct customer interaction, Efficiency Vermont will work with professional and trade member organizations representing a wide range of constituents. By sharing targeted information through these trusted channels, Efficiency Vermont will empower businesses with knowledge about best practices and resources that they can use to strengthen their bottom line. Vehicles will include association newsletters, websites, and technical materials, as well as event sponsorship, speaking engagements, conference and trade show participation, training workshops, and promotional and educational campaigns.

Partner organizations will include:

- American Institute of Architects—VT Chapter
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers—VT Chapter
- Building Performance Professionals Association of Vermont
- Construction Specifications Institute
- Farm to Plate Network
- Green Mountain Water Environment Assoc.
- Heating, Air-conditioning, and Refrigeration Distributors International
- Home Builders & Remodelers Assoc. of VT
- ICC Building Safety Association of VT
- Illuminating Engineering Society
- University of Vermont Extension
- Vermont Alliance of Independent Country Stores
- Vermont Apartment Owners Association
- Vermont Association of Hospitals & Health Systems
- Vermont Association of School Business Officials
- Vermont Convention Bureau
- Vermont Fuel Dealers Association
- Vermont Green Building Network
- Vermont Green Home Alliance
- Vermont Healthcare Engineers Society
- Vermont Hospitality Council
- Vermont Inn and Bed & Breakfast Association
- Vermont Maple Sugar Makers Association
- Vermont Rental Property Owners Association
- Vermont Retail & Grocers' Association
- Vermont Rural Water Association
- Vermont Ski Areas Association
- Vermont Superintendents Association

3.3.6 Community-Based Activities

Throughout the state, Efficiency Vermont will engage with Vermonters interested in creating or joining efforts to reduce energy use in their towns, institutions, businesses, and homes. Efficiency Vermont will partner with town officials, town energy committees, local organizations, and businesses to increase the impact of existing efforts or to support interest in creating new groups devoted to efficiency efforts. Offered services will include planning guidance, promotions, educational materials, volunteer training, and the contribution of efficient products for local energy-saving efforts.

Bennington community members speak with Director Jim Merriam at one of seven Efficiency Vermont Community Forums held around the state this fall.

3.3.7 Financial Services

In its ongoing commitment to help Vermonters overcome financial barriers to investing in cost-effective efficiency for their buildings and equipment, Efficiency Vermont will engage in the following efforts in 2015–2017.

Product and Service Price Reductions

To motivate Vermonters to make energy-efficient choices in the marketplace, Efficiency Vermont will target specific products and services for purchase price reductions. Primary mechanisms will be: 1) negotiated cooperative promotions that provide incentives to manufacturers, distributors, and retailers—both independent and chain stores—to lower the purchase price of products, and 2) rebates and financial incentives for:

- efficient products and equipment purchased at the retail level and through commercial suppliers and installation contractors;
- process equipment for such businesses as farms, manufacturers, and industrial facilities;
- the incorporation of advanced, cost-effective techniques and approaches that enable the design and construction of high-performance residential and commercial buildings;
- thermal building upgrades made by Building Performance contractors in small commercial and multifamily properties, and
- comprehensive home improvement projects conducted by Home Performance with ENERGY STAR contractors.

Financing for Energy Efficiency Projects

Efficiency Vermont will work with lenders to ensure the availability of cost-effective financing for energy efficiency projects. By including energy savings in the repayment formula, lenders may be able to provide funding for individuals and businesses not otherwise qualifying for financing. In many instances, such financing creates a positive cash flow for borrowers, because of monthly energy savings that are larger than the loan payments. Efficiency Vermont will provide technical and financial analysis, promotions, and informational support for customers.

Efficiency Vermont will engage with a range of financing vehicles, including:

- **Business Energy Loan with Opportunities Credit Union:** Increasing businesses' opportunities to finance efficiency projects by factoring energy savings into loan qualification calculations. In this performance period, Efficiency Vermont will engage in efforts to expand this offering to additional Vermont lenders.
- **Green Mountain Power (GMP) EverGreen Fund:** Zero-interest on-bill financing for Vermont's K–12 schools and towns located in GMP service territory.
- **Municipal Tax-Exempt Leasing:** Opportunities for municipalities to make energy-saving upgrades, in facilities such as K–12 schools, without raising budgets or establishing bonds.
- **Property Assessed Clean Energy (PACE):** Home loans secured by a property lien. Borrowers will have access to recent improvements to this offering, including a 50% loan advance prior to project completion, lowered fees, elimination of a partial-payment penalty, and a low-income interest rate buy-down funded through the Vermont Public Service Department.
- **Green Revolving Fund:** Financing for colleges, universities, and other nonprofit institutions, with financial support from the High Meadows Fund and in partnership with the Sustainable Endowments Institute.
- **Rural Edge Partnership:** Financing for Home Performance with ENERGY STAR projects in targeted moderate-income households. NEW!
- **Heat Saver Loan / EEN Partnership:** Financing for heating system purchases and comprehensive thermal efficiency projects through Efficiency Vermont's EEN and in partnership with the Vermont Public Service Department and local credit unions.
- **Agricultural Energy Efficiency Loan:** Providing agricultural facilities with interest rate buy-downs to enable easy access to financing for efficiency projects.
- **Association of Vermont Credit Unions:** Working to provide energy efficiency financing via a fast and simple online application and approval process, based on a model used with auto dealerships. NEW!

Financing Education and Analysis

To enable Vermonters to be aware of, understand, and make decisions regarding financing options, Efficiency Vermont will provide easy access to information by phone, through its website, in printed materials, and in media placements. Efficiency Vermont will continue to provide financial analysis for custom projects to help customers understand the financial aspects of efficiency investments.

In the 2015–2017 performance period, Efficiency Vermont will raise the profile of financing by:

NEW!
- providing BPI contractors with tools they can use to calculate and present options for their clients regarding financing;
- enhancing www.efficiencyvermont.com listings of financing options and lenders to better educate and guide customers, and
- making the discussion of cost-effective financing a standard part of service to customers lacking capital who can benefit from certain technology upgrades.

Financial and Leveraged Product Development

Efficiency Vermont will continue its efforts to: 1) increase financing opportunities for Vermonters engaged in energy efficiency projects, and 2) leverage public and private resources to draw new funding for energy efficiency efforts without additional ratepayer investment. These efforts are discussed in Section 3.4.5.

3.3.8 Coordination with Distribution Utilities

Efficiency Vermont will continue its work with Vermont Gas Systems and Burlington Electric Department (BED) to ensure coordination in the implementation of efficiency services well as in specific initiatives, such as those connected to the advanced metering infrastructure. Efficiency Vermont will also maintain its coordination with Green Mountain Power Corporation (GMP) in the implementation of services through the GMP Community Energy & Efficiency Development (CEED) Fund. These efforts offer GMP customers unique services as well as shared services, through which GMP invests in existing Efficiency Vermont programs. Efficiency Vermont will engage in ongoing communications and coordination with Vermont Public Power Supply Authority and utilities across the state, including Vermont Electric Cooperative and Washington Electric Cooperative.

3.3.9 State, Regional, and National Partnerships

In service to Vermonters and in support of the State's energy goals, Efficiency Vermont will continue to leverage the expertise and resources of entities engaged in a range of energy and efficiency endeavors, both in Vermont and outside the state. Efficiency Vermont will share its own expertise at regional and national gatherings, enabling Vermont to be both recognized for its innovations and informed by best practices in other states. In Vermont, partners will include the High Meadows Fund, the Vermont Housing and Conservation Board, the Regulatory Assistance Project, and many others. On a regional and national level, Efficiency Vermont will maintain ongoing partnerships with such organizations as the Northeast Energy Efficiency Partnerships, the New Buildings Institute, the Consortium for Energy Efficiency, ENERGY STAR, and the American Council for an Energy-Efficient Economy, working to share information on best practices and to establish uniform product eligibility criteria and program designs.

3.3.10 Resource Acquisition Research & Development

NEW!

In 2015–2017, Efficiency Vermont will engage in research and development efforts to determine the potential of behavior-based energy efficiency services to achieve verifiable, cost-effective energy savings. Behavior-based services are designed to motivate customers to reduce their energy use by empowering them with access to knowledge about:

- their energy use and the benefits of energy use reduction;
- the connection between their actions and their energy use, and/or
- ongoing energy use management approaches and benefits.

Waterbury resident Kelly Hackett discusses the ways her home energy report will help her save energy.

Expanding upon behavior-based energy efficiency approaches begun in 2014, the efforts will determine the potential for savings from:

- full-scale behavior-based energy efficiency;
- increased focus on energy management;
- expansion to diverse markets and customer types, including:
  - households with high, above-average, and average energy use;
  - households alerted to impending peak energy usage days (an expansion of a 2014 summer peak pilot), and
  - industrial businesses (a continuation of a 2014 pilot).

Efforts will also be designed to demonstrate rigorous measurement and verification approaches for quantifying savings and determining cost-effectiveness for behavior-based energy efficiency, and to test data collection and analysis processes. Efficiency Vermont will also engage in additional research to obtain optimal customer benefits and to ensure verifiable results. Descriptions of specific planned efforts and research questions to be addressed are provided in Section 5.5.

3.4 MARKET ADVANCEMENT ACTIVITIES

Efficiency Vermont will continue to engage in efforts that build customer awareness and knowledge, help shape energy and efficiency policies, and identify approaches for optimal service development, delivery, and improvement. In 2015–2017, the below activities—corresponding to Non-Resource Acquisition budget categories—will be essential to Efficiency Vermont's efforts to deepen energy savings and to have a lasting, positive impact on Vermont households, businesses, and communities.

3.4.1 Education and Training

Codes and Standards Support—Residential and Commercial / Industrial

To help Vermonters comply with and / or surpass state energy codes for new construction and renovation projects, Efficiency Vermont will:

- provide information to homeowners, building professionals, and towns on technical and compliance aspects of the State's Residential Building Energy Standards and Commercial Building Energy Standards through the Energy Code Assistance Center phone lines;
- provide increased support due to new codes for 2015 as well as the institution of a stretch code for homes, which is expected to prompt the need for assistance for owners, builders, and towns unfamiliar with new requirements and criteria;
- distribute code books and other code support materials by mail and at home shows, industry conferences, and other events;
- provide code development support, including analysis and consultation on potential code change impacts and processes;
- conduct outreach to local energy committees, and
- provide energy code training for a range of constituencies, including:
  - design and construction professionals and building tradespeople;
  - real estate professionals, mortgage lenders, appraisers, and attorneys;
  - town officials, regional planning commissions, and Act 250 district commissions.

Energy Literacy Project

Efficiency Vermont will coordinate with Vermont teachers, schools, and K–12 associations to increase students' knowledge of energy and efficiency, as well as to increase immediate and long-term energy-saving actions in homes, schools, and communities. The Vermont Energy Education Program, under contract with Efficiency Vermont to implement this project, will support educators in enhancing school curricula and increasing student awareness of and advocacy for energy-related issues in their schools and communities.

General Public Education

To motivate and empower the general public to take energy-saving actions, Efficiency Vermont will engage in activities designed to increase public awareness of: 1) energy efficiency and its benefits; 2) actions that lower energy use, and 3) Efficiency Vermont as a resource for comprehensive energy efficiency solutions. Methods will include:

- provision of information and marketing and advertising promotions via print, broadcast, web-based, and social media;
- increasing customer engagement through access, at www.efficiencyvermont.com, to recommendations on efficiency actions, online rebate applications, information about efficient technologies and approaches, identification of qualified local service providers, locations of retailers selling efficient products, and information on a range of other efficiency and energy topics;
- dissemination of information at home shows, community events, fairs, and trade shows, and

A customer engages with Efficiency Vermont's Jessie Frank at an efficient lighting light event at retail partner Home Depot's Williston location.

- creation of advice columns and electronic newsletters that deliver information on energy efficiency and Efficiency Vermont's services.

Better Buildings by Design Conference

Efficiency Vermont will present its Better Buildings by Design Conference annually. This two-day gathering is the region's premier design and construction conference, serving as a key resource to 1,000-plus construction and design professionals, and equipment installation and service contractors. The conference will focus on the latest techniques and technologies for building durability, superior performance, energy efficiency, and value for both residential and business new construction and retrofit projects. In addition to 40 workshops and hands-on demonstrations given by industry leaders, the conference hosts a trade show of 50 exhibitors of efficient technologies.

Efficiency Vermont's 2014 Better Buildings by Design Conference, the region's premier design and construction conference.

Customer Support

Vermonters will continue to have easy access to expert energy efficiency information and guidance through Efficiency Vermont's toll-free call center, which will provide:

- help for commercial and residential customers in understanding their energy use and engaging in energy management;
- comprehensive information about Efficiency Vermont's services and about efficient buildings and equipment, and
- referrals to resources such as Vermont's Weatherization Program, the Renewable Energy Resource Center, Vermont Gas Systems, and the Energy Code Assistance Center.

3.4.2 Applied Research and Development

Efficiency Vermont will undertake several research and development projects to gather information on areas with potential for inclusion in future service offerings. The projects will span a variety of technology applications and customer segments.

Emerging Data Services NEW!

As inexpensive, abundant, and reliable data begin to transform the way that energy services can be provided, Efficiency Vermont will continue to be strategic in planning optimal ways to use data analysis to deliver value to customers, systems planners, and policy makers. Efficiency Vermont will undertake research to identify data applications that increase the effectiveness of energy efficiency services. In the 2015–2017 period, Efficiency Vermont will:

- continue to leverage the State's investment in advanced metering infrastructure (AMI) and other emerging data innovations;

- invest in information technology to manage complex data and to build systems that make it possible to use data analysis to help achieve energy savings goals;
- explore new strategies, techniques, and / or technologies that show promise for increasing energy savings, decreasing delivery costs, and increasing customer engagement and benefits, and
- support other research and investigations that are likely to lead to greater market transformation. This work will use data from AMI, submeters, environmental and process sensors, building energy management systems, demographic and real estate databases, and historical efficiency program activities.

Technology Demonstrations

To bring the benefits of the next generation of energy-saving technologies and strategies to Vermonters, Efficiency Vermont will engage in research, development, and demonstration of emerging innovations. Efficiency Vermont will undertake these activities to advance the goals of sound product and service design over time through field testing, technology demonstrations, and research on emerging technologies and implementation strategies. Descriptions of specific planned efforts and recent results are provided in the Section 5.3.

3.4.3 Planning and Reporting

Annual Plans and External Reporting

Efficiency Vermont will prepare and submit required documents to the Vermont Public Service Board, the Vermont Public Service Department, and other required stakeholders. The below documents will be presented in fulfillment of requirements specified under agreements with state agencies, to maintain accountability and to provide accurate tracking of progress for service delivery optimization, for public benefit, and for the benefit of entities outside Vermont seeking replication.

- Annual plans—presenting significant updates to the 2015–2017 triennial plan
- Annual savings claims and annual reports
- Annual highlights brochures
- Monthly and quarterly reports
- Quarterly and annual budget variance reports
- Service quality reports
- Quarterly customer complaint and feedback reports
- Ad hoc reporting requests
- Vermont Public Service Department financial audits
- Vermont Public Service Department monthly invoice reviews
- Financial component of overall performance assessment

Demand Resource Plan

In the 2015–2017 performance period, Efficiency Vermont will engage in efforts regarding:

- yearly energy efficiency utility (EEU) demand-side electricity resource acquisition budgets and energy savings 20-year forecasts;
- Quantifiable Performance Indicators to measure EEU results for the 2018–2020 performance period;
- information provided to the Vermont Public Service Department in support of its evaluation efforts;
- plans and budgets for non-resource acquisition activities;

- the EEU compensation and performance award structure, and
- yearly budgets and energy savings goals for thermal energy and process fuels activity for a 10-year period.

In 2017, Efficiency Vermont will provide the Vermont Public Service Board, the Vermont Public Service Department, and Vermont's utilities with estimates from the 20-year projections of electric energy efficiency savings expected to be achieved from system-wide programs.

Participation in State and Regional Integrated Planning

Efficiency Vermont will continue its active participation in the Vermont System Planning Committee (VSPC), a collaborative body bringing together Vermont's utilities, the Vermont Electric Power Company, the Vermont Public Service Department, and individuals representing the interests of ratepayers to address approaches to electric transmission system planning and management. In addition, Efficiency Vermont will participate in the VSPC's four subcommittees: Coordinating, Public Participation, Geographic Targeting, and Forecasting. Efficiency Vermont will also support the VSPC's reliability planning and forecasting, energy efficiency geographic targeting, public engagement, and standard offer geographic targeting efforts. In particular, this work will involve input to solution selection, cost allocation, and implementation planning of all identified reliability deficiencies.

ISO-New England Forward Capacity Market Administration

As the implementer of Efficiency Vermont, Vermont Energy Investment Corporation (VEIC) will continue to represent the interests of Vermont ratepayers by participating in the ISO-NE Forward Capacity Market (FCM), in which energy efficiency savings are bid as a resource for the regional grid. VEIC will prepare and submit bids to provide Efficiency Vermont's capacity savings as a demand resource in annual FCM auctions. Activities will include capacity forecasting, resource qualification, bid development, and auction bidding. VEIC will track and report resource development, submit claims during capacity delivery periods, deliver reports to ISO-NE and Vermont stakeholders, and undertake all other activities required to support this market participation. VEIC will perform all necessary administrative and fiscal activities associated with these responsibilities, including budgeting and revenue forecasting. VEIC will also continue to participate in rule-making processes established by ISO-NE regarding the establishment and operation of the FCM and other responsibilities associated with being a New England Power Pool member.

3.4.4 Evaluation

As an essential part of its reporting efforts, Efficiency Vermont will engage in activities designed to maintain the accuracy of reported savings claims, including[4]:

- working with the Vermont Public Service Department as it conducts its annual savings verification to review the initial savings claim;
- participating in the Technical Advisory Group with the Vermont Public Service Department, BED, and other stakeholders to resolve any issues arising from the annual savings verification process and to provide a proactive mechanism for developing energy characterization and savings calculations;
- maintaining and updating the Technical Reference Manual (TRM), which characterizes energy-saving measures on the basis of several parameters: Annual electric savings, annual coincident peak savings, annual fossil fuel energy savings, incremental costs and measure

[4] More detailed information about evaluation activities can be found in Section 5.4.

lives, and other applicable resource savings such as water savings and operational and maintenance cost savings. In this performance period, Efficiency Vermont anticipates increased activities designed to enhance TRM reliability;
- metering, monitoring, and evaluation activities related to ISO-NE FCM participation, and
- rigorous, ongoing quality management protocols in alignment with Efficiency Vermont Program Implementation Efficiency Quantifiable Performance Indicators (see Section 5.2) and with the Service Quality and Reliability Plan, which defines customer service performance standards in four service categories: General Customer Satisfaction; Project Customer Satisfaction; Incoming Call Responsiveness, and Complaint Rate and Resolution.

3.4.5 Policy and Public Affairs

Public Affairs

Efficiency Vermont will provide energy, financial, and economic information and analysis to policy makers, state agencies, utilities, and other key stakeholders. These efforts will be undertaken in ongoing support of Efficiency Vermont's statutory and regulatory mandates, the State's *2011 Comprehensive Energy Plan* goals, and other relevant energy policy goals, and will include:

- working as a resource to policy makers, regulators, businesses, and community organizations;
- briefing the Legislature and state officials on energy efficiency issues;
- assisting legislators and state officials with review and development of policy proposals related to the Efficiency Vermont scope of work;
- providing expert testimony and input on pieces of legislation consistent with Efficiency Vermont's status as an appointed EEU, and
- presentations at public forums and meetings.

Efficiency Vermont will also strategically disseminate information, aligned with Vermont energy policy priorities and Efficiency Vermont goals, to deepen knowledge of and engagement in energy efficiency actions among targeted populations. Efforts will include:

- outreach to media to develop and publish stories that raise awareness of Efficiency Vermont program offerings, highlight the experiences of Efficiency Vermont customers, and educate the public on energy efficiency issues;
- response to media inquiries regarding Efficiency Vermont programs and operations, and general inquiries related to energy efficiency, and
- in-depth discussion of energy issues and their relation to Efficiency Vermont's work, through publication on http://www.efficiencyvermont.com of:
  - Efficiency Vermont's blog *Energy. Forward.*, providing timely discussion of efficiency activities under way throughout the state and presenting Efficiency Vermont research of value to Vermonters who want to deepen their involvement in their energy use, and
  - a library of white papers developed by Efficiency Vermont, sharing the latest thinking, analysis, and cutting-edge research on the future of energy efficiency.

Regulatory Affairs (Non-Demand Resource Plan)

Efficiency Vermont will continue to:

- work with the Vermont Public Service Department to write, revise, and maintain governing documents necessary for Efficiency Vermont to operate as a regulated utility;
- participate in Vermont Public Service Board proceedings that affect energy efficiency implementation in Vermont;

- review and provide advice on regulator-required, coordinated services and initiatives with Vermont's other EEUs and weatherization agencies to provide seamless, cost-effective, statewide energy efficiency programs;
- oversee Efficiency Vermont interactions in the ISO-NE Forward Capacity Market to ensure regulatory compliance and help secure financial benefits from energy efficiency in New England;
- work closely with the Regional Greenhouse Gas Initiative (RGGI) to help inform the Model Rule, report greenhouse gas reductions as a result of Vermont's RGGI-funded programs, and help maximize efficiency benefits from the regional cap and trade;
- develop and support policy instruments that can serve as useful tools for electricity and thermal energy savings through voluntary action or government adoption;
- research regulatory policies to support best practices for efficiency programs to enable continuous improvement in Efficiency Vermont's services and to support Vermont's prominence as a national leader in energy efficiency ideas and practices;
- pursue regulatory approval of flexible and robust strategies to cost-effectively avoid or control capacity and energy supply, in support of electric distribution utility integrated resource planning;
- review and provide guidance on Efficiency Vermont internal policies to ensure regulatory compliance, and
- participate as a party in the triennial review of distribution utilities' integrated resource plans, updating of avoided costs, and all other Vermont Public Service Board–ordered proceedings with potential impact on energy efficiency services.

Financial and Leveraged Product Development

As part of its efforts to bring efficiency within reach of more Vermonters, Efficiency Vermont will continue to:

- manage relationships with financial institutions, utilities, and government leaders to reduce barriers to implementing financing mechanisms for Vermonters' energy efficiency projects, and
- engage in activities designed to acquire public and private resources for Vermonters undertaking efficiency projects in their homes and businesses. This approach multiplies the impact of ratepayer dollars by using a modest amount of funds to draw higher amounts of new resources without additional ratepayer investment.

3.4.6 Information Technology

Efficiency Vermont's information technology (IT) efforts will continue to be focused in two areas:

1. **Information Services**; maintaining the long-standing IT focus on computer infrastructure, critical data and document management, substantial support for reporting and analytics, and ongoing attention to improving and updating existing applications and processes.
2. **Strategic Technology Services (STS)**; deepening Efficiency Vermont's ability to serve Vermonters with software development, acquisition, and integration, as well as continuing best-practice data stewardship to ensure customer privacy, security, and alignment with customer data usage preferences.

NEW!

In addition to ongoing IT activities, Efficiency Vermont aims to take on the following large STS development efforts in the 2015–2017 performance period:

- migrating the KITT application to a web application architecture; KITT is Efficiency Vermont's primary tool for project management, customer relationship management, and energy savings tracking;
- developing web services for KITT and Technical Reference Manual applications for integration;
- increasing the efficiency of regulatory reporting tools by integrating financial and performance data, and
- improving measure import and savings calculation tools.

3.4.7 General Administration

In support of the efforts outlined in this Plan, Efficiency Vermont will undertake activities centering on such needs as staff meetings, coordination of service implementation across different functions, and management, monitoring, and internal communication of overall performance and spending.

4. ENERGY EFFICIENCY UTILITY FUNDING

The Vermont Public Service Board has specified that the funding sources for Efficiency Vermont's electric efficiency and thermal energy and process fuel (TEPF) services be separate and distinct. Electric services will be funded through the Energy Efficiency Charge, whereas TEPF services will be funded by Vermont's Regional Greenhouse Gas Initiative (RGGI) revenues and by revenues generated by Efficiency Vermont's bidding of electric capacity savings into the regional ISO-New England Forward Capacity Market. Efficiency Vermont will strive to ensure that, from the customer's perspective, the provision of services will be seamless, regardless of the funding source.

TEPF services will support Vermont state energy policy goals as outlined in Section 581 of Act 92 (the Vermont Energy Efficiency and Affordability Act, enacted in 2008) and the *2011 Vermont Comprehensive Energy Plan*. A key provision of Act 92 is improving the energy fitness of 80,000 homes by 2020. Although TEPF funding levels will not be sufficient on their own to achieve this goal, Efficiency Vermont will design its TEPF services to be scalable to levels consistent with these public policy goals.

5. APPENDIX

5.1 EFFICIENCY VERMONT BUDGETS

5.1.1 2015-2017 Resource Acquisition and Non-Resource Acquisition Budget Summary

Resource Acquisition	**2015**	**2016**	**2017**	**2015-2017**
Total *Electric EEU Funds for Resource Acquisition*	$39,351,359	$42,460,068	$45,555,423	**$127,366,850**
Total *Electric EEU Funds for Research & Development*	$1,629,453	$2,168,379	$1,206,235	**$5,004,067**
Customer Credit[1]	$989,400	$1,009,188	$1,029,372	**$3,027,960**
Total *Thermal Energy and Process Fuels Funds*	$5,329,201	$5,972,859	$6,490,404	**$17,792,464**
Total Resource Acquisition Budget	**$47,299,413**	**$51,610,494**	**$54,281,434**	**$153,191,341**
Non-Resource Acquisition	**2015**	**2016**	**2017**	**2015-2017**
Total *Electric EEU Funds*	$4,217,048	$4,177,272	$4,260,432	**$12,654,752**
Total *Thermal Energy and Process Fuels Funds*	$575,052	$569,628	$580,968	**$1,725,648**
Total Non-Resource Acquisition Budget	**$4,792,100**	**$4,746,900**	**$4,841,400**	**$14,380,400**
Operations Fee	$919,838	$996,268	$1,045,682	**$2,961,788**
Sub-Total Prior to Performance Based Fee	**$53,011,351**	**$57,353,662**	**$60,168,516**	**$170,533,529**

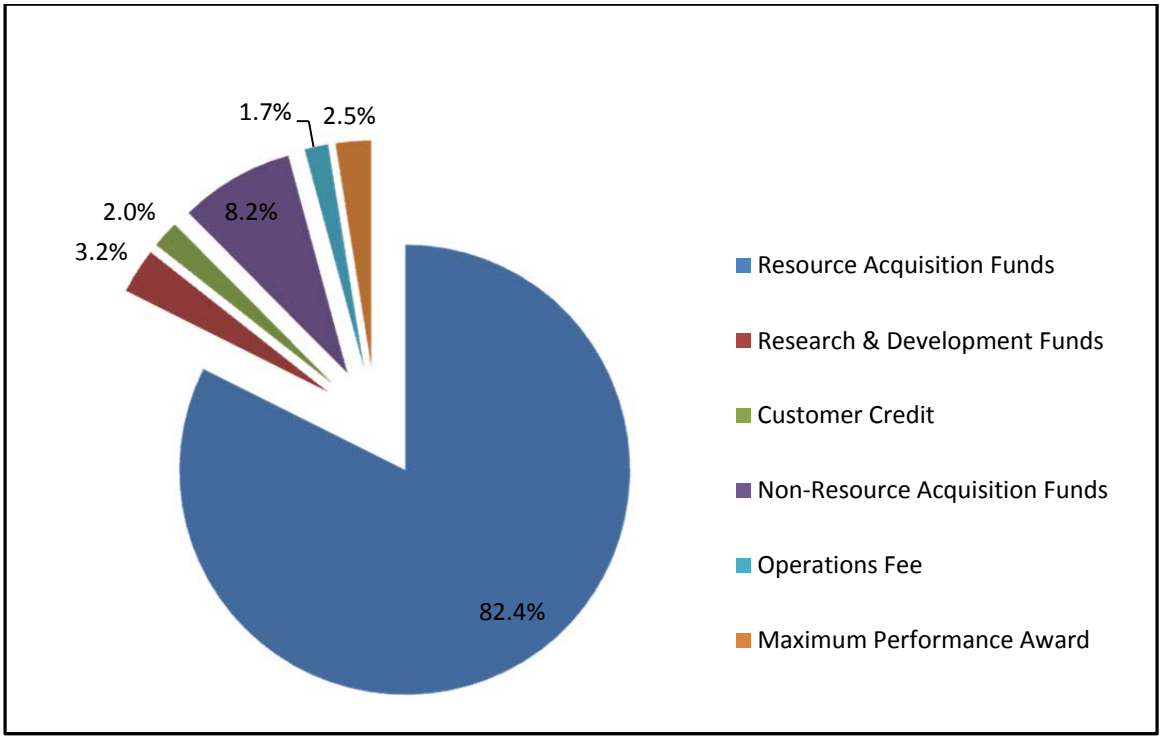
[1] Customer Credit budgets estimated

5.1.2 2015-2017 Budget by Market and Initiative

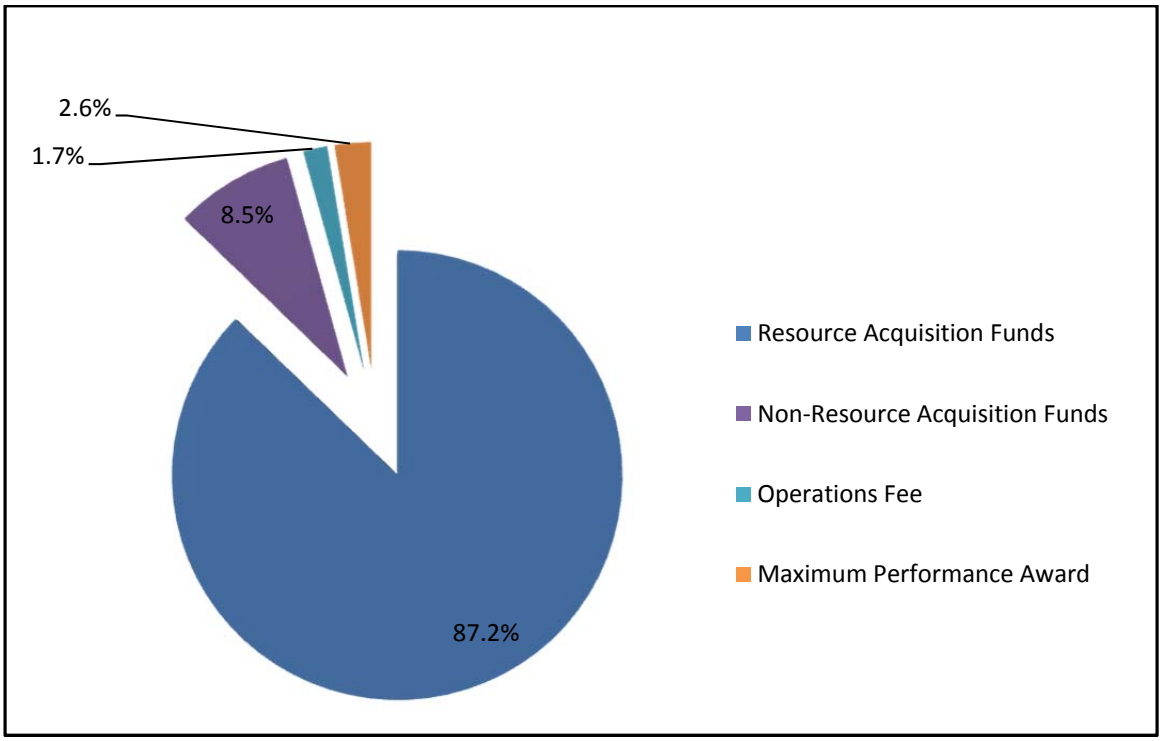
	2015	2016	2017	2015-2017
RESOURCE ACQUISITION				
Electric Efficiency				
Business Sector				
Business Existing Facilities	$ 22,761,804	$ 24,033,853	$ 25,641,426	$ 72,437,084
Customer Credit	$ 989,400	$ 1,009,188	$ 1,029,372	$ 3,027,960
Business New Construction	$ 3,207,177	$ 3,114,480	$ 3,046,426	$ 9,368,083
Sub-Total Business Sector	**$ 26,958,382**	**$ 28,157,521**	**$ 29,717,224**	**$ 84,833,127**
Residential Sector				
Efficient Products	$ 6,170,838	$ 7,196,769	$ 7,995,259	$ 21,362,866
Existing Homes	$ 4,379,208	$ 4,864,056	$ 5,284,024	$ 14,527,288
Residential New Construction	$ 2,832,331	$ 3,250,910	$ 3,588,289	$ 9,671,529
Sub-Total Residential Sector	**$ 13,382,377**	**$ 15,311,735**	**$ 16,867,571**	**$ 45,561,683**
Research & Development	**$ 1,629,453**	**$ 2,168,379**	**$ 1,206,235**	**$ 5,004,067**
Total Electric Efficiency	**$ 41,970,212**	**$ 45,637,635**	**$ 47,791,030**	**$ 135,398,877**
Thermal Energy and Process Fuels Efficiency				
Business Sector	$ 1,332,300	$ 1,493,215	$ 1,622,601	$ 4,448,116
Residential Sector	$ 3,996,901	$ 4,479,644	$ 4,867,803	$ 13,344,348
Total Thermal Energy and Process Fuels Efficiency	**$ 5,329,201**	**$ 5,972,859**	**$ 6,490,404**	**$ 17,792,464**
TOTAL RESOURCE ACQUISITION ACTIVITIES	**$ 47,299,413**	**$ 51,610,494**	**$ 54,281,434**	**$ 153,191,341**
NON-RESOURCE ACQUISITION[1]				
Education and Training	$ 837,950	$ 854,700	$ 871,810	$ 2,564,460
Applied Research and Development	$ 403,725	$ 411,800	$ 420,040	$ 1,235,565
Planning and Reporting	$ 415,000	$ 614,270	$ 626,570	$ 1,655,840
Evaluation, Measurement and Verification	$ 880,000	$ 897,600	$ 915,560	$ 2,693,160
Policy and Public Affairs	$ 493,025	$ 502,880	$ 512,950	$ 1,508,855
Information Technology	$ 1,501,000	$ 1,199,020	$ 1,222,500	$ 3,922,520
General Administration	$ 261,400	$ 266,630	$ 271,970	$ 800,000
TOTAL NON-RESOURCE ACQUISITION	**$ 4,792,100**	**$ 4,746,900**	**$ 4,841,400**	**$ 14,380,400**
Operations Fee	$ 919,838	$ 996,268	$ 1,045,682	$ 2,961,788
Sub-Total Prior to Performance-Based Fee	**$ 53,011,351**	**$ 57,353,662**	**$ 60,168,516**	**$ 170,533,529**
Performance-Based Fee (set-aside)	$ 1,379,757	$ 1,494,402	$ 1,568,523	$ 4,442,682
TOTAL BUDGET INCLUDING PERFORMANCE-BASED FEE	**$ 54,391,108**	**$ 58,848,063**	**$ 61,737,040**	**$ 174,976,211**

[1] Non-Resource Acquisition totals have been rounded

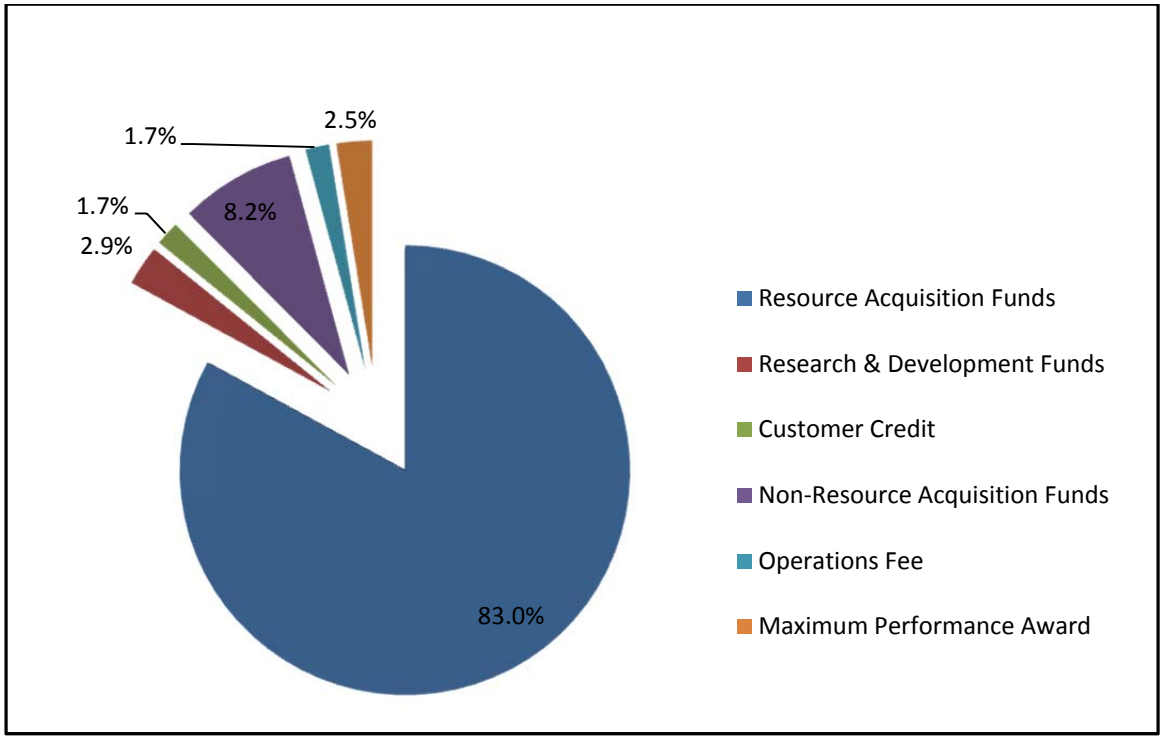
5.1.3 2015-2017 Electric Efficiency Budget



5.1.4 2015-2017 Thermal Efficiency Budget



5.1.5 2015-2017 Combined Efficiency Budget



5.2 QUANTIFIABLE PERFORMANCE INDICATORS

5.2.1 2015-2017 Electric Efficiency Performance Goals and Minimum Requirements

QPI#	Title	Performance Indicator / Milestone	Target
1	Electricity Savings	Annual incremental net MWh savings	321,800
2	Total Resource Benefits	Present worth of lifetime electric, fossil, and water benefits	$336,300,000
3	Statewide Summer Peak Demand Savings	Cumulative net summer peak demand (kW) savings	41,300
4	Statewide Winter Peak Demand Savings	Cumulative net winter net peak demand (kW) savings	53,700
5	Business Comprehensiveness	Savings as % of baseline year usage for Companies who complete Business Existing Facilities efficiency projects	11.0%
6	Market Transformation Residential	Vermont 1-4 unit residential new construction project completions with substantial energy savings in 2015-2017 as % of total 1-4 unit building permits in 2014-2016	42%
7	Market Transformation Business	Number of energy efficiency measure supply chain partners linked to at least 3 (completed) projects	500

MPR#	Title	Minimum Requirement	Minimum
8	Minimum Electric Benefits	Total electric benefits divided by total costs	1.2
9	Threshold (or minimum acceptable) Level of Participation by Residential Customers	Total residential sector spending	$32,500,000
10	Threshold (or minimum acceptable) Level of Participation by Low-Income Households	Total low-income single and multifamily services spending	$10,500,000
11	Threshold (or minimum acceptable) Level of Participation by Small Business Customers	Number of total non-residential premises with annual electric use of 40,000 kWh/year or less that acquire kwh savings	2,000
12	Geographic Equity	TRB for each geographic area is greater than values shown on Geo-Equity Table	14
13	Administrative Efficiency - Key Process Improvements	Meet all pre-determined milestones on schedule	TBD
14	Service Quality	Achieve 92 or more metric points	92
15	2015-2017 Spending	Spending for 2015-2017 is within 3% of the 2017 budget	$1,430,402

5.2.2 2015-2017 Electric Minimum TRB per Geographic Area (QPI #12)

Geographic Area[1]	Required TRB per Geographic Area[2]
Addison	$9,569,800
Bennington	$11,755,300
Caledonia	$7,381,200
Chittenden	$34,376,179
Essex/Orleans	$8,700,557
Franklin	$14,422,521
Grand Isle/Lamoille	$9,155,602
Orange	$5,985,825
Rutland	$19,819,855
Washington	$16,412,881
Windham	$16,951,229
Windsor	$16,433,720
Total	**$170,965,000**

[1] All geographic names above refer to Vermont Counties.

[2] Required TRB targets have been adjusted for Customer Credit

5.2.3 2015-2017 Thermal Energy and Process Fuels Performance Goals and Minimum Requirements

QPI#	Title	Performance Indicator / Milestone	Target
1	Thermal & Mechanical Energy Efficiency Savings	Annual incremental net MMBtu savings	246,000
2	Residential Single Family Comprehensiveness	a. Average air leakage reduction per project	34%
		b. Percent of projects with square feet of insulation added equivalent to at least 50% of the home's finished square feet of floor area	44%
		c. Percent of households (premises) with both shell measures and heating system measures installed, within contiguous calendar years.	16%

MPR#	Title	Minimum Requirement	Minimum
3	Threshold (or minimum acceptable) Level of Participation by Residential Customers	Residential sector spending as % of total spending	62.5%
4	Threshold (or minimum acceptable) Level of Participation by Low-Income Households	Low-income single- and multi-family spending as % of total spending	17.0%

5.3 APPLIED RESEARCH AND DEVELOPMENT ACTIVITIES

Efficiency Vermont will engage in a range of projects in 2015 as part of its Applied Research and Development efforts. The projects shown below constitute an initial list, which will undergo ongoing assessment to ensure its alignment with the goals and priorities outlined in this Plan. As noted in the Resource Acquisition and Non-Resource Acquisition Budget Summary in Section 5.1.2, the Applied Research and Development budget is $403,725, from which $228,725 will be allocated to Emerging Data Services and $175,000 will be allocated to Technology Demonstrations.

5.3.1 2015 Emerging Data Services

Inexpensive, abundant, and reliable data are beginning to transform the way energy services and research can be provided. Therefore, Efficiency Vermont must strategically plan how to use these data to deliver high value to internal and external customers, systems planners, and policy makers in changing energy markets and in the regulatory landscape. The associated benefits will increase the effectiveness of all energy efficiency services through resourceful approaches for obtaining business intelligence, analytics, and customer engagement that use multiple and varied data.

The Emerging Data Services category explores new strategies, techniques, and/or technologies that show promise for increasing energy savings, decreasing delivery costs, and increasing customer engagement and satisfaction. Efficiency Vermont particularly explores not-yet-proven approaches, given the custom nature and maturity of the programming in Vermont. Efficiency Vermont also supports other research and investigations that show promise to lead to greater market transformation. Although this work will often use Advanced Metering Infrastructure data, it also will involve data from energy sub-meters, environmental and process sensors, building energy management systems, demographic and real estate databases, and historical efficiency program activities.

The work of the Emerging Data Services category is ongoing, but it targets a specific outcome: Determining the value of an emerging data service. This exploration is currently a Non-Resource Acquisition (NRA) activity. Efficiency Vermont expects, however, that future work within this category will relate directly to Resource Acquisition (RA) programs and contribute to achieving energy savings. There are three basic conditions under which such a transition might occur:

1. **Investigating novel data applications for which no prior research exists:** Occasionally, Efficiency Vermont considers an idea—involving either software, hardware, or a combination of both—that promises to lead to successful implementation of cost-effective data services. Efficiency Vermont will research such ideas, to assess application to efficiency programming. The study design for this kind of investigation, developed under the NRA budget, will enable the promotion of effective technologies to scale, under other (presumably RA) budget categories.
2. **Analyzing an emerging data application for which prior research does exist:** From time to time, Efficiency Vermont recognizes that a promising data product or service can lead to more successful implementation of cost-effective program services. Efficiency Vermont will analyze existing research to determine the extent to which the approach should move directly into RA or other NRA categories. This condition does not involve in-house research.

3. **Applications that can be supported by an RA budget.** Efficiency Vermont will use the NRA category for investigation, development, and testing of new technology and approaches. It will use the RA category for the purchase of the validated technology platform, hardware, or software. Resulting data services that prove successful would then be implemented at scale, using RA budgets.

5.3.2 2015 Technology Demonstrations

Mapping Total Energy Burden: Energy burden can be described as the amount that households pay each month or year for electricity, heating, and transportation, and the hypothesis is that this varies widely among households and communities in Vermont. This project will map total household energy use in the state to identify areas that are 'hotspots' of high usage. Identifying communities with substantially higher overall energy use will enable recommendations of how spatial patterns in energy burdens can inform future Efficiency Vermont initiative planning and provide the potential to develop programs and marketing for specific areas in Vermont.

Deep Commercial and Industrial Energy Retrofits: There exists general sentiment in the engineering community that the technology exists to conduct deep energy retrofits achieving up to a 60% energy reduction in commercial and industrial buildings, resulting in very low energy use intensity (EUI) or being net zero ready; however, significant challenges exist. Efficiency Vermont will identify specific customers who are interested in this level of retrofit and will investigate ways to address the additional design costs and the 30 year payback associated with this level of deep energy retrofit. This effort will enable Efficiency Vermont to gain a greater understanding of the barriers, challenges, and related efficiency opportunities of this market, and help determine whether deep commercial and industrial retrofits are feasible and scalable in Vermont.

Pump Up the Savings: Heat pumps are growing in popularity with the promise of lower energy bills, and they could provide even greater savings if they are proven to produce a load shape that could qualify them for a lower electric utility rate. Some Vermont utilities have recently asked Efficiency Vermont to help gather more information about heat pumps in order to consider such opportunities. This project will focus on conducting, sharing, and applying the results of analysis on datasets (both existing and new) to reduce uncertainty of savings claims for HVAC measures, and improve the customer economics and systems benefit of heat pumps. One goal of this research is to provide a detailed report suitable for citing in TRM development.

Evaluation of Combined Heat Pump Water Heater and Residential Solar Hot Water Heating: This project will compare the energy use of conventional (electric or gas) and heat pump water heaters, each using solar thermal technology to preheat water. The aim of this effort will be to determine if heat pump water heaters offer measureable advantages due to their efficiency as backup during non-solar (cloudy or at night) periods as well as the degree of control that they offer in changing the rate of temperature recovery. This will be the second phase of a 2014 Research & Development project that focused on low-cost, remote metering for solar thermal installations.

Residential New Construction HVAC Design Study and Training: Heating, ventilation, and air conditioning (HVAC) designs in residential homes are among the longest standing and lowest tech parts of a house, and these systems are frequently specified by outdated "rules of thumb". This project will build on Efficiency Vermont's knowledge of HVAC systems and help educate Vermont installers about the latest best practices in design. One of the country's leading HVAC design groups

will be engaged to design a complete HVAC system (from scratch) in tandem with a Vermont builder and HVAC partner. All parties will be involved from early in the design phase, making this a true research and development project, with the added benefit of follow-through to completion. Onsite training will include Efficiency Vermont staff, builders, HVAC contractors, and others. This project will provide valuable training and enable monitoring of the prototype system's performance.

Maple Sugaring Electric Consumption: Maple sugaring technologies have been expanding rapidly in recent years. Some reverse osmosis equipment that once used fractional horsepower pumps have recently been upgraded to include larger pumping mechanism with much greater horsepower to control the flow of sap through the machine. Many sugarhouses are in remote areas and access to adequate electric supply to run these pumps is a challenge. Because the operating efficiencies of these reverse osmosis systems are not readily available, Efficiency Vermont will work with industry experts to explore electric efficiency opportunities. Insights gained through this project are expected to inform the evolution of the Maple Reverse Osmosis Program due to launch in early 2015.

Dairy Farm Refrigeration System Assessment: Due to increasing interest in new, energy-intensive refrigeration systems on larger dairy farms, Efficiency Vermont will engage farmers and dairy equipment vendors in an assessment of chiller refrigeration systems on larger dairy operations. Efficiency Vermont will use this opportunity to identify baselines and other potential efficiency opportunities, as well as to create a consistent approach for this type of refrigeration system. This project also will assess the cost-effectiveness of "up-sizing" smaller refrigeration equipment as an alternative to the installation of new chiller systems.

Low-e Storm Window Pilot: Windows are among the weakest thermal barriers in existing residential buildings. Unfortunately, energy efficient replacement windows are not a cost-effective energy saving measure because of high product and installation costs. This project will investigate the potential of energy efficient storm windows and interior panels to cost effectively reduce building energy consumption. Through upstream discounting and promotions, in collaboration with a manufacturer and one or more retail vendor, Efficiency Vermont will have the opportunity to evaluate the actual energy savings and customer satisfaction of these products in a sample of Vermont homes.

Home Energy Management System Baseline Assessment: Home energy management system technologies are drawing considerable interest and involvement from both established manufacturers and small innovators. At this early stage of these systems' emergence in the marketplace, products and services vary widely. Through this project, Efficiency Vermont will assess the baseline energy usage of these systems and will determine if insights gained may be of use in the design of software and hardware for energy efficiency purposes.

5.3.3 Recent Applied Research and Development Projects impacting 2015-2017 Plans

Efficiency Vermont Data Strategy and Analytics (Smart Grid / Advanced Metering Infrastructure)
Description: The growing amount of available data such as advanced metering infrastructure (AMI) interval data provides an opportunity to develop and implement a cost-effective approach for broader consumer-side energy efficiency services. An integrated data storage and analytics platform will allow Efficiency Vermont to develop and implement streamlined processes to deliver

recommendations and savings estimates and to verify results to customers more effectively. In addition, robust storage of statewide usage and other data with analytical capabilities will allow Efficiency Vermont to perform deeper market analysis for planning and verification purposes while ensuring confidentiality, privacy, and security.

Plans for 2015–2017: Work will continue in this area through the implementation of Efficiency Vermont's energy efficiency data platform to secure transfer of AMI data from Vermont distribution utilities. This implementation process will address privacy and cybersecurity considerations, project management, and development of infrastructure to enable customers to access their data. Efficiency Vermont will develop a set of analytical tools to help staff and customers take advantage of AMI data for identifying and verifying savings opportunities.

Classroom Lighting: Balancing Optimal Energy Efficiency and Illumination

Description: An effort to research and publish a practical guide for achieving high-efficiency and high-quality classroom lighting in Vermont K–12 schools, in partnership with lighting designers, the School Energy Management Program, and the Vermont Department of Education.

Plans for 2015–2017: "The K–12 School Lighting Guide" will continue to be a valuable resource for those designing classroom lighting systems for years to come.

Assessing the Ability of Smart Thermostats to Estimate Thermal Efficiency

Description: An investigation of smart thermostats, or programmable communicating thermostats, as tools to understand whole-house thermal performance. The study focused on estimating whole-building heat flux and disaggregating the heating energy usage due to behavior (turning temperature up and down) relative to the performance of the building envelope. The results of this 2012 project led to two expanded studies in 2013 and 2014. These studies measured the energy savings from installing smart thermostats in Vermont single-family and multifamily homes.

Plans for 2015–2017: The information gathered with the 2013 and 2014 expanded pilots will inform full implementation, expected in 2015–2016.

High-Performance (Low-Load) Homes

Description: Research exploring the design, construction, operation, and maintenance of high-performance, low-load residential buildings with the goal of implementing an initiative in support of such buildings. The whole-house monitoring performed as part of this study proved to be valuable. A 2013 High-Performance Home pilot became a viable Efficiency Vermont tier offering in 2014. Through continued monitoring of energy use and indoor air quality, Efficiency Vermont advances cost-effective energy efficiency upgrades while supporting a healthy living environment. Seven homes were completed in 2013 under the pilot and an estimated 15 homes are expected to be completed in 2014, including net-zero modular homes designed to offer Vermont homeowners an alternative to inefficient mobile homes.

Plans for 2015–2017: This initiative is expected to expand in 2015 and beyond.

Ductless Heat Pumps for Existing Homes

Description: Research to develop a methodology for quantifying energy savings from the installation of inverter-driven ductless heat pumps as a supplemental heat source in existing single-family homes with varying levels of shell efficiency. A ductless heat pump metering research and development project conducted in 2013 provided a foundation for current and future heat pump initiatives.

Plans for 2015–2017: Efficiency Vermont launched two heat pump pilot initiatives based on the 2013 project. These pilots have led to the development of a large-scale, statewide heat pump initiative, scheduled for launch in January 2015.

Continuous Energy Improvement (CEI) Dashboard

Description: Research to investigate the use of a graphical display "dashboard" of energy per unit production as a tool to allow employees in a manufacturing setting to better understand what impacts energy use and to encourage more active energy management through CEI efforts.

Plans for 2015–2017: Early results of this study indicate that an expanded use of dashboards is expected to be an important tool as Efficiency Vermont expands CEI efforts.

Path to Net-Zero Energy Homes

Description: In alignment with Vermont's goal of achieving "90% of Vermont's energy from renewable sources by 2050" as stated in the *2011 Comprehensive Energy Plan*, this effort aims to:

- develop and apply solutions to achieve comprehensive deep energy retrofits and net-zero energy in at least 10 existing homes across Vermont, and
- create a road map to inform program enhancements for a larger statewide approach toward achieving deep energy savings (50% or greater) in the residential market.

As part of this study, eight public presentations on the path to net zero for existing homes have occurred throughout 2014, with close to 40 consultations and five active zero-energy projects.

Plans for 2015–2017: Insights into the challenges in existing homes, as well as monitoring of several zero-energy home remodeling projects, continue to inform program design. Going forward, Efficiency Vermont will leverage this learning and continue to collaborate with partners to advance net-zero energy projects in both the residential and commercial sectors.

Low-Cost, Residential-Scale Remote Metering to Support Solar Thermal Heating Systems

Description: Research to identify and evaluate reliable, low-cost remote metering solutions for monitoring the performance of solar thermal systems. In partnership with solar contractors and other stakeholders in the industry, this effort aims to install meters in existing solar thermal homes and monitor them to ensure long-term performance of these systems, validate energy savings estimates, and establish metrics for "pay-for-performance" financing options for solar thermal.

Plans for 2015–2017: Although this project is still under way, its early results informed the design and development of the Solar Hot Water Initiative, which launched in 2014 and will continue in the 2015–2017 performance period.

Remote Savings Assessment with Internet-Connected Submeters

Description: Research to investigate whether inexpensive networked power meters could be installed by customers' electricians so that Efficiency Vermont staff could remotely analyze energy use and provide customized recommendations. The study identified several challenges involving coordination and communication during meter installations and developed a set of installation instructions and documentation forms to reduce costs and errors.

Plans for 2015–2017: A meter loan offering is currently under development, and is expected to launch in 2015. The goal is to provide data-driven recommendations about the most energy-intensive equipment in small and medium-sized businesses. Based on the results of research and development, the focus will be on streamlining system configuration, documenting installations, and providing real-time feedback to prevent common installation errors.

5.4 EVALUATION ACTIVITIES

5.4.1 2015 Portfolio-Wide Evaluation Activities

Annual Savings Verification - $50,000

The budget is based solely on Efficiency Vermont resources and does not include the annual savings verification activities of the Vermont Public Service Department (PSD). The budget is broken down into three categories:

1. Savings Preparation Budget

Savings preparation includes the initial conference between the PSD and Efficiency Vermont, and several steps involving the Efficiency Vermont customer database (KITT): Reconciliation, freezing, and providing the PSD with a snapshot of the savings database. The PSD generates the savings sample plan and provides Efficiency Vermont with a detailed list of projects it wishes to review. Preliminary project reports are provided by the PSD to Efficiency Vermont.

2. Savings Review Budget

Upon receiving the preliminary project report results from the PSD, Efficiency Vermont develops preliminary responses for each project and provides the PSD and its subcontractor, West Hill Energy & Computing, with any additional data and engineering assumptions used to calculate energy savings. The scope of the savings review can range widely, depending on the number of custom projects reviewed and the number and type of general questions. The scope can also vary from year to year, depending on the total number and types of projects closed. The number of custom projects selected for review typically ranges from 70 to 100 per year.

3. Savings Finalization Budget

Efficiency Vermont and the PSD meet in a savings finalization conference in early June to resolve any outstanding project and program issues highlighted in the preliminary findings. After the conference, Efficiency Vermont begins developing the "realization" spreadsheets to be applied to its KITT database. Data tools for future custom projects are modified where appropriate, and prescriptive screening tables are updated and revised to reflect the savings verification outcomes.

Technical Advisory Group (TAG) - $ 137,000

The Technical Advisory Group (TAG) resolves issues that arise from annual savings verification and serves as a proactive mechanism to develop energy characterization and savings calculations, ensuring the most accurate savings claim methods are applied to each year under the Efficiency Vermont contract. The TAG budget was developed based on 2014 activities and is broken down into the following five categories:

1. TAG Coordination

TAG coordination consists of scheduling monthly meetings, updating the TAG tracker, and coordinating communications around proposals and responses.

2. Measure Characterization Proposal Preparation

Characterizing new measures involves coordination and collaboration between Efficiency Vermont and its subcontractors to address specific issues. This coordination and collaboration might include general scoping meetings, measure research, and surveys that provide information to shape programmatic proposals.

3. Proposal Review

All programmatic proposals are required to go through a formal review process, using Efficiency Vermont expertise in measurement and markets, as well as subcontractors who have had similar experience in jurisdictions outside Vermont.

4. Proposal Discussions

Proposal discussions are carried out after Efficiency Vermont receives an official response from the PSD. Discussions involve small workshops to determine problem-solving steps to address substantive issues.

5. Adjustments Due to Outcomes

Assumptions and measure characterizations in Efficiency Vermont's KITT database and energy analysis tools need to be modified and revised after agreement has been reached between the PSD and Efficiency Vermont. This activity is a collaboration among Efficiency Vermont information technology, operations, and technical staff.

Technical Reference Manual (TRM) – $330,000

The Technical Reference Manual (TRM) budget is based on an assumption that there will be more frequent and rigorous annual TRM review across the three-year budget period. This review is the result of a TAG agreement in 2010 to enhance TRM reliability. The TRM budget is broken down into the following five categories:

1. TRM Management

This activity involves managing portfolio submissions and updating the TRM tracker. TRM management also includes the re-characterization of measures and savings methods to be applied to Efficiency Vermont's prescriptive tools for savings upload and calculation purposes. In addition, this activity includes the annual release of the updated Efficiency Vermont TRM.

2. TRM Development and Research

TRM development is based on research of new technologies and changing market conditions. All measure characterizations require considerable research, ensuring that all characterization accurately reflects the most current savings determination methods incorporating efficiency evaluation findings from other states and those at the national level.

3. TRM Updating

This activity includes the annual updating of existing measure characterizations, based on findings during savings verification. It also includes changes to baselines or potential market transformation as a result of new evaluations.

4. TRM Review Budget

Efficiency Vermont internally reviews all updated TRM measure characterizations prior to submitting them to the PSD for comment and approval. This effort is undertaken by technical staff, planning and development managers, and subcontractors. In addition, this activity includes yearly review of older TRM characterizations that could be reaching obsolescence. In such cases, the TRM characterizations might be identified for update or removal from the TRM.

5. TRM Meetings and Workshops

These meetings, between Efficiency Vermont staff and PSD staff, and are convened as needed. The budget is based on historical experience.

ISO-New England Measurement & Verification - $265,000

VEIC operates as a New England Power Pool (NEPOOL) market participant on behalf of Efficiency Vermont's performance in the Independent System Operator – New England (ISO-NE) Forward Capacity Market (FCM), which is measured via an annual sampling plan for small, medium, and large custom business projects. This budget was developed using historical costs incurred for required FCM evaluation activities. The ISO-NE measurement and evaluation budget is broken down into the following four activities:

1. Measurement and Verification Implementation

Measurement and verification implementation begins with the development of an initial sampling plan representative of the entire Efficiency Vermont portfolio. Subsequently, metering plans are developed and reviewed to ensure that the correct approach is implemented for the projects in the sampling plan. The budget includes costs incurred as a result of implementing the metering plan; installing meters on customer's equipment, collecting metered data, and removing the meters.

2. Measurement Review

All project meter data undergo review for reliability and validity. This includes analyzing meter data at 15 minute intervals across a season, with an average of two weeks' data. Additionally, a review of engineering assumptions and measure characterizations is also undertaken when required.

3. Measurement and Verification Finalization

As in the annual savings verification process, realization rates are calculated and applied to the appropriate databases by Efficiency Vermont technical personnel. Efficiency Vermont might amend analysis tools to reflect updated measure assumptions. A third-party independent process audit is undertaken, as required by ISO-NE, to verify that VEIC has complied with their submitted and approved measurement and verification plan.

4. Equipment and Calibration

To meter projects identified in the sampling plan, Efficiency Vermont routinely purchases metering equipment to conduct testing and analysis. Occasionally, because of the unique nature of a measure, specialized equipment is fabricated. All equipment used is required to be National Institute of Standards and Technology calibrated in accordance with ISO-NE requirements. This budget reflects the costs associated with both meter calibration and the scheduling of meters for selected projects.

5.4.2 2015 Initiative-Specific Evaluation Activities

Initiative-level evaluation activities will be assessed and adjusted as needed to ensure their alignment with the goals and priorities outlined in this Plan. The estimated budget for each individual activity below is between $2,000 and $10,000.

Category	Description/Intent
SMARTLIGHT Upstream Evaluation	The evaluation will monitor the performance of the SMARTLIGHT program to verify participation, measure the in-service rate, and compare the results to the 2012, and 2013 comprehensive studies of SMARTLIGHT In-Service-rate (ISR). This will help ensure distributor compliance with program requirements. Efficiency Vermont will visit commercial customers in person and will interview residential customers by phone.
Residential New Construction	Efficiency Vermont plans to conduct interviews with a range of home builders (custom home builders, mid-scale builders, developers) across different regions of Vermont to assess: • What home attributes customers value most (such as comfort, durability, low purchase price, low operating costs, healthy indoor air, etc.) • How they are currently marketing homes to customers • What resources and training Efficiency Vermont could provide to help them promote the value of the Residential New Construction program (and energy efficiency in general) to customers The goal is to work more collaboratively with builder partners as an extended sales force for energy efficient homes.
Rental Property Owners Evaluation	Market research to identify barriers and opportunities to retrofitting new efficient appliances (refrigerators, clothes washers, dryers, air conditioners, etc.) in residential rental properties. Will inform rebate amounts for rental property owners, as well as identify best practices to promote the initiative.
Weatherization Assistance Program	Evaluation of core low-income initiatives, primarily implemented through the Weatherization Assistance Program (WAP): • WAP Add-On • Targeted High Use • Vermont Fuel Efficiency Partnership Evaluation activities focused on subcontractor performance to implement projects: • Ensuring all available opportunities were identified and treated • Verification that on site installations match subcontractor invoicing • Verification that customer preferences or concerns were sought out and addressed • Verification that subcontractors have the resources (products, training, budget) to attain subcontract goals.
Vermont Lodging Market	Efficiency Vermont plans to conduct roundtables of lodging operators and owners to determine needs, motivations, and expectations for programs in 2015 and beyond. The roundtables will be in two different locations and will target different lodging operation sectors (by size: small and medium/large).

Farm Ventilation	Assess the savings calculations currently being utilized for the agricultural custom ventilation projects. Efficiency Vermont will conduct metering at approximately 10 customer sites. In order to get meaningful results, metering will be conducted during the cooling season. These results will help inform future program changes. Analysis of results will be undertaken by Efficiency Vermont and submitted to the Vermont Public Service Department for review.
Reverse Osmosis for Maple Sugaring	Metering will be conducted to verify the calculations that will be developed for this program. Although metering plans will be in place in 2015, the actual metering will not take place until sugaring season in the spring of 2016, hopefully in time for verification. Metering will be used to verify the rating and effectiveness of reverse osmosis in removing water from the sap. This will determine the amount of water that does not need to be boiled. Verification may also be conducted by assessing the amount of fuel (wood, oil) used to create a given amount of syrup.
Agricultural Customer Feedback	Soliciting feedback from two customer segments: • Dairy equipment vendors regarding existing services and feedback for future program design; this will most likely be in-person focus groups. • Non-dairy farmers - Feedback as it relates to their general concerns and needs and about how they use energy; this will likely be in a mail or telephone survey format, in coordination with other agricultural service providers.

5.4.3 Recent Evaluation Results Impacting 2015-2017 Plans

SMARTLIGHT Lighting Initiative

Description: Efficiency Vermont and Burlington Electric Department have partnered with electrical distributors to offer contractors and customers the most efficient replacement lamps on the market at a cost comparable to that of conventional products.

Evaluation Activities: As part of its continuous improvement efforts, Efficiency Vermont has undertaken program evaluation activities focused on the following:

- In-service rate(s) of products purchased and site inspections
- Distribution of LED products between customer type (commercial / residential)
- Commercial customer inventory preferences and product stocking practices
- General awareness of the discounts applied through SMARTLIGHT at the customer level
- Why the products were purchased

Evaluation Results: As a result of lessons learned from the SMARTLIGHT program evaluation activities, Efficiency Vermont has implemented the following changes:

- Distributors must provide the following information for all transactions:
  - Customer phone number
  - Customer type (residential / commercial).
- Measure savings are calculated and uploaded according to the actual customer classification (residential / commercial) as opposed to being allocated according to a calculated split.
- The in-service rate is being applied according to the actual customer classification rather than a blended value.
- Residential transactions are limited to a total of 12.

- Clarifying language is now included within the Participating Distributor Agreement stating that all products must be installed at the end user's location.
- A brochure was developed to increase customer awareness of the program.
- Ongoing annual quality assurance activities were developed in alignment with Efficiency Vermont prescriptive offerings.

Home Performance with ENERGY STAR

Description: Home Performance with ENERGY STAR is a national brand, managed by the U.S. Department of Energy, designed to ensure a comprehensive, whole-house approach to energy efficiency and to maximize long-term savings for homeowners.

Evaluation Activities: Efficiency Vermont's Home Performance with ENERGY STAR efforts have undergone several process and impact evaluations, carried out by Efficiency Vermont and assisted by independent, third-party evaluators. Full reports and results can be found here:

- www.publicservice.vermont.gov—If you're reading a non-electronic document, go to this web address and search for "Energy Efficiency Utility Performance Evaluation". Then click the link of that name, and scroll down to the link "Impact Evaluation—Efficiency Vermont Home Performance with Energy Star".
- www.efficiencyvermont.com—If you're reading a non-electronic document, go to this web address and search for "Home Performance report".

Evaluation Results: As a result of the evaluation efforts, changes being considered or put in place by Efficiency Vermont are as follows:

- Allowing customers to "stage" their projects by setting priorities with their contractor that meet their budget over several years, while maintaining their eligibility for incentives.
- Continuing follow-up with "stalled" customers who have completed audits, but have not yet followed through on retrofit projects. This tactic proved effective in 2013 as a means of notifying customers of the limited-time bonus incentive.
- Seeking more opportunities to integrate promotion of Home Performance with ENERGY STAR into other Efficiency Vermont program offerings, particularly those for efficient consumer products.
- Making system and process improvements to streamline the customer and contractor experience. Efficiency Vermont acquired new software to aid contractors in entering audit and project information and to increase transparency for customers, while streamlining reporting and data analysis for program staff. The new software will provide:
  - work flow management for contractors;
  - increased customer engagement opportunities throughout the work flow;
  - an online customer portal to guide homeowners step-by-step through projects, and
  - streamlined reporting and trend data for program staff.

In addition, Efficiency Vermont has taken the following steps to improve the existing HERO audit tool and overall savings estimates for ongoing programs:

- Set the minimum pre-retrofit R-value for foundation walls to R-3 (present minimum is R-0)
- Set the "n-factor" used in air-sealing savings calculations rather than allowing the contractor to vary this number according to the height and exposure of the building
- Set the minimum value for heating system efficiency (e.g., 60%) and changed at least one default efficiency (wood to 60% from 45%) to a higher value

Energy Savings Kit

Description: This offering has been available to residential customers since 2013. Customers must opt in to receive kits, which contain products to help them reduce their electrical usage and provide tips on actions they can take to save energy and money.

Evaluation Activities: Upon completion of the trial phase of the program, Efficiency Vermont undertook program evaluation efforts focused on:

- telephone surveys of participating customers to determine in-service rate of products delivered;
- customer feedback on energy savings kit product preferences, and
- review of customer mail-in feedback cards and follow-up on additional energy efficiency opportunities.

Evaluation Results: As a result of the evaluation efforts, changes being considered or put in place by Efficiency Vermont are to:

- support products with a high in-service rate, as they demonstrate customer need and satisfaction with products;
- add more products indicated by customer feedback cards (for example, adding an LED screw-base bulb), and
- modify customer feedback cards to track additional customer feedback.

Agricultural Engine Block Heater Timer

Description: Engine block heaters are typically used during cold weather to warm an engine prior to start. A timer allows a user to preset the heater to come on for only the amount of time necessary to warm the engine block, reducing the time that the heater is needed, thereby reducing electricity use. Efficiency Vermont offers financial incentives for these timers in agricultural applications.

Evaluation Activities: Efficiency Vermont undertook the following program quality assurance activities:

- Site inspections
- Customer telephone surveys

Evaluation Results: As a result of the evaluation efforts, Efficiency Vermont:

- increased its efforts to collect appropriate wattage data on engine block heaters;
- discontinued the prescriptive implementation of the engine block heater timers for agricultural equipment because evaluation results demonstrated significant variability in prescriptive savings, and
- identified opportunities to deliver an improved program for commercial vehicle fleets.

5.5 2015-2017 RESOURCE ACQUISITION RESEARCH AND DEVELOPMENT RESEARCH PLAN

Resource Acquisition (RA) Research and Development (R&D) activities will support research, pilot projects, and other efforts designed to meet high-level Efficiency Vermont goals to promote increased customer engagement, comprehensiveness, program innovation, and, ultimately, increased savings through behavior-based initiatives. These efforts will be guided by clearly defined research objectives and measurable outcomes, developed in collaboration with the Vermont Public Service Department (PSD) and other relevant stakeholders. The primary objective of these investigations is the determination of a program's ability to achieve verifiable savings, and whether those savings can be delivered cost effectively. The following table outlines the approved budgets for this performance period.

RA R&D Approved Budgets for Efficiency Vermont – EEU-2013-01 Order July 9, 2014

2015	2016	2017	Three-year total
$1,629,453	$2,168,379	$1,206,235	$5,004,067

Savings will not be claimed from the efforts directly funded through this budget. The expectation is that, once all parties are in agreement that the approaches developed through these efforts result in robust, reliable, verifiable, and cost-effective savings, programs or activities will then be funded from Efficiency Vermont RA program funds.

A three-year Research Plan for these R&D activities is outlined in the sections below. Overall objectives for this effort include:

- Continuing and enhancing behavior initiatives begun in 2014 to result in stable, effectively delivered programs – with appropriate evaluation and research to support recognition of savings and subsequent transfer of activities to RA program funding.
- Designing and piloting additional initiatives to:
    - Demonstrate the potential for specific engagement strategies and measurement and verification (M&V) approaches to achieve significant behavioral savings when taken to scale as full programs.
    - Serve additional sectors beyond the proposed residential and large commercial and industrial pilot (C&I) programs described here.
- Learning more about how to achieve the greatest amount of aggregate savings and ratepayer value from behavioral programs, including savings from energy management and conservation and savings from increased customer participation in programs or the adoption of technology, including how to identify and apportion these savings.
- Including “basic research” as well as establishing programs (see “Other Behavior Research” section, below, for examples).

2015-2017 Research Plan for RA R&D

The following table summarizes the initiatives and budgets for the three-year research plan. This budget category includes labor costs and data infrastructure costs as well as other program delivery and administrative costs.

	2015	2016	2017	2015-2017
Current Residential Initiatives				
Home Energy Reports	$716,358	$1,020,132	$0	$1,736,490
Behavioral Demand Response	$108,000	$0	$0	$108,000
Subtotal:	**$824,358**	**$1,020,132**	**$0**	**$1,844,490**
Current C&I Initiatives				
Continuous Energy Improvement	**$303,690**	**$343,572**	**$408,492**	**$1,055,754**
New Research				
New Market Initiatives	$37,500	$525,000	$626,147	$1,162,500
Data Analytics	$418,561	$198,506	$88,616	$705,684
Other	$45,344	$81,169	$82,980	$212,940
Subtotal:	**$501,405**	**$804,675**	**$797,743**	**$2,103,823**
TOTAL	**$1,629,453**	**$2,168,379**	**$1,206,235**	**$5,004,067**

Details of these initiatives are provided in the following sections, with descriptions, proposed research questions[5], and an outline of the three-year plan given for each.

Home Energy Reports Pilot

Description: Launched in November 2014, the Home Energy Report (HER) Pilot provides individualized, comparative electric usage information and energy saving tips to residential customers through mailed and emailed reports. Reports will be delivered to 100,000 Green Mountain Power (GMP) customers using a randomized treatment and control group design (RCT) in the following stratifications:

- 25,000 high-energy users will receive seven reports per year.
- 25,000 above-average-energy users will receive five reports per year.
- 50,000 average- to low-energy users will receive three reports per year.
- 20,000 customers will serve as the control group and will receive no reports.

Because of delays in data transfer implementation for other utilities, only GMP customers are eligible for the first roll-out of this pilot. The program is delivered by Opower.

In addition to usage information, a limited number of scheduled promotions will be provided within the reports, designed to increase participation in Efficiency Vermont's ongoing programs. Customers

[5] Investigation of some research questions may be funded by the Vermont Public Service Department's 2015-2017 EEU evaluation budget.

will also have access to a web portal that provides an individualized customer interface with program information and customers' own data and analysis (including AMI data).

Research Objectives:

- Test and establish an effective means for motivating residential customers in Vermont to undertake energy management and conservation behaviors to reduce energy usage.
- Determine achievable electric savings levels in Vermont, which is a state with a long history of efficiency participation, high levels of program spending, low penetration of air conditioning, etc.
- Explore the potential for determining thermal savings associated with actions taken in response to these communications.
- Demonstrate an M&V approach to quantify savings from these behavioral changes.
- Determine the appropriate program costs and cost-effectiveness.
- Determine the impact of the pilot on low-income customers as possible – motivational effect, savings, customer perceptions, and other determinations.
- Explore the magnitude of double counting savings from program-related actions undertaken by the participants – including participation in upstream-supported programs – and develop effective means of accounting for these effects.
- Determine the incremental effect of this outreach on other program participation (program lift), including how and whether different behavioral program actions or design elements influence the extent of this effect.
- Collect customer feedback on their experience, actions taken in response to these communications, enhanced perceptions of efficiency and Efficiency Vermont, etc.
- Review methods determined by evaluation of other programs to establish robust estimates of program persistence; consider undertaking such evaluations for this pilot.

Plans for 2015–2017: The R&D plan includes support for this pilot for 2015 and 2016. It is expected that by the end of these two years of testing, either cost-effective savings will have been proven for this approach – at which time it will be continued as an RA program – or it will be discontinued. Owing to this expectation, there are no funds allocated to this effort for 2017.

Residential Behavioral Demand Response Pilot

Description: This Behavioral Demand Response (BDR) pilot is an extension of the initial pilot delivered in the summer of 2014. The initiative represents a partnership between Efficiency Vermont and GMP, designed to explore the ways these two organizations can provide enhanced benefits to their joint customers through innovative approaches to reducing energy use during peak hours. The BDR approach delivers email and/or phone (IVR) messages to targeted residential customers to alert them of a utility peak event scheduled for the following day, with tips to suggest energy-saving actions. Feedback on the results of the customer's peak usage is provided to them within two days after the event. The program runs for up to five peak events, and the pilot concludes with a "report card" for the season, outlining the cumulative savings for both the individual customer and the program as a whole. Individualized customer messaging is driven by AMI data. The program is delivered by Opower and is implemented and cost-shared in partnership with GMP to their residential customers. The 2014 summer pilot included ~32,000 GMP customers and a control group of ~22,000. Because of delays in data transfer implementation for other utilities, only GMP customers were eligible for the first roll-out of this pilot.

Efficiency Vermont will investigate the benefits of repeating the BDR pilot in 2015. Discussions are currently underway with GMP as to the final research design, which will be determined by research objectives and budget.

Research Objectives:

- Test and establish an effective method for motivating residential customers in Vermont to undertake actions to reduce energy usage during defined peak hours without price signal or direct financial reward.
- Determine savings levels in Vermont, which has low penetration of air conditioning.
- Develop and test alternative messaging about means to save, during summer peak hours, other than reducing use of air-conditioning.
- Demonstrate an M&V approach to quantify savings from behavioral changes during peak hours.
- Assess savings during peak hours, as well as any cumulative residual effects of savings during non-peak hours, and assess persistence of the latter.
- Determine the appropriate program costs and cost-effectiveness.
- Collect customer feedback on their experience, actions taken in response to communications, enhanced perceptions of efficiency and Efficiency Vermont, etc.
- Determine persistence of response by comparing savings from the second and first year of the program, and by comparing savings of repeat participants to those of new participants.
- Assess any interactive effect on savings from customers involved as well in the HER Pilot.

Plans for 2015–2017*:* It is expected that, by the end of this pilot's second year (2015), either cost-effective savings will have been proven for this approach – at which time it will be continued as an RA program – or it will be discontinued. Owing to this expectation, there are no funds allocated to this effort for 2016 or 2017.

Continuous Energy Improvement Pilot

Description: Continuous Energy Improvement (CEI) is an approach designed to reduce energy intensity over time for large C&I customers. Designed appropriately, this type of program can benefit not only industrial customers but also large institutional and commercial customers. The approach is characterized by demonstrated customer commitment, assessment and planning, increased levels of real-time energy management, systematic measurement, and extensive customer engagement through Account Management outreach. The target market for this effort includes approximately 50 of the state's largest energy users.

In 2014, Efficiency Vermont launched a CEI pilot with eight industrial customers and one health-care facility (all under active Account Management). Customers were provided with: A set of group-focused trainings and peer interactions; individual, on-site trainings (Kaizen); support for assessment and development of energy and procurement plans, and software tools (Sensei) and metering equipment for real-time energy usage feedback and management. The pilot was designed to use the protocols outlined in *Superior Energy Performance: Measurement and Verification Protocol for Industry*[6] (SEP) approach for monitoring, tracking, and reporting performance.

[6] Developed by the Regents of the University of California, 2012.

During 2015-2017, work will include research and evaluation activities to confirm the validity of this approach -- as used to calculate and verify savings attributable to energy management and conservation behaviors -- and to confirm attribution to specific Efficiency Vermont and customer activities.

Research Objectives:

- Test and establish an effective means for motivating industrial customers in Vermont to undertake energy management and conservation behaviors to reduce energy usage.
- Demonstrate an M&V approach to quantify savings from behavioral changes; quantify the relative magnitude of project-based savings vs. behavior-based energy savings from energy management and conservation.
- Provide opportunities for enhanced engagement with those customers who are looking to improve their energy management and for Efficiency Vermont staff to engage more fully with these customers.
- Test the ability for Efficiency Vermont's Account Management staff to cost-effectively affect customers' energy management strategies. This includes developing processes to assess and track costs related to the pilot.
- Increase the identification of additional capital projects from each customer through CEI on-site activities, workshops, and trainings; assess the incremental effect of this outreach on projects and other program participation (program lift).
- Determine the pilot's ability to enhance customer relationships by increasing the number of company contacts Efficiency Vermont is working with in each customer facility.
- Inform the type and cost of system enhancements -- such as improved data reporting or permanent sub-metering -- required to undertake a successful CEI program with customers.
- Test the ability of Efficiency Vermont engineering staff to collect customer energy usage data, generate reliable baseline models, track deviation of actual usage from the model, and estimate savings.
- Develop a system to capture program-related costs, including customer as well as program costs.
- Gain experience applying analysis concepts outlined in the SEP M&V protocol.
- Increase per-customer value commensurate with the Energy Efficiency Charge (EEC) investment made by this customer group.
- Establish effective metrics to deliver the CEI approach to non-industrial C&I customers, such as large institutions or commercial buildings; share these protocols with other program administrators across the country.

Plans for 2015–2017: The efforts for this pilot in 2015 will be to refine this CEI approach with the prospect of capturing significant savings from behavior change as well as motivating increased efficiency project investment. Efforts targeting a second group of customers are planned for launch in 2016, drawing from a more-uniform set of company types in order to standardize the approach and delivery. Wastewater facilities are being considered as that second targeted group (or perhaps as an additional roll-out). If interim results are positive, efforts targeting a third group will be planned for 2017, with the objective of implementing across a broader segment of the Vermont commercial and industrial market in future years as an RA program.

Research into Behavior Savings in New Markets

Description: The program design and M&V approaches discussed in the two initiatives above reflect the best practices for behavior programs when either: 1) very large populations of fairly uniform customers can be identified, reached, tracked, and evaluated through randomized controlled trial RCT methods, or 2) single customers have available real-time data and sufficient energy usage to, together, allow intensive customer interaction to be a cost-effective way to motivate and assess behavioral savings. It is not readily apparent that either of these approaches addresses the characteristics of some other important Vermont markets – for example, low-income customers, small and medium size businesses, or community based outreach. Because of the value of finding effective means of prompting such customer types to undertake comprehensive energy efficiency actions, Efficiency Vermont will explore strategies to effectively motivate and capture behavioral savings. There are three steps necessary to be able to capture such savings: 1) identifying and engaging the customer; 2) providing appropriate interventions that lead customers to undertake changes in energy usage behaviors, and 3); being able to measure and track the appropriate information that allows verification of the resulting savings. Research will be undertaken to assess the potential for each of these steps, with results informing the design and implementation of pilot programs to test in the field.

Research Objectives:

- Inventory and evaluate the potential of data analysis to drive behavioral actions; in particular, assess whether data is sufficient to identify and target these market segments. Obtain additional data if needed and available.
- Inventory behavioral approaches to these markets undertaken by other program administrators.
- Assess products on the market or research in support of methods designed to engage these particular market segments effectively.
- Inventory and evaluate data analysis potential for driving behavioral actions.
- Develop requirements for new or modified M&V approaches that could be applied to categories of customers or program delivery schemes other than those currently widely used.
- Design pilot studies to test approaches, with implementation targeted for 2016 and 2017.

Plans for 2015–2017: In 2015, research and development activities will focus on the determination of the potential for developing effective methods of capturing behavior savings from these markets, and identification of which market(s) to address. Potential candidate markets include low-income customers, small and medium businesses, and community engagement efforts. In 2016 and 2017, funds will be used to design and implement pilots to test customer identification, customer engagement, and M&V methodologies.

Data Analytics

Description: The growing amount of available customer data, such as AMI interval data, provides an opportunity to educate and engage customers more fully around their energy usage, and to develop and implement cost-effective approaches for broader consumer-side energy efficiency services to customers. In addition, Efficiency Vermont's new integrated data storage and analytics platform incorporates a broader set of customer data (beyond usage alone) that will allow insights into

customer characteristics not previously available. The plan for the research and development period is to develop and implement streamlined processes to deliver recommendations and savings estimates, and to verify results to customers more effectively. In addition, this robust storage of statewide usage and other data with analytical capabilities allows deeper market analysis for planning and verification purposes. Over the research and development period, Efficiency Vermont will be investigating the power of this information, and tools developed to understand it, for enhancing customer engagement, motivating customer action, and capturing energy savings. Research projects may also be developed to test methods to best realize the value of the state's smart grid investments and higher-resolution meter data.

Research Objectives:

Examples of possible inquiry and tool development include:

- Determine data availability needed to make population-level inferences within markets and to understand trends.
- Develop predictive analysis methods and tools to identify likely program participants.
- Develop tools engineering staff can use to uncover savings that would not be visible during a traditional site survey, and insights that demonstrate to our customers that our value proposition is above and beyond incentives, and have real technical value to provide and support them in the energy decision-making process.
- Identify information that can be used to help curtail peaks and investigate the value of load shifting.
- Develop methods and tools for targeted marketing and to identify customers who may require assistance before they initiate contact with Efficiency Vermont.
- Determine the potential for custom data-driven interfaces to account holders through planned web interfaces.
- Research the ability to separate changes in energy use from variation driven by weather, production, and other factors.
- Determine the feasibility of modeling each customer's energy use in a way that allows dynamic detection of high monthly bills.
- Determine the data and analysis needed for customer segmentation and reporting for small and medium size businesses to begin addressing the requirements for delivering scalable, differentiated services to this market.
- Determine the data and analysis needed for better identification of low-income customers to begin addressing the requirements for delivering better scalable, cost-effective services to this market.

Plans for 2015–2017: The tools developed and the insights obtained through this work will be used to inform Efficiency Vermont programs and processes going forward. Efficiency Vermont expects that, over time, much of what is learned from this work will become integrated into ongoing program and customer support processes within traditional programs and initiatives. The level of research and development support needed for this pilot, therefore, will fall over the three-year period as programs and initiatives revise their customer engagement and program planning, delivery processes, and budgets to include this information and analysis. That is, levels of spending for this work will not be likely to decrease from the level shown here for 2015. The budgets shown in this initiative for 2016 and 2017 reflect the portion of that spending expected to still be classified as research and development, with the balance contained in the appropriate program budgets in those years.

Other Behavior Research

Description: As part of the three-year Research Plan for this initiative, additional fundamental or cross-cutting questions will arise that do not directly lead to program implementation. These additional research questions will be identified as the work progresses toward the initiatives outlined above, and through the coordination and discussion with the PSD. Owing to such questions, Efficiency Vermont will engage in a range of potential efforts, including:

- investigate fundamentals of behaviorally related savings calculations;
- address barriers that exist because of lack of information;
- better identify savings beyond and distinguished from those created from program participation and equipment measures;
- work to better understand energy demand, and
- identify creative ways to engage customers.

Efficiency Vermont will also provide some funding for participation in conferences and other forums related to innovation and best practices in behavioral efficiency.

Research Objectives:
Examples of possible inquiry include:

- Developing M&V approaches that the Independent System Operator – New England (ISO-NE) will accept for claiming behavioral peak savings for the Forward Capacity Market (FCM).
- Assessing challenges with traditional behavioral savings M&V and proposing and testing alternatives (such as attribution of product baseline savings within behavior savings calculations).
- Determining the potential for customer response to time-of-use pricing or other rate structures.
- Outlining the opportunities and challenges of tracking energy efficiency performance through assessments of impact on total usage.

Plans for 2015–2017: The results of these inquiries will be used to inform programs and processes going forward. Additional questions -- not directly related to individual programs or initiatives -- are expected to arise as part of the development of other work within this plan, and as such we have allowed for ongoing opportunities for basic research and analysis.

5.6 COMMUNITY FORUMS AND STAKEHOLDER ENGAGEMENT

As Efficiency Vermont's operations and scope have grown in recent years, public interest in its work has also increased. In the autumn of 2014, as part of its planning for the 2015-17 performance period, Efficiency Vermont held a series of community forums and other approaches to increase public awareness of its work, and to gather public input regarding priorities going forward.

The opportunities for public engagement included both in-person and online approaches. For in-person events, Efficiency Vermont scheduled a series of community forums throughout the state, taking particular care to select locations that were accessible to every region of the state. Forums were conducted in October and November in St. Albans, Barre, Lyndonville, Bennington, and

Brattleboro. At the time of the filing of this Plan, additional forums were scheduled to be held in December in Brandon, Richmond, and Fairlee.

For Vermonters not able to take part in an in-person forum, Efficiency Vermont developed an online survey through which members of the public could offer comments on Efficiency Vermont services and priorities, and provide rankings for priorities to be considered.

Efficiency Vermont engaged in significant outreach to ensure that the public was aware of these feedback opportunities. This included: An appearance by the Efficiency Vermont Director on Vermont Public Radio's "Vermont Edition" statewide public affairs program; an opinion column that ran in 12 newspapers around the state, and extensive direct outreach from Efficiency Vermont staff members to their customers and via community groups and organizations to their respective memberships.

The level of public interest thus far has been notable. At the initial five community forums in October and November, 111 members of the public attended and filled out surveys. As of this writing, an additional 44 individuals completed online surveys. From those initial five forums, here are a few key themes that emerged consistently:

1. Vermonters are interested in "total energy" approaches. In particular, there is a strong interest in Efficiency Vermont taking a larger role in thermal efficiency.
2. The contractors and partners who Efficiency Vermont works with are independent, but they are also a reflection on Efficiency Vermont itself. Several commenters at multiple meetings discussed the need for Efficiency Vermont to more closely monitor issues such as contractor quality and training to ensure that services are being effectively delivered.
3. There was a widespread view that the value of Efficiency Vermont is more than just the sum of the specific programs it operates. A common sentiment expressed at many meetings was support for Efficiency Vermont being a partner in helping Vermonters make good energy choices and to align with broad state energy policy goals.
4. Efficient heating technologies were of significant interest. From heat pumps to biomass, there was a recurring interest in Efficiency Vermont playing a larger role in explaining, promoting, and incentivizing the use of heating systems that were low-cost and low-carbon.

Following the conclusion of the December forums, a full report on the forums and online survey results, comments from the public, and how Efficiency Vermont intends to incorporate this information into its 2015-2017 operations will be provided to the Vermont Public Service Board, the public, and other interested parties.

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