

2016 Vermont State Agency Energy Plan

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Executive Summary

As one of Vermont's largest energy users, state government has an immense opportunity and an important role to play in demonstrating how public and private sector organizations from across the state can contribute to meeting Vermont's energy and climate goals. The State Agency Energy Plan (SAEP), prepared by the Department of Buildings and General Services with input and guidance from the Governor's Climate Cabinet and support from state agency staff, lays out a road map for how state government can lead by example as Vermont's Comprehensive Energy Plan is implemented. As state agencies put this plan's recommendations into action, they will show that Vermont's goals are within reach.

This SAEP establishes clear and measurable energy goals for state government in three major areas: Reductions in total energy consumption across all facilities and operations; expansion of the share of state energy that comes from renewable sources such as solar, wind, high-efficiency biomass, and hydroelectric power; and reductions in state government emissions of greenhouse gases that cause climate pollution.

The 2016 State Agency Energy Plan establishes these goals:

- **Reduce total energy consumption by 20% by 2025, and by 25% by 2030.**
- **Meet 35% of the remaining energy need from renewable sources by 2025, and 45% by 2030.**
- **40% reduction of greenhouse gas emissions below current levels by 2030.**

The SAEP's goals challenge state government to reduce its total energy consumption by a greater percentage by 2025 than sought in the corresponding CEP goal, expand the share of the total energy it gets from renewable sources by a greater percentage by 2025 than the corresponding CEP goal, and achieve greenhouse gas emissions reductions relative to these goals.

A profile of Vermont state government's current energy use at the beginning of the Plan highlights improvements made in recent years and establishes the baselines against which progress can be measured. The Plan includes many recommended strategies and actions for BGS and other state agencies to implement in different sectors, such as building energy use, distributed generation of renewable power, and reductions in fossil fuel use for transportation. These recommendations are listed at the end of each section. In the appendix are a set of five Lead by Example stories describing ways the state is saving energy, lowering cost and reducing carbon pollution.

The kinds of actions, organizational steps and funding sources the plan recommends include:

Energy in State-Owned and Operated buildings. Agencies are encouraged to track energy use using EPA's Energy Star Portfolio Manager. They should identify and prioritize further opportunities to improve energy efficiency and construct renewable energy facilities on their sites, participating in net



metering when possible. They should also take advantage of services provided by the new State Energy Management Program (SEMP) team to help them plan, finance, and manage energy projects.

Energy in new construction projects. All state agencies should utilize BGS Construction Guidelines, consider downtown locations when possible and assess the life cycle costs of potential energy improvements.

Energy in leased space. BGS should develop an Agency Energy Implementation Plan (AEIP) template for all state agencies whose operations are housed in leased space. Agencies are encouraged to adopt and use the BGS AEIP template and work closely with BGS to find leased space in downtown areas when considering new or additional leases.

Go Green Fleets Initiative All state agencies should work toward meeting the goal to make 25% of light-duty state fleet vehicles electric by 2025. BGS's Fleet Management Program should continue working to get more electric vehicles in state government operations. BGS should build charging infrastructure for use by fleet vehicles and employee vehicles when possible, and should conduct outreach to help employees transition to electric vehicle technology. BGS should continue to lead efforts across state government to right-size fleets, by optimizing vehicle size and composition to conserve fuel and save money.

Biodiesel in Transportation: VTrans should increase its purchase of biodiesel from state fuel-purchasing contracts for those facilities that have diesel storage tanks. All agencies that purchase diesel fuel for transportation purposes should use the highest biodiesel blend available without compromising the manufacturer's engine warranty.

On-the-Job Transportation and Solo Commuting by State Employees: State agencies should work with BGS to consider ways to monitor light-duty vehicle use and reduce unnecessary state employee travel where possible. They should adopt Policy 11.9 on telework. Agencies should work together to maintain and increase employee participation in the Agency of Transportation's successful Capital City Commuters program and explore ways of extending similar services and incentives to other state work sites outside of Montpelier.

Fully Implement the State Government Solar Initiative: BGS and other state agencies should pursue additional opportunities to contract with solar businesses specializing in roof-mounted solar. State agencies should incorporate solar photovoltaic panels into the built environment wherever feasible, and should work closely with advisors at the Agency of Natural Resources and the Agency of Agriculture Food and Markets to ensure proper siting.

Increase the Use of Modern Wood Heating with Biomass: State agencies should consider replacing older oil-fired heating systems with new, modern, clean wood product-burning heating systems. Wood products purchased for use in state building heating systems should be sourced from forests managed in accordance with ANR's voluntary harvesting guidelines for private landowners.

All agencies should collaborate on implementing SAEP recommendations through participation in regular meetings of the State Operations Working Group. Oversight and guidance by the Climate Cabinet will help to ensure success. Within individual agencies, developing Agency Energy Implementation Plans and working with the SEMP team is critical to making progress towards energy goals. In addition, agencies should specify roles and responsibilities among agency staff members for finding opportunities and making energy-related improvements to state facilities and operations.

State Agency Energy Plan

1 Introduction

The State of Vermont is committed to supporting Vermont's transition to a healthy and prosperous clean energy future, by reducing energy use and improving energy efficiency in its own facilities and operations, and by increasing the share of energy it gets from renewable sources.

State government is one of the largest institutional energy users in Vermont. It is the third-largest employer; state agencies occupy more than four million square feet of building space, and own and operate more than 1,800 vehicles. As one of Vermont's largest energy users, state government has an important role to play in demonstrating how public- and private-sector organizations from across the state can contribute to meeting Vermont's energy and climate goals, while also saving money and creating desirable workplaces well-positioned to recruit and retain top talent from Vermont and beyond.

This State Agency Energy Plan (SAEP), prepared by the Department of Buildings and General Services with input and guidance from the Governor's Climate Cabinet and support from state agency staff, lays out a road map for how state government can lead by example as we implement Vermont's Comprehensive Energy Plan and make progress toward ambitious energy goals for 2025, 2035, and 2050.

1.1 Purpose of the State Agency Energy Plan and Individual Agency Energy Implementation Plans

Authorized in legislation passed by the Vermont Legislature in 1992, the SAEP serves as a guiding document for Vermont state agencies when making decisions about energy in state government operations. The SAEP must be updated every sixth year subsequent to 2010. An update to the 2010 SAEP was incorporated into the 2011 Comprehensive Energy Plan as the State Agency Energy Leadership chapter. The 2016 SAEP will be published both as an integral chapter of the CEP and as a separate document.

The inclusion of the SAEP within the CEP clarifies state government's intent to demonstrate the institutional goals and actions that will contribute to a rapid transition to a clean energy future for Vermont and allows the SAEP to become a formal state agency leadership section within the larger plan.

The 2016 SAEP includes:

1. Clear and measurable energy goals for state government in three areas: a) reductions in total energy consumption across all facilities and operations; b) expansion of the share of state energy that comes from renewable sources such as solar, wind, high-efficiency biomass, and



hydroelectric power; and c) reductions in state government emissions of greenhouse gases that cause climate pollution.

2. A profile of Vermont state government's current energy use, highlighting improvements made in recent years.
3. A road map - including recommended strategies and action steps - that state government will use to make progress in different sectors, such as building energy use, distributed generation of renewable power, and reductions in fossil fuel use for transportation.
4. A recommended process for implementing this road map and making progress toward the SAEP's energy goals across state agencies, including steps for tracking, documenting, and reporting progress.

The plan focuses on near-term, actionable items that can be implemented now to meet the state's goals.

Individual agency actions to manage energy use and invest in energy improvements will be coordinated with this SAEP. Each state agency is also required to prepare a biannual Agency Energy Implementation Plan (AEIP) that aligns with the SAEP and provides more detail on agency-specific goals and recommended actions. Current plans are scheduled to be updated during 2016.

The 2016 SAEP was produced by the Department of Buildings and General Services in close consultation with an inter-agency staff group called the State Operations Working Group (SOWG). It is the objective of the SOWG to establish a coherent and consistent plan based on the array of obligations, responsibilities, legal mandates, and authorities that have been established relative to energy in state government operations.

As noted above, the State Operations Working Group consulted closely with the Climate Cabinet during the development of this plan. Established by Executive Order in 2012, the Cabinet is composed of state-agency secretaries, commissioners, and other senior officials, and is charged with providing comprehensive leadership of the state's climate change initiatives, including initiatives to reduce greenhouse gas emissions and reliance on fossil fuels, and to improve the state's resilience to the current and future impacts of climate change. The Climate Cabinet will provide oversight and direction as the SAEP is implemented during the next six years.

1.2 Statutory Authorization for the Plan

The SAEP was established in Title 3 V.S.A. § 2291 – State Agency Energy Plan. Relevant language can be found in Appendix A. The statute outlines the following objectives to be accomplished by the plan:

- (1) Conserve resources, save energy, and reduce pollution;
- (2) Consider state policies and operations that affect energy use;

- (3) Devise a strategy to implement or acquire all prudent opportunities and investments in as prompt and efficient a manner as possible;
- (4) Include appropriate provisions for monitoring resource and energy use and evaluating the impact of measures undertaken;
- (5) Identify education, management, and other relevant policy changes that are a part of the implementation strategy;
- (6) Devise a strategy to reduce greenhouse gas emissions; and
- (7) Provide, where feasible, for the installation of renewable energy systems.

2 State Government Energy Goals

The 2016 SAEP puts forth the following goals to establish state government's commitment to demonstrating leadership in Vermont's transition to clean energy and showing the diverse economic, environmental, and social benefits that this transition will yield for public and private institutions across the state. State leaders in the Climate Cabinet agree that demonstrating leadership should include reaching state energy and climate goals on an accelerated timeline.

The SAEP's goals therefore challenge state government to reduce total energy consumption by a greater percentage by 2025 than sought in the corresponding CEP goal, expand the share of total energy the state gets from renewable sources by a greater percentage by 2025 than the corresponding CEP goal, and achieve greenhouse gas emissions reductions relative to these goals. The specific goals are:

- Reduce total energy consumption by 20% by 2025, and by 25% by 2035.
- Meet 35% of the remaining energy need from renewable sources by 2025, and 45% by 2035.
- 40% reduction of greenhouse gas emissions below current levels by 2030.

2.1 Basls for the SAEP Goals

Total Energy Reduction

The Legislature asked in 2011's Act 40 that every agency, board, department, commission, committee, branch, or authority of the state reduce its energy consumption, including the amount of fuel used by its employees to travel to and from meetings during the workday, by 5% each year. The Legislature also asked that state government increase the amount of renewable energy used by the state.

The critical intent of Act 40 complements Title 3, summarized above, which requires that the energy needs of the state be met in a manner that reduces greenhouse gas emissions. However, if state government were to achieve a 5% reduction in energy consumption annually, total energy consumption would be reduced from fiscal year 2015 by 40% in 2025, and over 80% by 2050. Reductions of this magnitude are likely not feasible given current economic conditions, technologies, and funding.

This SAEP proposes a goal for reducing total energy use that we believe is achievable given current state programs and funding sources — namely a 20% reduction in total energy consumption by 2025,

including energy used to power and heat state buildings as well as energy associated with transportation by employees. This goal is at approximately the same scale as the all-economy goals put forth in the Comprehensive Energy Plan, while still challenging state government to lead by example by achieving a greater energy reduction.

Using Renewable Energy

The SAEP's renewable energy goal is also a good stretch goal, accounting for the progress made so far but also requiring considerably more investment in a transition to renewable sources of power. Vermont state government has already made good progress toward achieving the 2050 renewable energy goal adopted in the 2011 Comprehensive Energy Plan; in FY 2015, total energy consumption was 23% renewable. This progress has been achieved in large part through the successful implementation of net metered solar projects, and an increased use of woody biomass for heating. Progress has also been facilitated by the increasing share of renewable energy in the energy portfolios of the utilities that provide electric power for state operations.

Twenty-eight percent of the electric power distributed by Vermont's grid is generated from renewable sources. Finally, the 7% ethanol component of gasohol, or gasoline with added ethanol, now delivered at fuel pumps has helped increase the state's use of renewable energy.

Without relying on renewable energy supplied by the grid, state government increased its usage of renewable energy by 12% over the last four years. In FY 2015, the state used more wood products than oil for heating, and will continue to do so now that the two largest heat plants in state government, at the Montpelier Capital Complex and the Waterbury State Office Complex, are primarily fueled by wood chips.

Due to this progress, state government is on track to meet 35% of its energy needs from renewable sources by 2025 and 40% by 2030.

Greenhouse Gas Emissions

Based on a simple analysis conducted with the Center for Corporate Climate Leadership's GHG emissions calculator tool, state government was responsible for over 80,000 metric tons of CO₂ equivalent emissions (MMtCO₂-e) in FY 2015. If state government achieves the total energy reduction and renewable energy goals set forth in this plan, it will reduce greenhouse gas emissions associated with state government operations by at least 40% by the year 2030.

2.2 Sector-Specific SAEP Targets

State government should plan to make changes in all areas of operations in order to achieve these overall goals for reductions in energy consumption, improvements in energy efficiency, and increases in the share of energy consumption using renewable sources. This section provides a sector-by-sector synopsis

of what state agencies can do to help meet these goals. Additional guidance on the kinds of actions that can and will be pursued to meet these goals is in the Strategies and Recommendations section.

Improving Building Energy Conservation and Efficiency

To meet the SAEP's goals for reductions in total energy consumption, state agencies must improve electric and heating efficiency within state buildings (especially those that are state-owned, but also those that are leased), in addition to conserving more energy through changes in practices. In total, these gains in efficiency and conservation should reduce fuel usage by 15% by 2030, to support progress in meeting the state's overall energy use reduction goal. Funding is available for energy retrofits through the State Energy Management Program (SEMP). The Department of Buildings and General Services (BGS) energy team, in partnership with Efficiency Vermont, is available to provide technical assistance to agencies that wish to implement efficiency measures in their buildings. Visit bgs.vermont.gov/energy for more information.

Heating with Renewable Fuels

Meeting state government's renewable energy goals will require using more renewable fuels to heat buildings, along with continuing to increase the use of electricity generated from renewable sources. When building new state facilities, or when replacing heating equipment that has reached the end of its useful lifespan, state agencies switching to high-efficiency systems that rely on woody biomass will support progress toward our energy goals.

In addition, when new heating systems are not being purchased, switching to liquid biofuels for use in conventional heating systems, if and when available, will also increase the state's use of cleaner, renewable fuels. Specifically, the share of liquid bio-heating oil used for heating should rise from 0% in 2015 to 5% by 2020, and 25% by 2035.

Using Alternative Fuels for Transportation

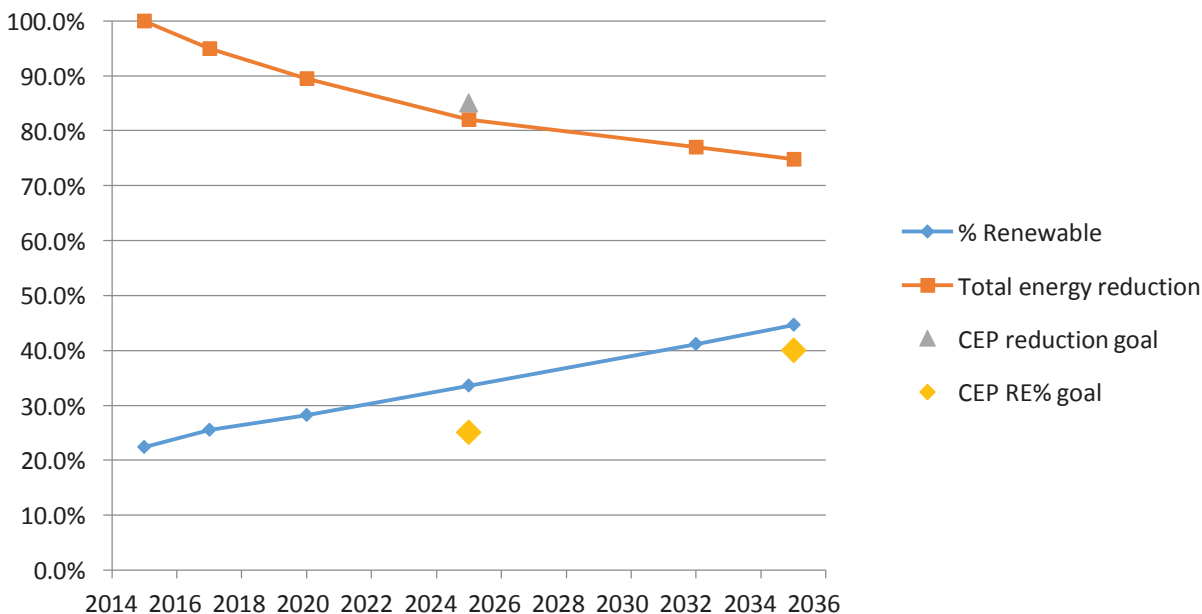
The energy that state agencies use for transportation must also shift if state government is to reach its near- and long-term energy goals. Specifically, the diesel fleet should increase the use of biodiesel from 0% in 2015 to 5% in 2020 and 25% by 2035. State agencies will also need to meet more of their transportation needs with electric vehicles. Specifically, miles powered by electricity in plug-in hybrid vehicles and all-electric vehicles should achieve a level sufficient to displace 10% of the state's current gasoline use by 2020, 25% in 2025, and one-third by 2032. The Go Green Fleets Initiative currently being launched by BGS (and described in the Recommendations section) is designed to achieve and surpass this goal.

In summary, state government must increase energy efficiency to reduce building energy usage by 15%; increase the use of biodiesel and bio-heating oil from 0% in 2015 to 5% by 2020, and 25% by 2035; and reduce state gasoline use by 10% in 2020, 25% in 2025, and one-third in 2032.



Exhibit 14-1 models a trajectory for energy reduction and renewables within state government if these changes occur. CEP goals are indicated for comparison, showing that the state is committing to lead by example.

Exhibit 2-1. SAEP Energy Reduction and Renewable Energy Trajectory



3 Recent Energy Improvements and Current Energy Use in State Government Operations

3.1 Summary of Accomplishments

Since the last SAEP was published six years ago, state government has made great strides in all areas of energy improvement, through the development of new funding sources, through investments in energy retrofits and renewable energy technologies for buildings and transportation, and through outreach and education for state managers and employees. Examples follow; further detail is provided in the Strategies and Recommendations section.

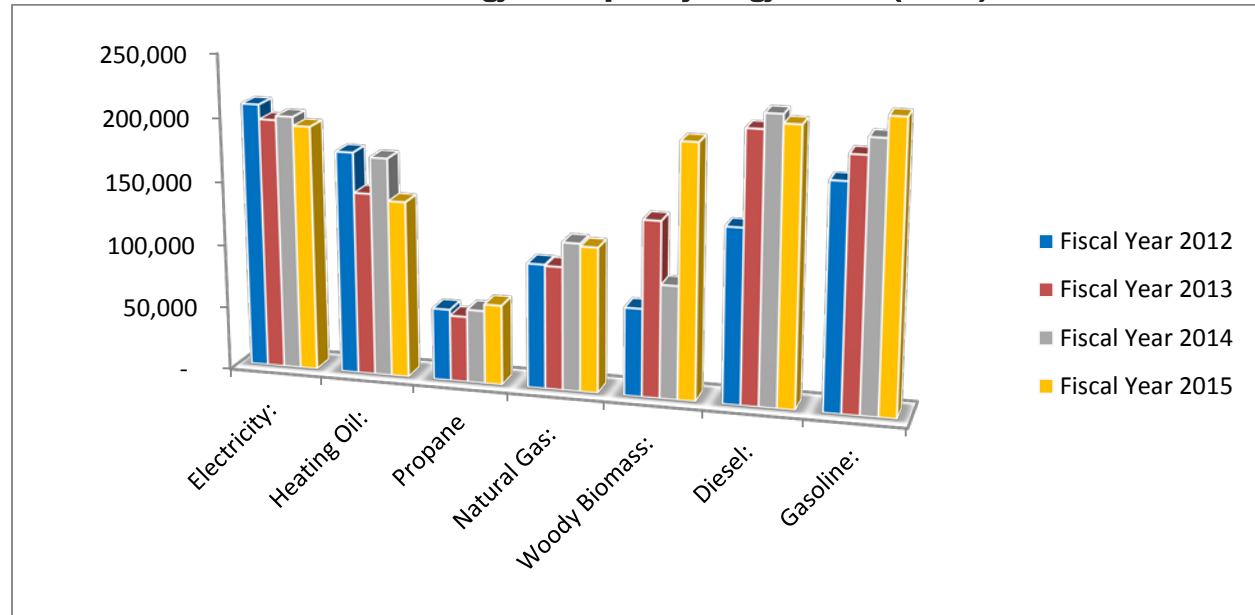
- State agencies have improved their buildings through weatherization, lighting upgrades, fuel switching away from fossil fuels, and toward alternative fuels like woody biomass, building controls optimization, and other various energy efficiency and conservation measures.
- State government has developed new funding mechanisms, and has partnered with Efficiency Vermont to provide dedicated staffing for a new State Energy Management Program to help advance this progress.

- Agencies are utilizing the Energy Star Portfolio Manager to track building energy usage and rate their buildings in comparison to similar types of structures nationally.
- The Fleet Management Program has managed to increase the efficiency of on-the-job employee travel by providing fleet vehicles to high-mileage state employees, rather than paying the higher cost of mileage reimbursement. Fleet Management Services has also established a systematic approach for supplementing the fleet motor pool with plug-in hybrid electric vehicles, to decrease fossil fuel consumption and the associated air emissions.
- Agencies are utilizing the WEX Fuel purchasing system to aggregate transportation energy data, to better manage state government transportation.
- Agencies and departments throughout state government have increased renewable biomass and solar photovoltaic usage in state government operations.

3.2 Recent History of Energy Use in State Government Operations

In fiscal year 2015 state government consumed 1,239,517 million Btu of energy. Total energy consumption has increased annually by over 7% on average from FY 2012. Transportation energy accounts for this increase. In fiscal year 2015, gasoline accounted for 27% of all energy consumed by state government, more than any other energy resource consumed over the same period. (Exhibit 14-2)

Exhibit 3-1. State Government Annual Energy Consumption by Energy Resource (MMBtu)



Transportation

Gasoline and diesel combined accounted for 45% of the total energy mix in FY 2015. This is a 28% increase in transportation energy from FY 2012. The transportation energy data used to derive these percentages includes gasoline consumption associated with all state government fleet vehicles, mileage

reimbursement for travel in employee-owned vehicles, and diesel consumption associated with the operation of the Vermont Agency of Transportation (VTrans) diesel fleet.

While transportation energy has increased, building energy consumption has decreased. Requirements to improve building energy efficiency through retrofit practices such as weatherization and lighting upgrades, and through new building construction practices, are well-established within state government operations. Electric vehicle technology, on the other hand, is relatively new, is only available for light-duty vehicles, and has only recently been incorporated into the state's motor pools and become available for state employee use. The opportunities to limit gasoline usage across all state transportation have therefore been more limited.

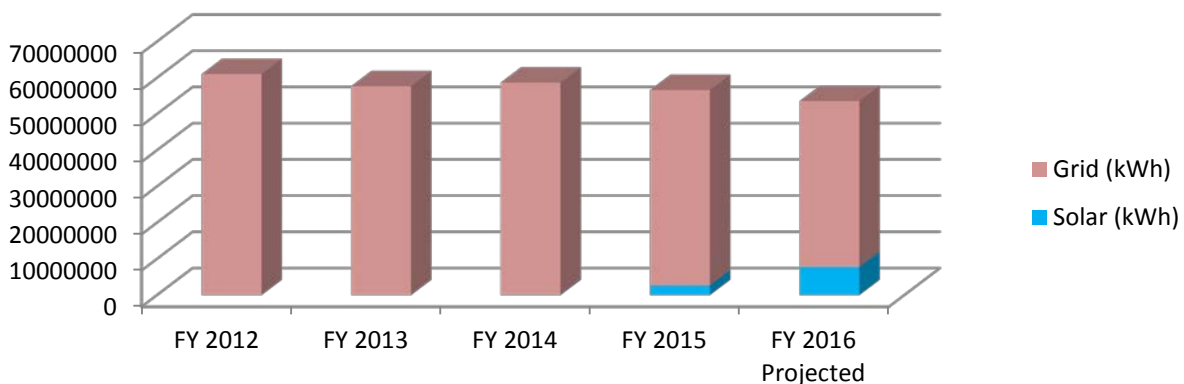
Buildings

In FY 2015, energy associated with state-owned buildings made up 55% of the total energy consumed through state government operations. While we have managed to decrease the amount of electrical consumption associated with our building stock and increase the amount of renewable energy consumed from FY 2012 to FY 2015, our oil and natural gas consumption has either increased or remained relatively steady during this period. This demonstrates a need to continue the state's focus on improving electrical efficiency, while also increasing our focus on thermal energy efficiency initiatives.

Renewable Energy

In 2012, state government had no solar photovoltaic projects associated with its electric utility accounts. In 2016 there will be over six megawatts of solar production capacity as a result of state government projects; if electricity consumption continues to decrease, these projects will offset total electrical consumption by 17% in 2016. (Exhibit 14-3). Woody biomass for state government building heating energy has increased by 17% from 2012. In FY 2015 the state used more wood products than oil for heating.

Exhibit 3-2. State Government Annual Electricity Consumption (kWh)



Greenhouse Gas Emissions

Emissions of greenhouse gases (GHGs) associated with state government operations have increased by 3% since 2012, but from 2014 to 2015 they decreased by 4%. In the buildings sector, GHG emissions have decreased slightly due to an increase in renewable energy consumption and a reduction in overall electricity usage, while transportation-related GHG emissions have increased due to an increase in gasoline and diesel consumption.

Energy Data Disclaimer

The energy data used in this plan was derived from aggregated government-wide energy expenditures, which have been converted to units of energy using average electricity costs, average gasoline prices at the pump and state fuel contract pricing. This data omits energy consumption associated with space leased to the state, because that information is not readily available. The data is meant to provide an indication of how much energy is consumed by state government in order to create a baseline against which we can measure progress toward our goals.

4 Strategies and Recommendations

While development and implementation of the SAEP is the responsibility by statute of the secretary of administration through the Department of Buildings and General Services, BGS has involved all agencies, through the inter-agency State Operations Working Group and the Climate Cabinet, in the development of the strategies and recommendations laid out below. The continuation of this collaboration, with a new focus on getting to work and overcoming obstacles to achieving goals and realizing energy improvements, is strongly recommended. Specific strategies for structuring this collaboration are included in Section 5.

4.1 Strategies and Actions for State-Owned and Operated Buildings, Construction Practices, and Leased Space

4.1.1 Make Use of Available Funding and Technical Assistance to Improve Energy in State Buildings

In 2015, the Legislature approved funding for the Department of Buildings and General Service to establish a new, comprehensive State Energy Management Program (SEMP). The purpose of this program is to help agencies across state government identify, fund, and manage projects that will make state buildings more efficient and power them with renewable energy. The program will also encourage operational practices (e.g., turning off the lights) that can dramatically reduce the energy consumed in state buildings.

The SEMF oversees two revolving loan funds to provide low-cost financing for energy management measures in state buildings and facilities. All state agencies and departments may apply to fund energy

projects using these funds. The State Resource Management Revolving Fund (SRMRF) and the State Energy Revolving Fund (SERF) are available for resource conservation measures, energy efficiency improvements, and the use of renewable resources. These funds were created to eliminate barriers to funding to up-front costs of efficiency improvements that yield significant cost savings once completed. They will make diverse projects in state buildings fundable, and in the process will help to make progress toward the state's energy goals while also saving Vermont taxpayer funds.

Since the creation of the SRMRF in 2004, over 70,000 MMBtu and over \$1.2 million have been saved. Additional projects have received funding and will soon be constructed. If no further investments are made, the fund is projected to save over \$2.1 million through avoided energy expenditures by 2020.

The SEMP has established the goal of investing \$4 million in energy improvements over the next four years through the two revolving loan funds. If this target is reached, state government will save an estimated \$800,000 annually over the next 20 years — roughly \$16 million in total energy savings. If the SEMP meets this investment target, the projected energy savings will reduce building energy consumption by 12% from 2015 totals. BGS estimates that the SEMP could invest an additional \$4 million by 2025 above these initial goals, resulting in an estimated 14% reduction in total energy consumption.

In 2015 the Vermont Legislature passed ACT 58, Sec. E.112, Energy Efficiency; State Building and Facilities, which requires BGS (with support from Efficiency Vermont) to scale up work performed by the SEMP for a preliminary period of four years to deliver energy and dollar savings to state government. Efficiency Vermont will provide adequate funding to support the creation and maintenance of BGS's SEMP team (including three full-time positions) during the four-year preliminary period.

BGS and Efficiency Vermont have committed to collaboratively supporting and managing the SEMP. By working in close partnership, BGS and Efficiency Vermont will leverage each organization's strengths, experience, and resources toward meeting the established goals. Significant work will take place in the period of this plan to identify and launch energy efficiency projects in state-owned buildings. The partnership will also address space that is leased by the state, through discussions with building owners about the improvements they could make for a major tenant of their buildings.

A first step will be to increase the number of state facility and operations managers that are actively measuring progress in reducing energy use against a measured baseline. The SEMP team and Efficiency Vermont are available to help state agencies use the U.S. Environmental Protection Agency's energy tracking tool, Energy Star Portfolio Manager, to analyze current energy consumption and establish a baseline for assessing progress.

Agency Energy Implementation Plans

All state entities are required to produce an implementation plan with actionable items specific to their operational energy consumption. These plans and the process to develop them can create an important

opportunity for analyzing current trends in agency energy use, setting agency-specific goals, and identifying good cost-effective projects that can be financed with these revolving loan funds and assisted by the SEMP team if desired. There is significant assistance available to agencies as they move forward with the highest-value energy efficiency and renewable energy improvements that can be made in state buildings.

Recommendations

- (1) *State agencies should work with the SEMP team to gather and analyze current energy use using EPA's Energy Star Portfolio Manager for buildings.*
- (2) *All state agencies that occupy state-owned buildings should identify and prioritize further opportunities to improve their energy efficiency. Many projects have already been completed and are saving state taxpayer money. When needed, state agencies should utilize services provided by the SEMP to expand their capacity for planning cost effective projects, organizing financing, and managing the construction process. For more information, go to bgs.vermont.gov/energy.*
- (3) *State agencies should also evaluate opportunities to construct renewable energy facilities and participate in net metering on facility sites where possible. Sites should be carefully selected to ensure the protection of natural resources and to minimize visual impacts for site neighbors.*

4.1.2 Implement Energy-Saving Construction Practices

The [BGS Design Guidelines](#) are meant to help architectural and engineering firms better understand state government construction standards. The guidelines were last updated in 2013, and are due to be updated again in 2016. BGS adheres to the commercial and residential building energy codes required by the state, and works with partners to achieve higher standards when practical.

When starting new construction or renovation projects, state agencies can contact Efficiency Vermont for technical support. When technical advisors from Efficiency Vermont provide guidance during the earliest phase of a project, they can often help to ensure that opportunities to improve building energy efficiency during design and construction are maximized, and that the necessary construction work for efficiency improvements proceeds efficiently, without obstacles and delays.

BGS currently considers meeting the energy standards necessary to secure the U.S. Green Building Council's LEED, or Leadership in Energy & Environmental Design certification, on all new construction projects. However, BGS does not *require* that projects meet these standards and become certified. According to the U.S. Green Building Council, LEED is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects must satisfy certain prerequisites associated with each different levels of certification and earn the corresponding points. Prerequisites and credits differ for each rating system, and teams choose the best fit



for their project. Projects can receive a LEED Certified, LEED Silver, LEED Gold, or LEED Platinum certification depending on the number of points achieved.

State government currently has one LEED Silver-certified building, the Pittsford Training Academy, and one LEED Gold-certified building, the Bennington District Court and Office Building. The Waterbury State Office Complex is on target to become state government's first LEED Gold-certified campus.

The LEED certification process focuses on many areas of sustainability, including downtown designation. Locating state government operations in downtown areas helps build strong local economies, and reduces transportation energy by increasing walking, cycling, and transit opportunities. The commissioner of Buildings and General Services and all other state officials have been asked by the Legislature to locate state government functions such as new buildings in downtown areas when suitable. [Title 24 § 2794 \(12\)](#).

BGS is statutorily required to utilize life-cycle cost analysis when considering the use of renewable energy sources, energy efficiency, and thermal energy conservation in any new building construction or major renovation project in excess of \$250,000. In accordance with this procedure, the *life-cycle cost* of each new building construction or major renovation project shall mean the net total of the present-value purchase price of all items used, plus the replacement cost, plus or minus the salvage value, plus the present value of operation and maintenance costs, plus the costs or benefits of the energy and environmental externalities.

Recommendations

- (1) *All state agencies should utilize BGS Construction Guidelines when constructing or renovating state facilities, and should adopt higher standards wherever possible given project budgets.*
- (2) *All agencies should work closely with BGS and local municipalities to find a suitable downtown location for their operations when considering new construction, if appropriate.*
- (3) *State agencies are encouraged to assess the life cycle costs of potential energy improvements — including long-term cost savings — during design and construction planning. The National Institute of Standards and Technologies' [Building Life Cycle Cost Programs](#) offers free calculation tools to help analyze potential capital investments in buildings. The SEMP team can offer assistance on life-cycle cost evaluation as well.*

4.1.3 Reduce Energy Use and Improve Efficiency in Leased Space

In 2015, state government leased 1,044,281 square feet of space. This is a 41% increase in leased space from 2011, signaling a growing need to advocate with building owner/operators for energy efficiency and renewable investments in buildings that the state does not own.

In 2014 the Legislature passed Act 178, Section 40, Energy Efficiency; State Leases, requiring the commissioner of Buildings and General Services to develop a set of criteria and guidelines to evaluate and, where appropriate, incorporate the use of energy efficiency measures, thermal energy conservation measures, and renewable energy resources in buildings and facilities leased by the state. In response to this legislative mandate, BGS developed Operations Procedures for Energy in Leased Space.

Many agencies occupy leased space and do not have the ability to directly implement energy conservation measures associated with their space. There is a need to develop guidelines for state employees to follow when occupying leased space, in order to reduce the overall energy impact of state government. In response to this need, the State Operations Working Group proposed an Agency Energy Implementation Plan template for those agencies occupying leased space. This template should consist of specific actions that all agencies can adopt and build on to reduce their energy impact.

Recommendations

- (1) BGS should develop an Agency Energy Implementation Plan (AEIP) template for all state agencies whose operations are housed in leased space.*
- (2) All agencies whose operations are housed in leased space are encouraged to adopt and use the BGS AEIP template.*
- (3) Agencies should work closely with BGS to find leased space in downtown areas when considering new or additional leases.*

4.2 Strategies and Recommended Actions for Transportation

State government is committed to demonstrating fleet management and investment practices that reduce energy use and emissions from transportation. In FY 2015, state government consumed over 2.7 million gallons of gasoline, including gasoline consumption associated with state-employee mileage reimbursement, and over 1.6 million gallons of diesel. Actions to meet new goals for reducing state gasoline use and increasing the use of biodiesel and bio-heating oil from 0% in 2015 to 5% by 2020 and 25% by 2035 are summarized below.

The Fleet Management Program managed by the Department of Buildings and General Services is reducing the overall cost of employee travel and reducing greenhouse gas emissions by right-sizing its fleet. *Fleet right-sizing* is a management practice that can help vehicle fleet managers build and maintain sustainable, fuel-efficient fleets. Fleet inventories can include vehicles that are highly specialized, rarely used, or unsuitable for current applications. By optimizing fleet size and composition, managers can minimize vehicle use, conserve fuel, and save money. For more information, see www.afdc.energy.gov.



Another key initiative during the last several years has been to add plug-in hybrid electric vehicles to the state motor pool. Electrifying the state fleet addresses a key priority in Vermont's Zero Emission Vehicle Action Plan and a Multistate Zero Emissions Vehicle Plan that Vermont has committed to help implement. These initiatives are fully described in the Comprehensive Energy Plan.

Since 2007, Fleet Management Services has been purchasing plug-in hybrid vehicles for the motor pool. As of 2015, 24% of the vehicles in the state's central motor pool are plug-in hybrid electric vehicles; 13 of the 55 vehicles are EVs. The environmental and cost benefits of this transition are significant. Other state agencies that maintain their own vehicles have also leased plug-in hybrids. As all-electric vehicles — which run entirely on electricity, and can drive longer distances without being charged — improve, they will replace the plug-in hybrids to maximize the electric miles driven while meeting state transportation needs.

Additionally, as electrification of the fleet has progressed, the state has accelerated the installation of charging infrastructure needed to power these vehicles and maximize their electric miles. Eight new dual-port level 2 charging stations have been installed at fleet headquarters in Montpelier, allowing FMS to charge 16 vehicles at once. BGS has also recently procured vendor services on a statewide contract to provide electric vehicle charging equipment to state government. The Fleet Management Program is also reducing costs and emissions by providing efficient fleet vehicles to high-mileage state employees, rather than paying the higher cost of mileage reimbursement.

The program has been very successful at reducing mileage reimbursement. Gasoline consumption associated with mileage reimbursement has decreased by 28% from FY 2012, although total gas and diesel consumption have increased.

In the next five years, the Fleet Management Program and all state agencies must collaborate to make more progress on right-sizing fleets, continuing the transition to electric vehicles (including new all-electric vehicles with longer ranges), and reducing employee travel.



Following are the state's strategies and recommendations for achieving these energy improvements in state transportation.

4.2.1 Launch the Go Green Fleets Initiative

Starting in 2016, the state will launch a new *Go Green State Fleets Initiative* to formalize and demonstrate its commitment to low-carbon and clean-energy transportation. This initiative will help agencies lead by example in the transition to greener fleets and fleet practices that save taxpayer funds and reduce energy use and greenhouse gas emissions. The initiative will also recognize the many ongoing efforts by state agencies to green their fleets and fleet practices, and will support progress toward state energy and climate goals. The initiative will be coordinated by the Department of Buildings and General Services.

While state government has made good progress in electrifying its fleet, currently only 4% of the total fleet of 300 light-duty vehicles (including those leased by individual agencies from BGS) are plug-in hybrid electrics. This percentage rises to roughly 20% if both plug-in and conventional hybrids are counted. In order to convert an additional 21% of the state's light-duty fleet by 2025 and meet the goal in the Vermont ZEV action plan, all state agency fleets have to incorporate electric vehicles.

Converting a much larger percentage of state government's light-duty fleet to electric is an attainable goal: the technology is available, the vehicles are affordable, and the investment in vehicles and infrastructure is cost-beneficial to the state. The medium- and heavy-duty fleet engine technology is becoming more efficient, but there are currently no viable electric options for these size vehicles. Several agencies, including large agencies such as ANR and VTrans, have agreed to join the Go Green Fleets Initiative and make plug-in hybrid electric and all-electric vehicles available to employees for on-the-job travel. When electric models are not practical or available, the Go Green Fleets Initiative will also encourage state agencies to lease the most fuel-efficient vehicles possible.

Many of the state's heavy-duty vehicles are operated by VTrans and ANR. The modernization of these fleets is underway, ensuring more efficient and cleaner-burning equipment. New federal requirements will require improvements in heavy-vehicle fuel efficiency. In addition, the 2012 and newer heavy duty on-road vehicles have significantly reduced NOx emissions. At VTrans, the majority of vehicles and equipment are within their cost-effective service period — and stable funding remains a challenge for the agency, making early replacement of vehicles before the end of their service period difficult.

Finally, the initiative will mobilize strategies to encourage trip planning and driving practices that reduce energy use and air and climate pollution emissions. For example, VTrans is launching a new project to install Automated Vehicle Location (AVL) systems in all agency plow trucks and some other fleet vehicles. These systems provide easy tracking, reporting, and analysis of idling. Better and more accessible data should allow for better management and resulting efficiencies. This pilot may produce lessons that can be implemented in the central motor pool and other state fleets.



Recommendations

- (1) *All state agencies should work toward meeting the goal adopted in the Vermont ZEV Action Plan — to make 25% of light-duty state fleet vehicles electric by 2025. The Fleet Management Program should continue working with agency operations staff to identify opportunities to add more plug-in hybrids, and new all-electric vehicles with longer ranges, to the central motor pool and to agency fleets where they are well-matched to transportation needs. BGS should also work to familiarize agency leaders and employees with the new electric vehicles through Ride and Drive events, training videos, and other means as capacity allows.*
- (2) *BGS and state agency leaders and operations staff should encourage and support the use of electric vehicles by state employees, and should encourage trip planning and mobility practices that reduce fuel use and the associated air emissions. Go Vermont should be a key partner in this effort.*
- (3) *BGS should build charging infrastructure to service the state's growing EV fleet, and make that infrastructure accessible to the public where possible. BGS should continue to lead efforts across state government to right-size fleets, by optimizing vehicle size and composition to conserve fuel and save money.*
- (4) *BGS and VTrans should consider lessons from the project to install AVL equipment in VTrans plows and other vehicles, to reduce idling more broadly across the state fleet.*
- (5) *BGS should establish systems for tracking and reporting on progress in this Go Green fleet transformation and its environmental and cost benefits.*

4.2.2 Increase the Use of Biodiesel In Transportation

To reach the renewable energy goals and greenhouse gas emissions goals of the SAEP, state government will have to seriously consider the use of biodiesel blends when possible. At present, 55% of total state government transportation energy is attributable to the Vermont Transportation Agency (VTrans), including over 95% of diesel consumption. All original-equipment manufacturers warranty their engines for use with B5, a blend of 5% biodiesel and 95% petroleum diesel. Some manufacturer's warranty their engines for use with B20, a blend of 20% biodiesel and 80% petroleum diesel. The National Biodiesel Board keeps a list of manufacturer warranties on its website, biodiesel.org/using-biodiesel.

VTrans currently has 144,500 gallons of diesel storage capacity. As fueling facilities with underground tanks reach their end of useful life, VTrans is not replacing them, due to the life-cycle cost relative to using retail locations to pump diesel. According to the Vermont Clean Cities Coalition (VCCC), there is currently only one gas station in Vermont that has biodiesel available at the pump.



For those locations that still have storage tanks, VTTrans can purchase B5 from the state; but it will take a greater effort to make biodiesel readily available at gas stations throughout Vermont.

VCCC plans to convene a Vermont biodiesel working group in 2016 to start tackling the issues of biodiesel adoption in the state. The adoption of biodiesel use in the VTTrans fleet will help to support the state's overall efforts.

Recommendations

- (1) *VTTrans should increase its purchase of biodiesel from state fuel-purchasing contracts for those facilities that have diesel storage tanks.*
- (2) *All agencies that purchase diesel fuel for transportation purposes should use the highest biodiesel blend available without compromising the manufacturer's engine warranty. All manufacturers fully warranty their engines with the use of B5, a blend of 5% biodiesel and 95% diesel.*

4.2.3 Reduce On-the-Job Transportation and Solo Commuting by State Employees

The most efficient way to reduce energy consumption in state transportation is to reduce on-the-job travel when possible, by identifying unnecessary travel and requiring teleconference and ridesharing when appropriate. This can be accomplished by better understanding and tracking agency light-duty vehicle use and encouraging ridesharing and teleconference and videoconference use. State employees in some agencies could use better access to video conferencing.

Although telecommuting will not directly affect the goals stated in this plan, a considerable amount of energy is consumed by state employees commuting to and from work. [Policy 11.9 – Telework](#), issued by the Department of Human Resources and approved by the secretary of administration, establishes the basic principles and conditions regarding employee requests to work remotely from an alternative worksite. All agencies are encouraged to promote this policy when appropriate. As the third-largest employer in Vermont, state government could help motivate the broader use of telecommuting among Vermont organizations, by demonstrating its value and good policies and practices to manage it.

Another way to reduce state government-related transportation is to encourage and incentivize employees to use public transit services when available to commute to work. The state [Go Vermont](#) program, administered through VTTrans, provides commuting alternatives for all employees in Vermont, among which state employees are a big part. Go Vermont connects rideshare participants, administers vanpool programs, and is a convenient portal to state transit programs.





In 2012, the state agencies agreed that increasing the use of Go Vermont's services by state employees should be a priority, and Montpelier was selected as the site for a pilot project to provide state employees with incentives for using rideshare, transit, and other mobility options. The original intent was to reduce parking pressures at the Capitol Complex. In July 2013, the Capital Commuters program was launched. This three-year pilot project, managed within the

Go Vermont program, offers discounted bus passes, preferential carpool and vanpool parking, local business discount cards, and a "guaranteed ride home" benefit to state employee participants. It has helped to spur increases in the use of public transit by state employees and significant environmental benefits. (See table below and Case Study in Appendix D for more detail.

Environmental Savings (Annual)	Results: Total Activity	Results: Activity attributed to CC Program
Annual total miles	2,264,856	607,200-1,214,400
Gallons of gas (Ave. 26 MPG)	87,109 gallons	23,353-45,707 gallons
CO ₂ (19.4 lbs. per gallon)	1,689,914 lbs./845 tons	453,048 lbs.-906,096 lbs.
Cost (\$2.50 per gallon)	\$217,773	\$58,383-\$116,765

These initial efforts cost roughly \$120,000 and were supported by federal and state funds. VTrans has been covering the discounted bus-pass costs using state funds. July 2016 will mark the end of the three- year pilot, with strong indications that the Capital Commuters program will be made permanent. Starting in FY '16, each state agency must contribute the amount necessary to cover the bus-pass costs for its respective employees. Between July 2013 and June 2015, a total of \$244,900 has been spent on the passes, and total annual costs are projected to be between \$130,000 and \$150,000.

Recommendations

- (1) *State agencies should work with BGS as part of the Go Green Fleets Initiative described above, to consider ways to monitor light-duty vehicle use and reduce unnecessary state employee travel where possible.*
- (2) *State agencies should seek to provide employees with the necessary equipment and training to facilitate conference calls, webinars, and other virtual meetings and information sharing.*
- (3) *State agencies should adopt and implement Policy 11.9 on telework, and should share the lessons they learn as they implement it about how to support telework without causing any significant impacts to the productivity or quality of state employee work.*
- (4) *To maintain and increase state employee participation in the Capital City Commuters program, beginning in FY '16 state agencies should fund the costs of public-transit passes for their employees who already participate in the program or would like to participate. In addition, state agencies should work with VTrans' Go Vermont program to explore ways of extending similar services and incentives to other state work sites outside of Montpelier.*



4.3 Strategies and Recommended Actions for Renewable Energy Use at State Facilities

In fiscal year 2015, the state's energy profile was over 17% renewable without accounting for any renewable energy that state agencies purchase from the grid. Roughly 27% of energy consumed by state government is projected to be renewable by the end of 2016 as a result of several new initiatives:

- Agencies have recognized the importance of becoming less dependent on fossil fuel for heating, and have taken advantage of modern wood-burning technology to heat state buildings with biomass.
- Agencies have taken advantage of Vermont's solar net metering law to implement cost-effective solar projects.
- Implementation of the new renewable energy standards established in ACT 56, which require electric power provided by Vermont's utilities to be 55% renewable by 2017 and 75% renewable by 2032, will significantly increase the percentage of electricity purchased for use by state buildings that comes from renewable sources.

The use of renewable energy at state facilities can grow further to meet state government's energy goals through implementation of the following strategies and recommended actions.

4.3.1 Fully Implement the State Government Solar Initiative



The state is currently under contract with AllEarth Renewables to provide a cost-effective strategy to increase the state's renewable energy portfolio. Through this contract, BGS and the Department of Corrections have entered into 10 group net metering contracts that, when completed, will create almost five megawatts of solar power capacity and reduce greenhouse gas emissions by over 4,000 tons of carbon dioxide.

*Photo of the Southeast State Correctional Facility in Windsor, VT
Courtesy of AllEarth Renewables*



These projects will offset all the electricity consumed by state correctional facilities and numerous state office buildings throughout Vermont. The state pays no upfront cost, and receives a reduced electric bill every month.

Other agencies are also taking advantage of net metering to green their facilities and reduce electricity costs. The Department of Buildings and General Services contracted for a roof-mounted system at the Waterbury Office Complex, making it the first state owned building to incorporate roof-mounted solar panels. The Department of Fish and Wildlife and VTrans are also utilizing Vermont's solar net metering law to build fixed panel arrays at various locations. These panels generate electricity that is purchased by Vermont utilities at a rate that will make the projects financially beneficial over time. (See case studies in Appendix D for more detail on these projects.)

Recommendations

- (1) *BGS and other state agencies should pursue additional opportunities to contract with solar businesses specializing in roof-mounted systems similar to the new system at the Waterbury State Office Complex.*
- (2) *State agencies should work to incorporate solar photovoltaic panels into the built environment wherever feasible, and should work closely with advisors at the Agency of Natural Resources and the Agency of Agriculture, Food & Markets to ensure that:*
 - *Projects are sited in appropriate locations that comply with natural resource and flood hazard regulations and guidelines.*
 - *Projects are designed and built with practices that minimize natural resource impacts and visual impacts for neighboring properties.*
 - *Projects are not built on prime agricultural soils, and best practices are used to ensure soil health and vitality.*



4.3.2 Increase the Use of Modern Wood Heating with Biomass

The state has increased its use of high-efficiency wood heating systems in recent years through a variety of projects at different scales.

The Montpelier district heat plant was rebuilt in 2014, and now primarily burns wood chips with No.2 heating oil backup. This is projected to reduce the amount of oil burned in the plant by over 80%, and reduce greenhouse gas emissions by 1,500 tons per year. The heat plant serves the entire Capital Complex. Through a partnership with the City of Montpelier, the district heat plant is able to distribute hot water to city customers that have opted to connect to the city's hot water loop.

A new Waterbury heat plant constructed at the new Waterbury Office Complex is now fully operational, and will burn wood chips for the majority of the heating season with propane backup. The old Waterbury heat plant was the last location at which the state was still burning No. 6 heating oil, which produces more greenhouse gas emissions than propane and No. 2 heating oil. The environmental benefits for state operations in Waterbury will be similar to those in Montpelier.

Other recently completed projects are also reducing emissions and increasing the state's use of renewable wood energy:

- The Barre District Courthouse had been retrofitted with an efficient wood heating system. Pellet boilers now heat the building instead of an old electric resistance boiler. This project is expected to save over 230 tons of carbon dioxide emissions per year.
- The Northern State Correctional Facility, Northeast Regional Correctional Facility, and Southeast State Correctional Facility all burn logwood to heat their facilities.
- The VTrans Enosburg Garage, Derby District Garage, Barton Garage, Brighton Garage, Canaan Garage, Irasburg Garage, and Westfield Garage all burn cordwood that is primarily sourced from roadside cleanup and maintenance tree cutting.

The Comprehensive Energy Plan includes new goals for promoting the use of woody biomass in modern heating systems; however, the plan also emphasizes that this resource must be harvested in a sustainable way to ensure that the increased use of biomass does not harm the health of Vermont's forests.

On January 15, 2015, the commissioner of the Department of Forests, Parks and Recreation (FPR) adopted a set of voluntary harvesting guidelines for private landowners to help ensure long-term forest health and sustainability. The guidelines were developed in response to [Act 24](#), which was passed by the Vermont Legislature in 2013. These guidelines were not yet adopted when BGS released the latest RFP for wood biomass for the state purchasing contracts, but they are now available to guide future purchase of wood heating products for use in state operations.



Recommendations

- (1) *The state should continue to replace older oil-fired heating systems with new, modern, clean wood product- burning heating systems. BGS should target the largest oil-consuming locations, and should prepare cost-benefit analysis studies that consider the cost of replacement relative to energy savings and environmental benefits. The age and useful life of the existing heating systems should be weighted when determining which projects to undertake first.*
- (2) *Agencies responsible for buildings heated with oil should contact the BGS Energy Manager to obtain information and discuss further options available to switch to a biomass heating system. The [Biomass Energy Resource Center](#) is also a great resource, available through Vermont Energy Investment Corporation, for all agencies interested in biomass for their facilities.*
- (3) *All agencies should ensure that wood products purchased for use in state building heating systems are sourced from forests that are managed in accordance with ANR's [voluntary harvesting guidelines for private landowners](#).*

14.5 Implementing the State Agency Energy Plan

This plan is the product of close collaboration across state agencies. The State Operations Working Group, which assisted BGS with the development of the analysis, strategies, and recommendations, includes representatives of many state agencies and departments - including VTrans, the Agency of Natural Resources, the Department of Public Service, the Agency of Agriculture, Food & Markets, the Agency of Commerce & Community Development, and the Department of Corrections.

The State of Vermont is committed to supporting Vermont's transition to a healthy and prosperous clean energy future by implementing this plan and meeting the goals it sets forth for state government's use of energy. Continuing coordination and collaboration across state government through regular meetings of the State Operations Working Group and through oversight and guidance by the Climate Cabinet will ensure our success.

Within individual agencies, identifying the best projects to pursue through the development of action-oriented Agency Energy Implementation Plans and through work with the SEMP team is critical to making progress towards energy goals. In addition, agencies should specify roles and responsibilities among agency staff members for finding opportunities and making energy-related improvements to state facilities and operations. VTrans has found that periodic meetings among staff working on energy improvements really drives progress.

Finally, celebrating success will help keep us all motivated.



Acknowledgements

The Department of Buildings and General Services would like to recognize the many hardworking agency leaders and staff listed below who contributed time and insights toward the development of this State Agency Energy Plan. We offer a special thanks to the Agency of Natural Resources for its assistance with drafting and editing the plan and the Lead by Example case studies in Appendix B.

Agency of Administration

- Justin Johnson, Secretary

Department of Buildings and General Services

- Michael Obuchowski, Commissioner
- Daniel Edson
- Harmony Wilder
- Nicole Hersey
- Deb Ferrell

Department of Public Service

- Christopher Recchia – Commissioner
- Asa Hopkins
- Anne Margolis

Agency of Agriculture, Food & Markets

- Chuck Ross – Secretary
- Diane Bothfeld – Deputy Commissioner

Agency of Commerce & Community Development

- Pat Moulton – Secretary

Department of Housing & Community Development

- Noelle MacKay – Commissioner
- Chris Cochran

Agency of Natural Resources

- Deb Markowitz – Secretary
- Sarah McKearnan
- Billy Coster
- Lil Lumbra

Department of Environmental Conservation

- Alyssa B. Schuren – Commissioner
- Jeff Merrell

Department of Fish and Wildlife

- Louis Porter – Commissioner
- Adam Miller

Agency of Transportation

- Chris Cole – Secretary
- Gina Campoli
- Alec Portalupi
- Tim French
- Ross MacDonald
- Phil Cross

Appendix C: State Agency Energy Plan

Statutory Authority (Title 3 V.S.A. § 2291)

Title 3 V.S.A. § 2291 – State Agency Energy Plan

§ 2291. State Agency Energy Plan

(a)(1) When used in this title, "life-cycle costs" shall mean the present value purchase price of an item, plus the replacement cost, plus or minus the salvage value, plus the present value of operation and maintenance costs, plus the energy and environmental externalities' costs or benefits. Where reliable data enables the Department of Buildings and General Services to establish these additional environmental externalities' costs or benefits with respect to a particular purchasing decision or category of purchasing decisions, that is energy related, the Department may recommend the addition or subtraction of an additional price factor. All State agencies shall consider the price factor and environmental considerations set by the Department when examining life-cycle costs for purchasing decisions.

(2) "State facilities," when used in this chapter, shall mean all State-owned or leased buildings, structures, appurtenances, and grounds.

(3) "State fleet," as used in this chapter, shall mean passenger vehicles and light duty trucks for use by State employees in the conduct of official duties, excluding law enforcement vehicles assigned to sworn law enforcement officers, and shall be procured by the Commissioner of Buildings and General Services.

(b) It is the general policy of the State of Vermont:

(1) To ensure, to the greatest extent practicable, that State government can meet its energy needs and reduce greenhouse gas emissions in a manner that is adequate, reliable, secure, and sustainable; that assures affordability and encourages the State's economic vitality, the efficient use of energy resources, and cost-effective demand side management; and that is environmentally sound.

(2) To identify and evaluate, on an ongoing basis, resources that will meet State government energy service, infrastructure, purchasing and supply, and fleet needs in accordance with the principles of least cost integrated planning; including efficiency, conservation and load management alternatives, purchasing preferences, wise use of renewable resources and environmentally sound infrastructure development, energy supply, purchasing practices, and fleet management.

(c) The secretary of administration with the cooperation of the commissioners of public service and of buildings and general services shall develop and oversee the implementation of a state agency energy plan for state government. The plan shall be adopted by June 30, 2005, modified as necessary, and readopted by the secretary on or before January 15, 2010 and each sixth year subsequent to 2010. The plan shall accomplish the following objectives and requirements:

(1) To conserve resources, save energy, and reduce pollution. The plan shall devise strategies to identify to the greatest extent feasible, all opportunities for conservation of resources through environmentally and economically sound infrastructure development, purchasing, and fleet management, and investments in renewable energy and energy efficiency available to the state which are cost effective on a life cycle cost basis.

(2) To consider state policies and operations that affect energy use.

(3) To devise a strategy to implement or acquire all prudent opportunities and investments in as prompt and efficient a manner as possible.

(4) To include appropriate provisions for monitoring resource and energy use and evaluating the impact of measures undertaken.

(5) To identify education, management, and other relevant policy changes that are a part of the implementation strategy.

(6) To devise a strategy to reduce greenhouse gas emissions. The plan shall include steps to encourage more efficient trip planning, to reduce the average fuel consumption of the state fleet, and to encourage alternatives to solo-commuting state employees for commuting and job-related travel.

(7) To provide, where feasible, for the installation of renewable energy systems including solar energy systems, which shall include equipment or building design features, or both, designed to attain the optimal mix of minimizing solar gain in the summer and maximizing solar gain during the winter, as part of the new construction or major renovation of any state building. The cost of implementation and installation will be identified as part of the budget process presented to the general assembly.

Appendix B: State Agency Energy Plan Leading By Example Case Studies

- [Department of Fish & Wildlife: Fish Hatchery Energy savings](#)
- [BGS, Fleet Management Services: GoGreen State Fleets Initiative](#)
- [Department of Buildings & General Services: Waterbury State Office Complex](#)
- [Agency of Transportation: Solar Garages](#)
- [The Capital Commuters Program](#)



LEADING BY EXAMPLE

How state government is saving energy, lowering costs, and reducing carbon pollution

Vermont's five hatcheries produce more than 2 million healthy fish for release in state waters each year. Hatcheries require significant amounts of electricity, propane and other sources of energy to grow fish. These five facilities have become surprisingly energy efficient, just by replacing older lighting fixtures and heating systems, introducing new energy-smart equipment and adjusting production processes to reduce energy use.

This year alone, energy improvements at the hatcheries will save Vermont \$75,000 on fuel bills and reduce emissions by 3,000 metric tons of carbon. Energy upgrades to date could power all of Grand Isle's homes for a year or allow passenger vehicles to circle the Earth 327 times.

Partnerships Make it Possible

Leveraging a variety of partnerships, the hatcheries have been able to make these changes without a large upfront budget. Funding was provided by the Department of Buildings and General Services (BGS) State Energy Management Program, utilizing one of the revolving loan funds that help agencies implement energy efficiency upgrades and use the energy dollar savings to pay back the loan. BGS reinvests the loan payments in other energy projects. The program is available to all agencies.

Additionally, strong relationships with the U.S. Fish and Wildlife Service yielded access to federal partners' experience and assistance. The Vermont Energy Investment Corporations, another key partner, provided expertise on upgrades to hatchery systems, from pumps to lighting.



photo courtesy of WCAX-TV

Doing More Work with Less Energy

Ed Weed

- ② A variable frequency drive installed to reduce pump speed saves more than \$2,900 per year.
- ② Recirculating heated water needed to grow fish during cold months has decreased propane and electricity costs by approximately \$60,000 a year.

Bald Hill

- ② A high efficiency boiler replaced the less efficient oil fire burner, saving \$79,000 over the expected life of the project.
- ② A solar photovoltaic system installed at the hatchery will produce approximately 34,000 kWh annually and generate \$160,000 over the 25 year expected lifetime of the panels.

Bennington

- ② Installed netting over ponds will reduce predation, improve fish survival and increase production by nearly 30 percent with little additional energy use or cost.

Early rearing landlocked Atlantic salmon at Ed Weed are raised in a new tank system that recirculates water, saving water use and the propane needed to heat it.



Looking Ahead

Vermont's fish hatcheries have shown that even in tight budget times, and with very limited capital money, investments in energy efficiency and renewable power can be successful. Wide ranging energy improvements were made possible by using innovative financing mechanisms, while leveraging existing relationships between partners that understood that environmental and financial benefits can be achieved by working together. The fish culture program will continue to improve the efficiency of its operations and reduce the amount of non-renewable it uses to the greatest extent possible. Here is what we have in store:

Renewable Power - Growing Fish on Sunlight

To raise fish at a hatchery you need a lot of power. Despite their small size and efficiency, Vermont's hatcheries spend nearly \$250,000 a year on electricity. Fortunately, by taking advantage of a state contract with the Vermont-based company All Earth Renewables, the Department of Fish and Wildlife will be able to build two new on-site solar projects that will offset all of its hatchery electricity usage and reduce its electricity bills by 10%, without upfront costs.

The partnership will enable the Department to access the company's expertise in permitting and design. The two projects, totaling 650 KW in capacity, will help support progress towards state government's ambitious 2025 and 2050 renewable energy goals.

Saving More Energy

The Fish & Wildlife Department is also planning the next round of efficiency investments.

Ed Weed

- New efficiency intake pumps will save \$12,000 a year.
- Reducing the height of the water intake "headbox" will pay for itself in less than a year and save more than \$2,000 a year.

Bald Hill

- A new solar thermal panel hot air heating system will circulate air warmed by the sun to supplement the hatchery building's conventional heating system.

Salisbury

- New variable frequency drives will reduce pumping costs by nearly \$12,000 a year – and will pay for themselves in less than two years – with no loss of performance.
- New more efficient lighting will save money and electricity.

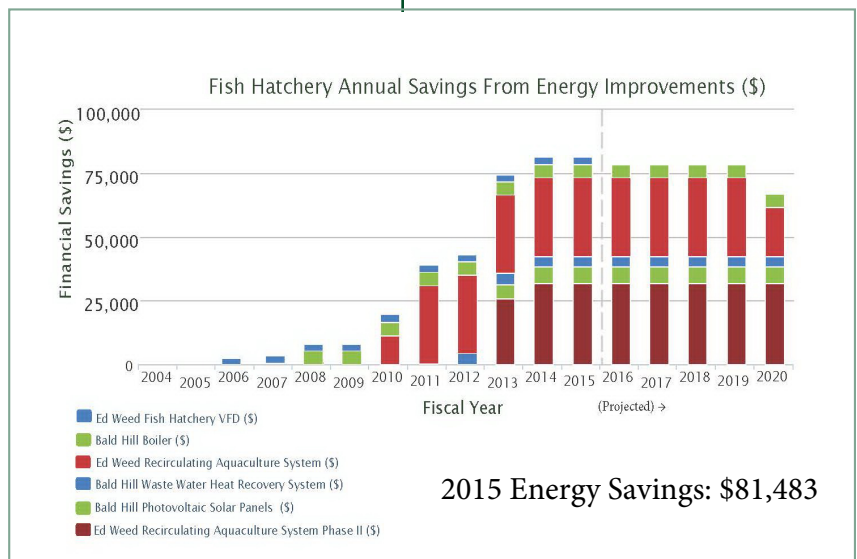
Bennington

- New efficient lighting fixtures will pay for themselves, saving electricity and money.

Roxbury

- Upgrading the current propane boiler to a wood pellet boiler will reduce fossil fuel use, save money, and support the timber industry.

Upgrades to date save enough energy annually to power all of Grand Isle's homes for one year, or to fuel a car traveling around the Earth 327 times.





LEADING BY EXAMPLE

How state government is saving energy, lowering costs, and reducing carbon pollution

Transforming Transportation

The New GoGreen State Fleets Initiative

Almost half of Vermont's greenhouse gas emissions come from transportation –from moving people and goods around our rural state. State government is committed to reducing the fossil fuel use and emissions from its own transportation activities, by:

- ➊ Replacing conventional vehicles with cleaner plug-in hybrid and all electric models;
- ➋ Adopting new policies and practices to ensure that state employees travel from place to place as efficiently as possible; and
- ➌ Reducing our travel miles.

In the next five years, state agencies will work together on a new initiative to significantly reduce the fossil fuel used in state transportation.

Progress on Reducing Greenhouse Gas Emissions

Almost half of state energy use is from vehicle travel – from the use of passenger sedans that transport employees to meetings and site visits, and from the use of many trucks and plows that perform critical maintenance and construction work.

The new State Agency Energy Plan sets ambitious goals for greening state transportation, including displacing 10% of current gasoline use by 2020, 25% in 2025, and one-third by 2032.

Achieving them will be challenging. The path must include converting the state's fleet to electric vehicles – the cleanest cars on the road today. The Department of Buildings and General Services (BGS), the agency that manages approximately half of the State's vehicles, has made great progress in the last several years.

A More Efficient Fleet

- ➊ There are now 49 conventional hybrid vehicles and 13 plug-in electric vehicles in the state's BGS fleet, making it the largest electric fleet in Vermont.
- ➋ BGS is working with other agencies to ensure that when vehicle replacement occurs, the new vehicles are as fuel efficient as possible. Since electric models are not yet available for trucks, improving average fuel economy of the state's conventional vehicles is critical.
- ➌ In the future as more biofuels become available, the state may also be able to displace conventional diesel with these lower emitting alternatives.



There are now 13 plug-in electric vehicles in the state's BGS fleet, making it the largest electric fleet in Vermont.

Charging Infrastructure

- During construction projects, BGS is pursuing installation of charging stations to power fleet vehicles and enable employees who commute in EVs to charge at their workplaces. Eight “Level 2” chargers with capacity to simultaneously charge 16 vehicles are now available at fleet headquarters. The new Waterbury Office complex includes two dual port Level 2s with electric infrastructure in place to increase the number of chargers when needed.
- BGS has awarded a contract to Green Mountain Power to provide electric vehicle charging infrastructure to all state agencies, local municipalities and public schools. BGS used its standard bid process to ensure new stations will meet high standards and be cost-effective.

Looking Ahead

Although state government has made good progress on electrifying the fleet, the total energy used in state transportation still increased almost 30% since 2012.

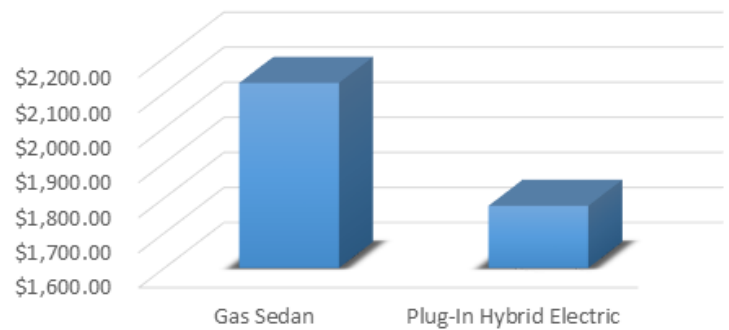
Starting in 2016, the state will launch a new **GoGreen State Fleets Initiative** to drive progress towards the transportation energy goals in the State Agency Energy Plan. Led by BGS with participation and support from many other agencies, the initiative will work on reducing fossil fuel use in state transportation to save taxpayer dollars, scale back energy use and reduce harmful greenhouse gas emissions.

By demonstrating the benefits of environmentally friendly, safe transportation for all Vermonters, the initiative will also help support progress on the state’s plan to accelerate the adoption of electric vehicles by businesses, institutions and households all across Vermont.

What needs to be done?

- Adding More EVs.** Converting a larger percentage of the fleet to electric vehicles is within reach: a wider selection of affordable cars with electric ranges up to 200 miles are soon coming to market. BGS will add at least five new EVs to the fleet each year. Employees whose trips can be made in EVs will be assigned those vehicles whenever possible.
- Rightsizing the Fleet.** Maintaining a fleet with high average fuel efficiency – including efficient heavy-duty trucks for which there are no electric models yet– can dramatically reduce fossil fuel use.
- Educating Employees.** BGS will offer Ride and Drive events and employee training to get the state’s work force comfortable with new EV models, and to encourage their use. Education about eco-efficient driving practices that reduce fuel use and air emissions, such as avoiding single driver trips, reducing idling, and slowing average highway speeds, is also a top priority.

Comparative Annual Fuel Costs for One Sedan
Gas vs. Electric



By using a Fleet Electric Vehicle, state employees save taxpayer dollars and reduce harmful greenhouse gas emissions.



LEADING BY EXAMPLE

How state government is saving energy and money— while helping the climate – for all Vermonters

The Waterbury State Office Complex A Model for Green, Climate Resilient Building

The State Office Complex in Waterbury, Vermont was hit hard by Tropical Storm Irene in 2011. Water levels rose above the first floor of many buildings, and agencies were forced to relocate their employees to temporary locations scattered across the state.

When Vermont's Governor Peter Shumlin decided to rebuild state offices at the site, the Vermont Department of Buildings and General Services (BGS) saw a rare opportunity to design and build a complex that would save state government tens of thousands of dollars annually and model green building for other organizations – with energy and climate smart features throughout.

Description and Financing

The property loss at the Waterbury State Office Complex was extensive. Complicating this challenge was the fact that many of the original buildings were located in floodplain areas at high risk for future flooding. New buildings would have to be highly cost effective to operate, and resilient to the more severe weather events and flooding that scientists are expecting in the northeast due to a changing climate.

The State funded the project with a combination of insurance, federal disaster recovery funds, and state bond revenues. BGS and the Agency of Natural Resources established close partnerships with the Federal Emergency Management Agency, the Town of Waterbury, and local community and business organizations to make the complete redevelopment of the historic complex possible.

The project includes the restoration of the site's "historic core," a collection of 13 historically significant buildings that face Main Street. It also includes a biomass heat plant, restored floodplain, a new energy efficient office building that can be heated and cooled at low cost to the state's budget, green stormwater infrastructure and enhanced pedestrian circulation.

Doing More Work with Less Energy

🔍 **Energy efficient heating and cooling.** The new and retrofitted buildings include efficiency measures that will dramatically reduce the costs of operating office buildings. Integrated "building envelope systems" will protect historic exteriors while air sealing and insulating to reduce unwanted and costly heat transfer. New energy management systems will control HVAC and lighting to maximize occupant comfort and minimize building energy usage, for example by automatically shutting down heating and cooling systems when windows are open.



The Complex is on track to become the State's first LEED Gold Certified Campus, a renowned, internationally recognized green building accreditation.

- 🔗 **Heat from Vermont-grown wood chips.** The new central heating plant has a highly efficient woodchip-fired boiler with back-up propane. With this new heating system in place, the state will no longer burn the higher greenhouse gas emitting #6 fuel oil for heating state government owned buildings anywhere in Vermont
- 🔗 **Conservation.** The complex will reduce water consumption with widespread use of low flow fixtures, which save energy too.

Preparing for Future Storms

The site plan integrates flood resilient site locations and designs to minimize the risk of future flood damage and restore a healthy floodplain that helps protect Waterbury's downtown. For example:

- **Moving Away from the River.** 22 buildings totaling 300,000 square feet located closest to the river were demolished, and fill was removed to lower the floodplain and reconnect it to the river. The removed fill was used to elevate the new office building and central heat plant above the 500 year flood elevation.
- **Flood-proofing.** All of the mechanical, electrical and plumbing in the historic building was removed from the basement areas, and the basement areas were filled and structurally reinforced, so that the lowest floor elevation of those historic buildings is also above the 500 year flood level.
- **Greening-up.** Almost 1000' of river frontage was replanted with vegetation to create healthy riparian buffers that can slow floodwaters. Green stormwater infrastructure, such as swales and plantings, were installed to help absorb and clean stormwater from rain events that can pollute the river.

Clean Energy On Site

- 🔗 **A new solar roof.** The state has entered into a group net-metering agreement with a private solar developer to finance and install a 100 kW rooftop solar photovoltaic system on the new office building. The solar panels will save money and help Vermont achieve it's renewable energy goals with no upfront cost to taxpayers.
- 🔗 **EV-ready parking.** The state's Fleet motorpool is going electric. The Waterbury State Office Complex will have two dual port charging stations to serve the all-electric and plug-in hybrid fleet vehicles, and capacity to host an additional five stations when demand increases.

Looking Ahead

The new Waterbury State Office Complex, due for full occupation in 2016, marks an exceptional achievement of state government and exemplifies construction practices for the future.

Energy smart investments will reduce the Complex's greenhouse gas emissions by 5,000 metric tons (CO₂E) – the emissions from heating and powering over 450 homes.





LEADING BY EXAMPLE

How state government is saving energy, lowering costs, and reducing carbon pollution

Powered by the Sun VTrans Solar Garages

In 2013, the Vermont Agency of Transportation (VTrans) took the first significant steps towards reducing energy costs and greening operations at the agency's 60 garages, where hundreds of state trucks, plows and construction vehicles are housed and serviced.

VTrans has now installed on-site photovoltaic solar energy systems at six garages, and is planning to install solar net metering projects at a majority of its facilities as funding allows. The transition will help support progress towards Vermont's goal – included in the 2016 Comprehensive Energy Plan – of meeting 90% of the state's energy needs with renewable sources by 2050.

Description and Financing

VTrans' decision to go solar was helped along by the state's "net metering" law. Net metering allows electric customers, including state agencies and other public and private institutions, to generate power from solar, wind and other renewable sources. In exchange, Vermont utilities credit the customers for the power that their systems produce.



The state garage in the town of Orange was the first to install its own photovoltaic system in 2013. Consisting of 72 panels each roughly 5 ½ by 3 feet in size, the solar array runs 100 feet along ground-mounted fixed racks positioned next to the parking lot at the garage. The annual projected power production of the array is 19,700 kWh – 21,000 kWh, or enough electricity to power three average households in Vermont for one year.

Although the photovoltaic system is relatively small, its installation required careful planning to stay within the agency's budget. The final price tag in Orange came to \$52,777, a cost that included all equipment (solar panels, rack systems, inverters, foundation materials and miscellaneous hardware) and the labor of an electrical contractor to connect the photovoltaic system to the grid.

VTrans realized significant savings when the agency trained its own district employees to construct the system on-site. Done when the employees had down time from their regular highway maintenance duties, the in-kind labor resulted in an estimated savings of between \$25,000 and \$30,000. The installation work prepared staff to manage future maintenance and repairs on the array.

The solar panel array at the Orange garage is 100 feet long and consists of 72 panels ground-mounted on fixed racks.

Solar net metering projects such as this one are on the rise in VTrans. To date, the Agency has installed six photovoltaic systems at the Orange, North Montpelier, Bennington, Readsboro, Wilmington, and Dummerston state garages. At an average cost of \$61,500, the installations were paid for through the Agency's Transportation Buildings appropriation, which is approved by the legislature each year.

Saving Money Builds Support

These on-site energy initiatives can increase employee morale among staff who take pride in the fact that their efforts are reducing their workplace's reliance on fossil fuels, and the associated greenhouse gas emissions.

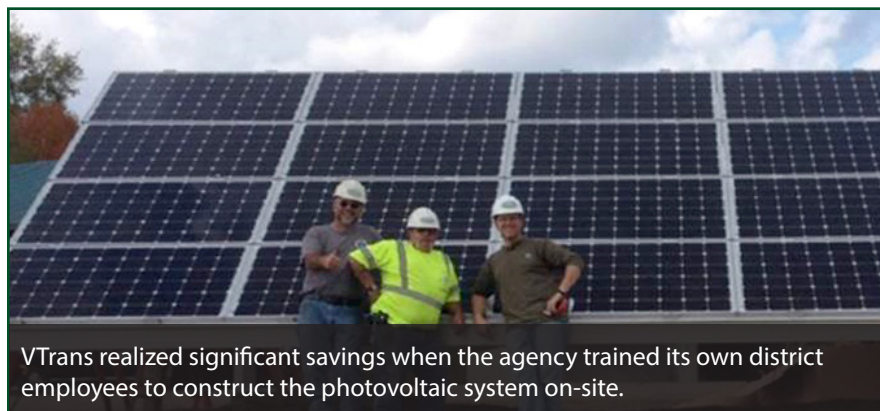
They also build staff support as they save VTrans money. At current rates, the power generated by the new solar systems is worth roughly \$0.20/ kWh. As an example, over 12 months in 2015, the VTrans garage in Orange generated 19,601 kWh. The project will pay for itself in roughly 12 years and will generate energy valued at over \$98,000 during the 25 year expected life of the panels.

Garage employees that helped build the six systems can now watch electric meters spin backward. VTrans has taken care to ensure that each garage gets credited with the cost savings from going solar, so they use the savings to meet other garage budget needs.

Looking Ahead

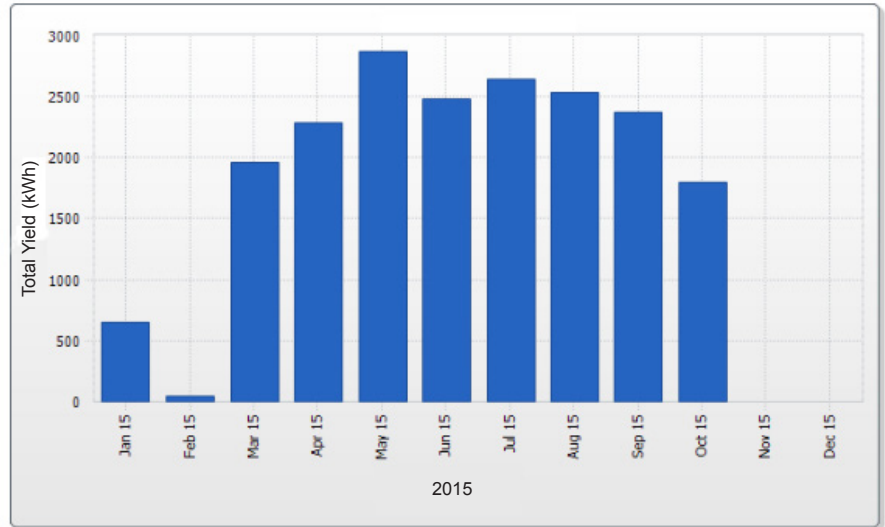
As budgetary constraints allow, VTrans plans to install three solar net-metering systems per year over the next 10 to 15 years. Each system will be similarly sized and dependent on an average annual budget of \$200,000. Construction scheduling will be carefully planned to optimize staff availability during the spring and summer and minimize disruption to highway maintenance efforts.

For more information on the VTrans Maintenance & Operations Bureau's solar net-metering effort, contact Tim French, timothy.french@vermont.gov, 802-224-6593.



VTrans realized significant savings when the agency trained its own district employees to construct the photovoltaic system on-site.

AOT Orange Garage: 2015



The Orange garage project will pay for itself in roughly 12 years and will generate energy valued at over \$98,000 during the 25 year expected life of the panels.



LEADING BY EXAMPLE

How state government is saving energy, lowering costs, and reducing carbon pollution

Green Transportation Choices for State Employees The Capital Commuter Program

The State of Vermont's Capital Commuter program, an innovative alternate transportation initiative, takes to heart the financial, logistical and environmental challenges of commuting in Vermont. Launched by the Agency of Transportation (VTrans) in July of 2013, Capital Commuters incentivizes state employees working in Montpelier to take the bus, carpool, bike, or walk to work, reducing the energy usage and greenhouse gas emissions from single-driver commute trips as well as the need for expansive parking lots at state offices.

Description

After the relocation of hundreds of state employees from the flood-damaged Waterbury State Office Complex to offices in Montpelier, competition for parking spaces was at an all-time high. The construction of hundreds of new spaces was not plausible, affordable or sustainable, so at the direction of the Agency of Administration (AOA), VTrans created a working group tasked with developing alternate transportation models for state employees.

The result was a three-year pilot project designed to benefit enrolled participants and provide a template for green commuting programs for state agencies and private businesses that want to reduce environmental impacts from employee travel and solve parking problems in downtown areas. Over 550 state workers (about 10% of the eligible workforce) have registered so far. Key features of a Capital Commuters membership include:

- ② Discounted bus passes
- ② Preferential carpool and vanpool parking
- ② Discount card for use at local businesses
- ② Qualification for Go Vermont's "Guaranteed Ride Home" benefit that reimburses costs (up to \$70) for an alternative way home (taxi, bus, rental car) in the event of an emergency

The Many Benefits of Green Commuting

The Capital Commuter program was developed by VTrans along with representatives from the Agency of Administration, the Department of Buildings and General Services, the Human Resource Department, the Vermont State Employees Association, the Montpelier Energy Committee, and the Green Mountain Transit Agency. Local businesses supporting the program sponsored discounts at their stores. The program has:



Capital Commuters incentivizes state employees working in Montpelier to take the bus, carpool, bike, or walk to work, reducing the energy usage and greenhouse gas emissions.



🎯 **Reduced Parking Needs.** Results from an annual survey of Capital Commuter participants indicated that the program is reducing parking needs between 100-200 spaces per day. The average cost to build a parking space in the U.S. is \$15,500¹. As such, the estimated cost savings of avoided construction of these 100-200 parking spaces is between \$1,550,000 and \$3,100,000.

🎯 **Reduced Fossil Fuel Use.** By reducing the number of single-driver commutes, the program has saved participants money, lessened our environmental impact and supported progress towards the goals set forth in the Comprehensive Energy Plan. Those benefits have been quantified using participant responses to survey questions about their commuting activities before and during the program, and using the average distance Vermonters commute (23 miles). Because of the program:

- 🎯 More than 1 million passenger vehicle miles have not been driven.
- 🎯 More than 40,000 gallons of gasoline have not been consumed.
- 🎯 More than 780,000 pounds of climate polluting carbon dioxide emissions have been abated.
- 🎯 Program participants have saved over \$100,000 by buying less gas.



The Capital Commuters working group and the forum it provides paved the way for other great solutions for reducing single occupancy vehicle travel, such as an expansion of CarShare VT to Montpelier and support for bike friendly infrastructure projects.

Looking Ahead

VTrans supported start-up work to launch the pilot as part of the state's Go Vermont program, including development of the brand and website, coordination of registration, and distribution of promotional material. State and federal funds covered the roughly \$12,000 in start-up costs.

VTrans also covered the \$244,900 cost of subsidizing employee bus passes between July 2013 and June 2015. As of July, 2015, state agencies cover the costs of subsidizing discounted bus passes for their own employees, estimated to be between \$130,000 and \$150,000 in SFY 2017.

The successful three-year pilot ends in June, 2016. The Steering Committee is meeting in March, 2016 to determine if this should be made into a permanent program and/or extended to all State employees. In addition, the state hopes the pilot will provide a model for private businesses, non-profits and other employers wishing to reduce the impact of their employees commutes by providing efficient commuting incentives.

For more information about Capital Commuters, visit:
www.connectingcommuters.org/capital-commuters/ or contact
Ross MacDonald, ross.macdonald@vermont.gov, 802-828-5577.

By reducing the number of single-driver commutes, the program has saved participants money, lessened our environmental impact and supported progress towards the goals of the Comprehensive Energy Plan.

¹ *Transportation Cost and Benefit Analysis II – Parking Costs*
Victoria Transport Policy Institute (www.vtpi.org)

