

Comprehensive Energy Plan 2011

Vermont's Energy Future

VOLUME 1

"I believe there is no greater challenge and opportunity for Vermont and our world than the challenge to change the way we use and produce energy."

—Governor Peter Shumlin



efficiency



electricity



thermal
energy



transportation
& land use

Foreword

I believe there is no greater challenge and opportunity for Vermont and our world than the challenge to change the way we use and produce energy. The challenge is not unique to Vermont, but Vermont does have a tremendous opportunity to serve as a leader. Hurricane Irene should serve as yet another reminder that the way we use and produce our energy—ensuring that we live and work in efficient homes and buildings; that we use the sun, wind, water, forests, and fields for energy; that we prepare to change our transportation technology and infrastructure; and that we make choices that support the growth of compact, sustainable communities—will help our economy, our energy security and independence, and our environment.

It is with these outcomes in mind that, soon after taking office, I asked my cabinet to support the Department of Public Service's Comprehensive Energy Plan efforts. I thank all those in my administration who assisted with the plan, as well as all of the Vermonters who came to meetings, submitted comments and ideas, and demonstrated how much they care for the future of this state. I look forward to working with the Legislature and with all Vermonters to implement the action steps set forth here, and to continuing the conversation as we move toward a more sustainable and secure energy future for Vermont.

—Governor Peter Shumlin



CONTENTS

Our Current Energy Picture... 2

The Vision for Vermont's
Energy Future 3

Energy Plan Strategies by
Sector

*Energy Efficiency and
Conservation First* 5

*The Strategy for Electricity
and for Renewable Energy* 7

Transmission and Regional
Market Strategies 9

*Heating Our Homes and
Businesses* 10

*Transforming Transportation,
Fostering Smart Land Use* 14

Implementation..... 16

Highlights and Action Steps

Alternative Progress Indicators 3

State Government Leadership 6

A Total Energy Standard 7

Smart Grid Future..... 11

Energy and Agriculture 13

Electric Vehicle Adoption 14

A Note to the Reader

The Comprehensive Energy Plan 2011 has been divided into three sections. Volume 1: Vermont's Energy Future, includes the vision and overarching strategies that drive the plan's recommendations. Volume 2: Facts, Analysis and Recommendations, sets forth detailed supporting information by energy sector and topic. Volume 3: Appendices, contains several backup reports and documentation for the plan.

When Governor Shumlin asked me to join the Department of Public Service, he made clear that state energy planning was a first-year priority and asked me to complete a Comprehensive Energy Plan, required by 30 V.S.A. § 202a.

With the support of Governor Shumlin's cabinet, a large team throughout state government got to work. The Agency of Natural Resources, the Agency of Transportation, the Agency of Commerce and Community Development, the Agency of Agriculture, the Department of Buildings and General Services, and the Agency of Human Services—plus the Tax Department, the Health Department, and the Agency of Administration—had a role in and contributed to the plan. The Planning and Energy Resources Division at the Department of Public Service led the charge, and I am grateful for the tremendous amount of work they accomplished.

The governor asked us to create the plan with the current issues in mind: a challenged national economy that has affected Vermont's jobs and budget picture; expiring energy supply contracts and the end of the state's reliance upon Vermont Yankee; continuing concerns about the price of electricity and of fossil fuels for heating and transportation; and concern about the effect our energy choices have on our environment and on our economic security.

With the help of Vermont Natural Resources Council and others, we convened over 18 separate advisory sessions, open meetings, and public hearings throughout the state, inviting members of our communities, regional planning commissions, town energy committees, businesses, and foundations to offer their perspectives on energy planning.

Throughout the planning process, Vermonters responded with an extraordinary breadth and depth of interest and invaluable insights which have informed this plan. Indeed, we received over 9,000 separate comments throughout the planning period, including dozens of detailed and specific policy recommendations. Documentation of this process and of all public comments is available for reference at www.vtenergyplan.vermont.gov/. This website remains open as the portal for ongoing input and information.

We view this plan as the beginning of the conversation—not the end. We recognize that a successful plan must remain current and responsive to change. As progress is measured, the state must revisit the goals set forth in this plan and adapt strategies to achieve success based upon experience. I hope you find the plan educational and inspirational, yet practical in the strategic short-term actions it recommends. Thanks to all who helped contribute to this plan, and to all who will help achieve its vision.

—Elizabeth Miller, *Commissioner of Public Service*

Our Current Energy Picture

Although Vermont has made great strides in energy development, we stand at a moment of tremendous challenge and opportunity for our energy future:

- Vermont already consistently leads the nation in electric efficiency investments, in recent years reducing our electricity consumption by more than 2% annually. And efficiency saves not only energy but also money: Even a single year of efficiency investments under current programs yields an economic benefit to the state of \$5 for every \$1 spent. *See Vol. 2, Sec. 4.*
- Despite these beneficial expenditures on electric efficiency, we are well behind on the goals the legislature has set to make our homes more energy efficient. Although we have managed to improve total energy efficiency in approximately 6,700 homes since 2008 with current programs, funding, and efforts, we would need to increase our pace to approximately 8,200 homes *per year* to meet the legislative challenge to improve the energy performance of 80,000 homes by 2020. *See Vol. 2, Sec. 7.*
- Vermont has enjoyed relatively stable electricity prices over the last 20 years. In fact, the retail price of electricity in Vermont, when adjusted to 1991 dollars, has remained nearly flat. We also have, for many of the last 20 years, enjoyed electricity prices that are favorable compared to our New England neighbors. *See Utility Facts 2011, Fig. 1.2d and 1.12, and Vol. 2, Sec. 3.* Nevertheless, a larger percentage of Vermonters' income is spent on energy costs—particularly for home heating and transportation—than the national average.
- Approximately two-thirds of our total energy usage is for heating and transportation, and nearly all of those dollars are for fossil fuels and flow out of state. Last year, Vermonters paid over \$600 million to import fossil fuels for use in our homes, businesses, and other buildings. *See the Regulatory Assistance Project, Affordable Heat Report 6-29-2011 and Vol. 2, Sec. 6-8.* That is almost \$300 million more than we were paying a decade earlier. Drivers also purchase approximately \$1 billion per year in gasoline and diesel for transportation. *See Vol. 2, Sec. 9.* By any standard, paying for imported fossil fuels imposes a large burden on the Vermont economy.
- Because of our rural character and land use patterns, Vermonters drive more than most other Americans. Indeed, transportation costs usually are the second-largest expense of a Vermont household, after housing costs. And combustion of transportation fuels accounts for 47% of Vermont's greenhouse gas (GHG) emissions. *See Vol. 2, Sec. 9 and www.anr.state.vt.us/anr/climatechange/vermont_emissions.html.*
- Meanwhile, vehicle fuel efficiency technology is improving in response to more stringent standards, and electric vehicle technology is poised to radically change our transportation energy picture.
- Since 2004, total emissions in Vermont have steadily declined by approximately 3% per year. However, trends indicate that we are still well behind our goals of achieving GHG emission levels 25% below 1990 levels by 2012 and 50% below 1990 levels by 2028. We will not reach the 2028 goal without more direct efforts to lower the state's contribution to global warming. Meanwhile, the devastation of Tropical Storm Irene serves as a potent reminder that climate change—and the extreme weather and environmental disruption scientists expect it will bring—will not wait for slow policy development or be cured by small progress.
- Vermont on the whole is moving steadily toward renewable energy. Nearly half of our electricity supply is currently renewable (including large hydroelectric resources out of state). Thirteen percent of our schools, representing 30% of Vermont's K-12 public school students, already heat with local wood and other biomass, and there is a burgeoning biomass industry in Vermont. In total, nearly a quarter of Vermont's energy usage presently is from renewable sources. Meanwhile, use of solar thermal and photovoltaic energy is on the rise; wind energy projects are in process that could account for 6 to 7% of our state electric load if built; and Vermont-based renewable energy businesses are working hard to expand their markets. We are set to do significantly more with renewable energy in the coming years. *See Vol. 2, Sec. 5 and 8.*
- Natural gas, which is currently less carbon-intensive than other fossil fuels and is sourced from North America, is presently a fuel choice for only a limited number of Vermonters, and accounts for approximately 5% of our total energy usage. New extraction techniques, while raising significant environmental and emissions concerns, have clearly decreased prices in the past few years, and are forecast to continue to influence energy prices going forward. *See Vol. 2, Sec. 5.*
- Vermont utilities are transitioning to new long-term contracts with Hydro Quebec and others over the next few years, and are expected to end purchases from Vermont Yankee in 2012. Favorable electricity prices and excess supply in the New England market have allowed our utilities to secure contracts to meet our needs in the coming years. However, challenges remain to carry out transmission upgrades needed in the years ahead and to ensure that long-term electricity needs are met in a cost-effective and environmentally-sustainable manner. *See Vol. 2, Sec. 5.*

The Vision for Vermont's Energy Future

With those facts in mind, what energy vision should we set for our future, and what short-term steps should we take to support it?

We intend to set Vermont on a path to attain 90% of its energy from renewable sources by mid-century. We have chosen a comprehensive approach, requiring action in all sectors regarding all energy sources.

90% of our energy needs from renewable sources by 2050.

The goal is underpinned by this strategy: to virtually eliminate Vermont's reliance upon oil by mid-century by moving toward enhanced efficiency measures, greater use of clean, renewable sources for electricity, heating, and transportation, and electric vehicle adoption, while increasing our use of natural gas and biofuel blends where nonrenewable fuels remain necessary. The moves must be deliberate and measured to ensure overall energy costs for our businesses and residents remain regionally competitive.

Oil costs are perhaps the most volatile and troubling aspect of the energy future. Political instability is a significant threat to supplies; the continued industrialization of major populations around the world is increasing the rate of use and cost of this resource. Rising prices at the pump and the increased cost of heating our homes have placed further strain on Vermonters' pocketbooks. Oil also presents environmental costs not fully captured in the price of a barrel, and contributes to the challenge of climate change.

It is imperative that we take more control over our energy future. Vermont's dependence upon oil for a large portion of our heating and the vast majority of our transportation needs is a vulnerability that we should work aggressively to address in the next 20 years—by taking what we have learned from our electric efficiency efforts and applying it to heating efficiency improvements; by supporting the use of renewable

sources for heating, including biomass and blended biofuels; by helping to transition our local transportation and heating fuel companies and workers to the new energy future; and by planning for the infrastructure changes required to move part of transportation energy onto the electric grid.

In considering the goal that we have set, consider also the acceleration curve caused by innovation. Computing and communications technology tell the story—small steps in early years leading to major, unforeseeable changes in later years. The overlay of communications technology onto our electric grid, the acceleration of renewable technology and concomitant lowering of price, and the emerging electric vehicle industry mean that we are on the brink of large changes in the energy industry, pushing us toward bold goals.

But near-term, smaller, and tangible steps are required now. We have no illusions that our march toward our mid-century goal will be, or should be, linear. The next decade is a time for focusing on heating efficiency as effectively as we've focused on electric efficiency in the past decade. We also must plan for the transportation funding and infrastructure changes that will be required as we transition to plug-in electric vehicles (PEVs). We must establish a smart grid capable of managing load and distributed generation so that we can expand renewable projects here, increasing our energy security and jobs. Investments in renewable energy, including Vermont-based projects, will lead us to greater energy independence and reduced costs for all Vermonters. We must also integrate more energy generation into our working agricultural landscape, to support our farmers and our energy future at the same time.

We are aiming to enhance our state infrastructure—the energy infrastructure for the 21st century. Making these choices will create well-paying jobs, reduce total costs for Vermonters, and support a better quality of life.

Why We Must Achieve Our Goal

There are *four key benefits* obtained by achieving our ambitious goal.

1. Foster economic security and independence.

Focusing further efforts on efficiency will create jobs, enhance local economic activity, and reduce total costs for Vermonters. Enhancing Vermont's use of renewable resources will reduce our dependence on oil and other fossil fuels, which are subject to price volatility and uncertain supply. The goal will be to keep more of Vermonters' dollars in state and in region, and to keep energy affordable for the long term by significantly curtailing our reliance on fossil fuels.

2. Safeguard our environment.

Our move toward renewable energy sources must be strongly coupled with enhanced energy efficiency programs and conservation education, in keeping with our state's long-standing environmental leadership. Some may ask, "what can the small state

Action Step: Investigate Alternative Economic Progress Indicators

In our Energy Plan meetings, we heard from Vermonters concerned that traditional economic progress measures do not adequately account for real economic benefits and harms associated with the choices we make—for example, loss of habitat caused by development. The administration is investigating adding such measures to our current economic measures, including Genuine Progress Indicators already in use elsewhere, and already the subject of research by UVM's Gund Institute.

of Vermont do to help our global climate challenge?” The answer is that we can do our part and lead others by example. A ton of greenhouse gases saved here is still a ton saved—and if we spur our economy with the energy investments we make, we will show how environmental choices can lead to economic prosperity. By making these choices, we will help not only our environment but also the Vermont brand—which underpins our tourism and agricultural industries and attracts businesses to our state. We must balance what we love about Vermont—its fields, forests, and mountains—with responsibly sited energy projects.

3. Drive in-state innovation and jobs creation.

Pursuing the goal of 90% renewable energy by 2050 will help Vermont further drive and develop the clean energy sector of our economy. It is about creating knowledge and jobs—and building the underlying capacity to continue creating them. We have a tremendous base from which to build. Our higher education centers are already engaged. For example, the partnership between University of Vermont and Sandia National Laboratories has started smart grid program innovation; UVM’s Transportation Research Center is engaged in the PEV infrastructure challenge; Vermont Technical College is a national center for alternative fuels; Norwich is developing energy-related GIS applications; Green Mountain College became the nation’s second climate-neutral campus this year; and both UVM and Middlebury have committed to a carbon-neutral future. And our private sector actions are already robust. IBM has established itself as an exemplary leader in

industrial energy efficiency; our efficiency utility, Efficiency Vermont, is helping the largest commercial users in the state save 7.5% annually through a commercial energy efficiency challenge; and numerous in-state businesses—renewable energy developers, manufacturers, and solar, efficiency, and home energy contractors—are already driving jobs and innovation. We also have a strong backbone of local fuel dealers and other service providers who are already pushing for low-sulfur and biofuel-blended products, and are well-positioned to help Vermonters make the transition to a renewable energy future. A state energy plan that endorses and expands upon the efforts of all of our local energy business and academic resources will help Vermont position itself as an innovation hub for energy, capable of leading the nation by example.

4. Increase community involvement and investment.

The plan’s focus on efficiency and renewable energy sources, including community-based sources, will help connect Vermonters to our energy choices, strengthening our communities. The plan also supports productive energy uses for our working landscapes—particularly our farms, forests, and fields. The goals of this plan will require broad involvement of Vermonters through town energy committees; school, community, church, and social group programs; work programs; conservation corps; neighborhood and community net metered energy projects; and efficiency campaigns in homes and businesses. Vermont already has a high level of community energy engagement, but focused education and efforts are needed to accelerate our success.

The Leverage Points That Will Help Us Achieve Our Vision

Isolated actions are likely to yield isolated results—and what we need are deeper, long-lasting results. The analyses and conversations that shaped this Plan repeatedly revealed four separate leverage points that all must be addressed at once when implementing a particular strategy:

- Outreach and education
- Finance and funding
- Innovation and expertise
- Regulatory policy and structures

In simple terms, if we make a regulatory change or put a financing mechanism in place without supportive public outreach, we are unlikely to achieve the goal we had in mind. Energy efficiency programs, as an example, bear this out—a recent study suggests that lack of public access and understanding has depressed home efficiency investments. See *Regulatory Assistance Project Affordable Heat report and Vol. 2, Sec. 7*. Similarly, the best public outreach campaign in the world—making the case for efficiency investments or small-scale renewable energy choices—will do very little if we fail to address financing, support jobs training and local business innovation to provide the service, and enact regulatory changes needed to support the programs. A systematic approach addressing all leverage points is required.

As you read, keep these leverage points in mind—we have attempted to describe how each can be addressed in crafting the key policy recommendations in this Plan.



Overview of Energy Plan Strategies by Sector

Use Less and Save Money: Efficiency and Conservation First

Efficiency and conservation must be the first priority for any comprehensive energy plan.

The energy sector is comprised of both supply and demand sides, and both must be addressed in the transformation of the energy system as a whole. When it is cheaper and more economically beneficial to adjust on the demand side—through, for example, increased energy efficiency measures—than to increase the supply side, energy efficiency should be pursued first. The cost of existing energy efficiency measures is clearly smaller than the energy savings they produce; those efficiency dollars also stay local and create good jobs for Vermonters. Meanwhile, electricity prices and heating fuel prices are expected to rise, and are in any event subject to market forces and volatility. The costs of renewable energy technologies are forecast to drop over time, but the timeline and depth of this drop are not likely to change the economic equation regarding efficiency in at least the next decade. Therefore, efficiency investments must continue to be the first choice in energy policy.

Vermont's experience with energy efficiency has been very successful. We have reduced our electric demand more than 2% annually in recent years—if electric efficiency were counted as a supply resource, it would currently comprise about 11% of our portfolio. Moreover, as shown in the economic impact analysis of Vermont's present electric and thermal efficiency programs included in Vol. 2 of the plan, Vermont's one-year energy efficiency budget leverages a net gain of 43 job-years (one full-time job for one year) for every million dollars of program spending, and a net increase over the life of the measures installed of nearly five dollars of Gross State Product for every public dollar spent. *See Vol. 2, Sec. 4.* These multipliers take on more significance when one considers that Vermont's energy efficiency programs have been operating and will continue to operate for many years, compounding those one-year net benefits. Thermal efficiency programs, in which Vermont has invested fewer public dollars, have yielded more modest but still positive economic impacts, in addition to heating fuel savings. A greater investment would yield greater results because fixed program costs would be spread over a greater number of projects.

All that said, there is much more we can do. For example, to meet the existing goal of improving the energy efficiency of 80,000 homes by 2020, as mandated by the Legislature in 2008, we would have to weatherize approximately 8,200 homes a year—22 homes each and every day—for the next 9 years. Of course, many Vermonters have made and will continue to make their homes more energy efficient even

without any public incentives—but nevertheless we are not on pace to meet the legislative goal using current programs.

For electric efficiency programs, in the short term we intend to pursue electric efficiency measures designed to achieve savings of up to 3% of the electric demand annually. Although some have called for even more accelerated savings, we believe it is important to balance efficiency efforts with year-to-year ratepayer costs and the capacity of our program infrastructure.

But in the longer term, we need to deepen our investment in efficiency programs designed to lower usage of all fuels, not simply electricity. Here are some of the ways we will pursue this goal using key leverage points:

Regulatory Policies and Structures

As a key energy strategy, DPS will lead an effort with the Agency of Human Services, Efficiency Vermont and key stakeholders to review all state-supported efficiency programs presently in place and develop a roadmap for a whole-building approach to all-fuels efficiency by the end of 2012. The roadmap should include:

- Program delivery improvements, so that from the consumer's point of view, a smooth and one-stop approach to energy efficiency projects will occur.
- Funding and financing mechanisms, recognizing that we are far behind on our legislated energy efficiency goals, and that it costs, on average, \$7,500 to complete an energy project yielding 25% savings. This investigation must identify not only the cost of achieving our goals but also the best mix of funding and financing to do so. The economic impact analysis regarding electric efficiency completed for the Department of Public Service makes clear that Vermont should *not* trade electric efficiency dollars collected from ratepayers for all-fuels efficiency—those dollars are bringing tangible and important benefits to the state tied to the electric load reductions achieved. Instead, Vermont must identify ways to unlock private financing options and then identify the proper amount and use of a secure, sustainable source of funding tied to the fuels the efficiency measures are addressing.
- Measurement of progress and tracking of results, so that the state has a better view than current structure allows regarding how many homes have been improved, to what extent, and at what cost. Recent studies have highlighted the lack of overall progress tracking as a failure in the current patchwork system for non-electric efficiency programs.

In short, we believe that Vermont should put the same sort of innovative thinking into the structure and delivery of whole-building efficiency as it did more than a decade ago when our electric efficiency programs were created; we cannot assume that adding an all-fuels program here and there will help achieve our goals. The present approach is not doing enough.

Innovation and Expertise

The state should pursue all-fuels efficiency innovation by developing a strategy to help our local fuel dealers shift over time from heating fuel supply, distribution, and service businesses to energy service companies capable of providing efficiency improvements to their customers. Our intent is to open the opportunity for heating fuel-based businesses to participate in the new energy economy so that they are not stranded in the old one in the coming decades.

Finance and Funding

When it comes to raising public money (funding) and enabling private investment (financing) to support energy efficiency, it is clear that no one solution will give us the robust progress we desire in order to lower Vermonters' total energy bills. Among the many other strategies supported in the plan, we recommend investigating and then instituting well-designed programs for utility on-bill payment of customer energy improvements, and implementing a strategy for using a portion of Vermont's Qualified Energy Conservation Bond allocation for leveraging energy improvement financing. These two specific short-term strategies will help open the opportunity for better energy improvement financing.

Outreach and Education

To create awareness and develop demand, we will provide and align state support for the ethic of conservation and efficiency in all sectors. We will coordinate a statewide education information and outreach campaign to emphasize conservation and efficiency, and to promote the programs available to Vermonters for greater energy savings. We will also collaborate with the Vermont Energy Education Program, which brings energy programs to our primary and secondary schools, to deepen the curriculum and programs, including targeted, measurable school energy challenges, available to support these efforts. Although there are amazing lesson plans already in existence at schools throughout our state, we have lacked concerted statewide support for making energy efficiency and energy choices a deep and recurring part of the educational dialogue. Efficiency Vermont, Vermont Sustainable Jobs Fund, and others are partnering with VEEP in these efforts.

There are many other actions and initiatives for efficiency highlighted in the Facts, Analysis and Recommendations volume of the plan:

- Although nearly one-third of new homes presently are EnergyStar™ rated, we can and should drive this number to 60% by 2020. In addition, we will set a path toward promoting net zero energy for new residential and commercial construction by 2030, with interim goals set, taking into account the lessons learned from the building professionals who have constructed such facilities in state already, and studying the resiliency and performance of those buildings. The Department of Buildings and General Services has reviewed net zero buildings and will continue to review it as state facilities are built and repaired post-Irene.
- Encourage expansion and best practices for town energy committees and other organizations to disseminate Do It Yourself, Button Up and similar energy

Highlight: State Government Leadership

The state must lead efficiency and renewable energy efforts by example in its own buildings and vehicles. In the aftermath of Tropical Storm Irene, the state has been struggling with significant damage to its buildings in the Waterbury office complex, and the dislocation of state workers caused by that damage. While the damage has shifted the order and pace of immediate projects, it has sharpened the focus on state energy usage and the need to incorporate policies and practices that will lead to sustainable, efficient work environments for state employees. As the governor called for in spring 2011, all agencies and departments will create action plans to reduce energy usage by 5%. The Department of Buildings and General Services will lead the way, creating a strategic action plan for its own use that will serve as a model for all other agencies and departments. In addition, Buildings and General Services (BGS) will work with Efficiency Vermont and our utilities to, for the first time, catalog state electricity usage in a manner that can then be tracked for improvement and integrated with smart grid deployment. The state will work to maximize the payoff of its efficiency investments. On the renewable energy front, VTrans has instituted several innovative solar projects and has shared best practices with other departments and agencies. The state has also issued a request for proposals for renewable energy, and the secretary of administration is committed to completing a state telecommuting plan. The State Agency Energy Plan and Agency Energy Implementation Plans will guide these effort.

efficiency training, building upon the success of the Central Vermont Community Action Council's recent stimulus-funded program.

- Support greater efforts by the Vermont School Energy Management Program to document current school building conditions, recommend energy improvements that will lead to savings, and then help implement all cost-effective improvements in our school buildings.
- In the context of Efficiency Vermont screening processes and the all-fuels efficiency research discussed above, consider the need to expand the health and safety measures presently used for efficiency projects delivered to low-income Vermonters to include the improved quality of life and better building integrity certain measures may provide. If an affordable home can be made significantly more comfortable to live in and durable by replacing windows that otherwise frost over every winter, we should account for that benefit in choosing investments even if such a project would otherwise not present the lowest bottom-line improvement that could be put in place, to keep our stock of affordable housing and ensure homes meet the needs of residents.
- Continue to work with the Vermont Energy Climate Action Network and others to deepen the town energy committee impact in Vermont. Many towns are undertaking great projects with significant impact. *See VNRC, VLCT Communities Tackling Vermont's Energy Challenge*, April 2011. Ensuring that such committees continue to thrive, and are used in even more towns throughout Vermont, will help bring energy efficiency and conservation to the grassroots. Town energy inventories and challenges, among other initiatives, should be encouraged and the successes loudly trumpeted.

The Strategy for Electricity and for Renewable Energy

Vermont policies and utility choices have already put us in a very good position. While maintaining a regionally competitive electricity rate for Vermonters, we have attained nearly half of our present electricity needs from renewable resources, including large-scale hydro. At the core of our energy strategy in the next two decades and beyond must be an effort to continue our progress on renewable electricity, not only to meet our present electricity needs but also to allow our other energy needs to transition to electricity to the maximum extent possible—largely trading volatile, high-cost, and environmentally harmful petroleum-based fuels for renewable electricity. In order to achieve our long-term vision of allowing Vermonters to virtually replace petroleum-based fuels with renewable fuels, including biofuels and renewably generated electricity, we must encourage further growth of the renewable energy sector of our economy and also make strategic regional decisions to ensure that progress accelerates. Our goal is to bring local and regional renewable generation to a point of ubiquity and greater affordability compared to the fuels it will replace.

Here are some of the ways we recommend driving this transformation:

Regulatory Policies and Structures

Currently, we are on a pace to increase in-state renewable generation by about 13% by 2013, compared to 2005 levels. If the present voluntary Sustainably Priced Energy Enterprise Development (SPEED) program were to remain in place unchanged—seeking 20% qualified renewable resources by 2017—our pace would have to remain at least as fast to reach our goal. *See Vol. 2, Sec. 5.*

Action Step: Investigate a Total Energy Standard

Our vision for Vermont's future requires significant renewable energy usage in all sectors—not just electricity generation. Although we have policies in place to drive renewable resources in the electric sector, we have not yet effectively addressed Vermont's heavy reliance on fossil fuels in other sectors. Innovative programs to encourage greater efficiency and usage of renewable energy sources in transportation and heating would help Vermont meet its goals, and would address concerns raised by many Vermonters during this planning process that present policies do not adequately address heating and transportation energy uses. We recommend an interagency and stakeholder working group to develop a plan for a Total Energy Standard, based upon a picture of Vermont's total energy usage of 154 TBtus, of which 23% is presently renewable. Targets for efficiency and total renewable energy should be investigated, along with mechanisms to achieve steady progress in thermal and transportation fuels. Such an innovative program would further Vermont's national energy leadership.



The Public Service Board has issued reports regarding the Standard Offer small-scale renewable generation pricing program developed by the Legislature, and regarding whether Vermont should adopt, like all other New England states and many others nationwide, a mandatory Renewable Portfolio Standard (RPS) for electricity load. The Board's study sets forth the successes of the SPEED program to date, along with its drawbacks, and recommends how an RPS could be efficiently and affordably designed and adopted in Vermont.

This Plan recommends that the Legislature consider adopting a streamlined RPS for Vermont, with an aggressive total renewable electricity goal. The plan recommends that any RPS be designed to account for total renewable generation—both existing and new, small and large—in order to maximize cost-effectiveness and utility flexibility while ensuring greater certainty and higher penetration of total renewable electricity in our energy portfolio. Any adopted RPS must be coupled with targeted distributed generation renewable clean energy programs and further support for net metering projects to ensure that local renewable electricity projects are robustly deployed. Therefore, specific additional complementary policies are:

- Develop the next-generation Standard Offer program—a clean energy program offered in small but predictable annual increments to at least an additional 50 MW of small-scale distributed generation, designed to allow pricing mechanisms based in part upon market, location, and economic benefit of projects, so that Vermont can continue to benefit from these projects while ensuring a careful approach to cost.
- Encourage utilities to develop or expand existing auction mechanisms for procurement particularly targeted at mid-sized generation projects that relieve transmission constraints, or provide renewable power or other targeted benefits at the best cost, and employ regulatory mechanisms that allow utilities to seek these targeted benefits.

In addition to renewable electricity standards, we recommend actions to improve our regulatory system in the plan, including:

- Recruit immediately at the Department of Public Service a renewable energy project development manager assist with interagency coordination and information dissemination for developers.
- Develop a system for petitioner-funded mandatory mediation for Section 248 siting projects, so that intervenors have an effective and affordable process for presenting objections to proposed projects and seeking

solutions with developers without enduring full litigation at the Public Service Board.

- Consider Section 248 amendments to simplify the permitting process for small-scale projects where appropriate.
- Through the Climate Cabinet, review the structure of state agencies and departments overseeing energy policy, given growing awareness of the connections in all energy sectors to environmental and economic security issues to ensure that we are best supporting the public interest as we face increased numbers of sometimes controversial in-state generation projects and regional and national transmission rules that impact Vermonters' bottom line.

Innovation and Expertise

Recognizing the value of proper siting of renewable energy projects in reducing environmental harm, our Agency of Natural Resources is engaged in an effort to identify areas of sensitive natural resources that may be reviewed when considering development in state. This effort will be comprehensive, and is expected to be completed near the end of 2012.

More survey work can be done, however, to specifically assist with renewable energy deployment. Therefore, we recommend that Vermont agencies and interested businesses collaborate and combine resources where possible to allow statewide mapping of geography, features, and resources through Light Detection and Ranging (LiDAR). Such mapping should be integrated with the already very useful Renewable Energy Atlas (www.vtenergyatlas.com) created by the Vermont Sustainable Jobs Fund. Presently, high resolution satellite and aerial photography mapping is available only in a patchwork of the state, and municipalities have limited funds and opportunity to obtain such mapping. The new three-dimensional imaging and other capabilities of LiDAR—such as wetlands detection, measurement of foliage and soil density, and roof and land angle mapping—make it the state-of-the-art technology for renewable energy site selection. Unsurprisingly, the technology is expensive, but coordinated efforts, given the multiple uses such mapping could be put to, will ensure that Vermont best utilizes this innovative tool.

Finance and Funding

While ultimately we expect renewable energy to play on the same field as other energy sources, presently many forms of renewable energy are more expensive to develop and deliver than existing fossil fuels. Markets will transform. Solar thermal applications provide an example—although further education and private financing tools should be

deployed to increase usage, solar hot water systems are now cost-effective for many families to install, with relatively short time periods for return on investment, if upfront capital or good financing options are available. Prices for other renewable fuel sources will become cost-competitive if market penetration increases, technology advances, and supplies grow to meet demand. They also are expected to offer a price advantage over gasoline when used for transportation in the electric vehicle future.

Meanwhile, Vermont's size and its relatively limited financial resources must be deployed effectively to encourage progress. Among the finance and funding actions recommended in the plan are:

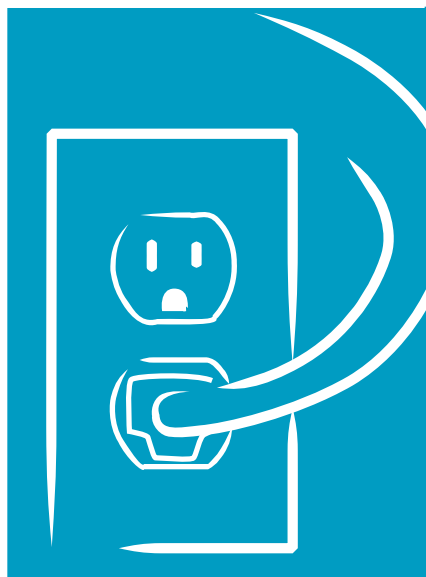
- Expand focus on Property Assessed Clean Energy program deployment and develop on-bill utility payment for small-scale renewable generation and thermal projects for customers.
- Within a year, the newly constituted Clean Energy Development Fund Board will offer a strategic plan including financing recommendations for the Fund going forward, as its current source of funding expires in 2012.
- Through the Clean Energy Development Fund and the Vermont Economic Development Authority, work to deploy a portion of Vermont's Qualified Energy Conservation Bonds for clean energy projects.
- Investigate whether voluntary participation in a community renewable energy program, setting targets for community-scale and community-owned generation in conjunction with the development of meaningful,

robust local energy plans, would allow towns and regions that wish to make the investment become "green energy zones," implementing regionally-appropriate, community-scale projects, creating jobs while increasing renewable energy development.

Outreach and Education

The state should expand its efforts to explain the benefits of various renewable energy solutions, including cost-effective thermal solutions such as solar hot water and improved biomass heating technologies for homes. This energy planning process showed that many Vermonters are already engaged in the state's energy future—but greater education regarding Vermont's current energy picture and the benefits of a greater renewable energy future will increase Vermonters' awareness and participation further. Through the Department of Education and our local schools and school boards, the Agency of Commerce and Community Development and Department of Labor workforce development programs, and through partnerships with private nonprofit organizations such as the Vermont Sustainable Jobs Fund, the state can step up its outreach and education efforts. A key strategy will be to support expansion of the Renewable Energy Atlas as an innovative educational and development tool for all Vermonters.

While there are many specific issues, energy sectors, and energy sources discussed in detail in the Facts, Analysis and Recommendations volume of the plan, key issues raised include: transmission planning and regional market participation; and thermal energy, including natural gas expansion and biomass deployment.



Transmission and Regional Market Strategies

Our first priority is a reliable supply of electricity—even more challenging to manage as the region transitions to a future more reliant upon renewable electricity, including small, distributed generation.

In the 1950s, in order to bring St. Lawrence River hydropower to Vermont, a single, statewide transmission company—Vermont Electric Company, or VELCO—was formed. Although its ownership structure and purpose have evolved over the years, VELCO remains utility-owned and -operated, and continues to manage the statewide transmission system on behalf of all Vermonters subject to the rules of New England's Regional Transmission Operator, ISO-NE, and the Federal Energy Regulatory Commission (FERC). More recently, Vermont rejected the path of electricity industry restructuring followed by many of our neighbors. Our electric utilities remain vertically integrated, capable of owning generation and distribution facilities and serving monopoly territories, though they now operate within the competitive regional generation and pooled transmission market.

It is critical that Vermont continue to focus on ensuring that already-existing regional transmission facilities and interconnections at Highgate, Derby Line, and elsewhere are as robust and reliable as possible. Looking forward, the plan also recommends several near- and longer-term strategies to improve our place in the regional system and strengthen our transmission system here in Vermont, including:

- Continue to focus on electric efficiency and peak load reduction, because it is Vermont's coincident peak load that is used to calculate Vermonters' share of regional transmission reliability projects. Build-out of regional transmission infrastructure has taken on a lightning pace in the last decade, costing the region several billion dollars, and the pace is expected to accelerate in the next decade and beyond as more stringent reliability rules are implemented and more dispersed, intermittent generation is deployed. We are, in many respects, captive to these costs apart from our ability to moderate our share by controlling our peak loads and reviewing projects sited in Vermont.
- Place far greater focus on Vermont's regional participation and advocacy at ISO-NE and FERC than we have been able to do to date. The Department of Public Service and the Public Service Board monitor and participate in ISO-NE and FERC proceedings; however, the resources for this work are thin and the structure for participation has not been systematically evaluated since the emergence of a robust regional market in the late 1990s.
- Focus on greater connection between in-state energy policy and regional transmission planning advocacy. In the last decade, Vermont has developed a stakeholder group for transmission planning, known as the Vermont System Planning Committee. This group is now revisiting its mandate as even greater federalization of transmission planning has emerged. Vermont must have a say in the development (or reform) of market rules and must position itself to respond to developments in the market

itself, such as the emergence of independent merchant transmission companies.

- Ensure that Vermont transmission planning and operation benefit the general good consistently and robustly and reflect state energy priorities.
- Advocate for and cooperate regionally in transmission projects that will reduce inefficiencies in neighboring transmission zones—for example, pushing for the New York project to relieve system constraints that presently restrict imports and upgrades to the PV20 transmission line from Plattsburgh, New York, to Sandbar in Vermont. In addition, Vermont should support development of cost-effective transmission projects capable of bringing renewable energy from its source to market throughout the region, in order to bolster the economics of renewable electricity for Vermonters and our neighbors.
- Finally, we should continue to push for and pursue wherever feasible so-called non-transmission alternatives or NTAs (now called "market resource alternatives" by ISO-NE). NTAs are projects or strategies—new generation, firm demand response, and efficiency measures, primarily—that may if deployed avoid or delay more expensive transmission projects. Presently, regional market rules and federal planning requirements do not effectively encourage the use of appropriate, robust NTAs here or elsewhere. In Vermont, for example, a NTA analysis appears to identify generation solutions that would ameliorate identified transmission problems for less cost overall, even though market rules presently share regionally only the cost of transmission infrastructure, not NTAs.

Overall, we must focus our attention on the reliable and strategic use of our transmission system, and we must continue to press for regional market rules that align with Vermont's goals.



Heating Our Homes and Businesses

Vermonters rely primarily on fossil-based fuels for heating our homes and businesses. To help both our economic security and our environment in the years ahead, we must shift our heating fuel usage. Making our buildings more comfortable and efficient, as already outlined, is the first and best strategy for saving heating fuel. In addition, we must work to shift toward renewable sources and renewable-blended fuels for heating—creating opportunities for our local Vermont fuel delivery companies to bring these products to Vermonters—and toward expanded natural gas infrastructure to offer greater choice of heating fuel options to more Vermonters.

Natural Gas

Vermont has access to a large North America-based supply of natural gas, presently available at prices approximately one-third lower than those for petroleum-based fuels, with favorable and stable forecast prices. Currently, natural gas supplies about

Highlight: Transmission and Distribution—A Smart Grid Future

Vermont is uniquely positioned to be a leader in smart grid deployment, application, and practices. A statewide smart grid initiative is well underway, bringing reliability and communication improvements to our transmission and distribution systems and allowing advanced meter installation in over 85% of the state in the next few years. This will bring significant opportunity for customer management of electricity usage.

In the short term, while all parties work hard to ensure that the project is completed on time, state regulators are also working to ensure that consumer protection rules are in place when meters are deployed, so that privacy, consumer choice, and other concerns are addressed proactively. Meanwhile, investigation of optimal rate structures—designed to allow Vermonters who wish to manage their electrical usage to do so in a way that saves both energy and money—is ongoing.

In the longer term, we believe that a smart grid and advanced meters will allow the real game-changers to emerge: customer-chosen applications to manage electric usage; better management of distributed generation service territory-wide; reduction of peak loads; and two-way integration with electric vehicles to allow for micro-scaled distributed generation.

Vermonters will have the chance to shape this future. Our statewide deployment puts us in a lead position to develop the practices and technologies that will support the 21st century electric grid nationwide. Using our head start, Vermont should foster the partnership developed between UVM and Sandia National Laboratories, among other academic, commercial and institutional partners, to develop Vermont into an energy innovation hub.

5% of our energy needs, limited by a gas transmission and distribution infrastructure that exists only in Franklin and Chittenden Counties.

Natural gas can address two key needs: reduce Vermonter's reliance on overseas oil for heating and for heavy fleet transportation, and help fill a gap in electric supply. Natural gas offers an opportunity to do these things with a lower carbon footprint than other fossil-based fuels. Although environmental concerns regarding hydrofracture extraction and methane release are significant, Vermont should not turn its back on this resource because it allows a lower-cost, less carbon-intensive source of energy than other traditional fossil-based fuels. As Vermonters noted again and again when providing input to this plan, deployment of all energy sources involves tradeoffs and choices. Vermont should choose to expand natural gas within its existing transmission territory and beyond.

In the short term, Vermont Gas Systems has committed to pursue expansion of the gas infrastructure within its present service corridor and south to Middlebury. Proceedings regarding the expansion are expected to occur at the Public Service Board in the next two years. A robust public engagement process must be a part of this system expansion plan. Within five years, the choice of gas service may be available to customers in the Middlebury region. Service may also be expanded to customers along the route from South Burlington to Middlebury. Vermont Gas will also continue its expansion plans within the existing service territory. In the longer term, the plan calls for expansion of the Vermont Gas service territory south to Rutland and beyond, which would allow our Vermont system ultimately to connect to U.S.-based gas supplies through the Glens Falls area, providing greater security and redundancy to the system.

By mid-century, Vermont should aim to expand its usage of natural gas from its present 5% foothold. Expansion of natural gas would, if environmental controls are heeded, provide carbon reduction benefit for every gallon of heating oil displaced, and it would allow room for the use of natural gas for peaking electric generation and for heavy-duty vehicle fuel.

Biomass and Biofuels

Vermont has extraordinary fields and forests that—in addition to providing for important agricultural needs and ecological values—can provide biomass resources for energy. Combined with more cutting-edge technologies to process other biomass such as algae and farm wastes, these resources can provide substantial, though not unlimited, capacity for supply.

Vermont already has significant use of biomass for fuel and electric generation. About 6% of our current electric load is from biomass resources, including wood and farm and landfill methane. In addition, over 14% of our heating needs are presently met with biomass-based fuels including cord wood. We have considerable biomass available here in Vermont for development, and a burgeoning set of biomass businesses including fuel harvesting and processing, equipment manufacturing, and fuel delivery. Although our forest resources require careful management to remain sustainable, it is clear that Vermont is poised to expand its use of biomass significantly in the coming decades.

The question is: how? As with other resource choices, using biomass involves tradeoffs, and not all agree. Rather than placing specific restrictions on end usage for woody biomass, we recommend that the guiding principle for its prioritization and use be sustainable, well monitored forest management practices. Recommendations set forth in the plan keep this principle in mind, including:

- Direct state investment and incentives toward projects that maximize biomass fuel-use efficiency, and displace fossil fuels. We also recommend monitoring of available woody biomass by Agency of Natural Resources, so that availability can be taken into account as biomass projects subject to regulatory review are brought forward.
- Continue to encourage residents, institutions, and communities not only to invest in energy efficiency but also to switch to biomass-based heating equipment and fuels, including wood- or crop-based solid fuels such as chips and pellets as well as blended liquid biofuels. Vermont is on the verge of becoming a national leader in community-scaled thermal systems—thanks to the Montpelier district heating project and other initiatives—and this should be encouraged as a means of replacing significant amounts of fossil fuel while ensuring advanced pollution controls to protect and improve air quality.
- Open Vermont’s small-scale renewable incentive program to biomass equipment, in addition to the innovative efficiency program for woody biomass heating mandated by the Legislature in 2011. We also must expand public awareness of the cost and benefits of fuel switching and continue to investigate financing mechanisms that enable Vermonters to make the investment.
- Encourage greater innovation in fuel delivery systems—so that Vermonters can benefit from automated, bulk delivery from our local fuel dealers, much as they have done over the years with traditional fuel oil.
- Continue advocacy and support for low-sulfur and low-carbon fuel standards and for greater biofuel blending with traditional fuel oil in our energy portfolio.

The following recommendations should be viewed in the context of the recommendations being made by the legislative study committee on biomass (the Bio-E Committee) focused primarily on woody biomass, particularly with regard to forest health and sustainability, and adjusted in implementation as appropriate based on those forthcoming recommendations:

- With respect to electric generation, while Combined Heat and Power (CHP) plants clearly offer better efficiencies than electric-only projects, advanced electric generation technologies, strict emissions controls, and careful forest management practices likely may allow some additional woody biomass electric generation, particularly if it can be combined with load applications in a manner that is economically positive.
- There are few industrial sites in Vermont that could continuously use a sizable portion of CHP plant waste heat. Therefore, regardless of fuel source for biomass electric generation, we recommend that the present efficiency standards in our statutes be revisited, after conclusion of the Bio-E Committee’s report later this year, with an eye toward whether the present standard allows development of many possible CHP applications where waste heat could be effectively used, but only during a part of the year.
- We also recommend that, when reviewing biomass CHP projects, total energy costs and savings for such projects be reviewed and considered, rather than focusing solely on the price for electricity generated or heating fuel replaced. We should foster technologies and applications that allow Vermonters to save total energy dollars by using local, sustainably managed sources of fuel, supporting through our limited financial mechanisms and incentives those that replace the greatest amounts of fossil fuel most efficiently.

In addition to woody biomass, grass-based biomass may take hold in Vermont for institutional heating or CHP applications, and we should not neglect the chance to use otherwise fallow fields for energy from sustainable, renewable grass crops that also provide water quality protection and a source of income and jobs in our agricultural sector.

Meanwhile, there are active research programs around the state and nascent businesses developing other crop-based sources of biomass for thermal and electric load, including biomethane gas. This is an exciting area for academic investigation, local innovation, and commercialization. Vermont leads nationwide in its development and deployment of small-scale bio-digesters, and can position itself to do the same with other aspects of biomass energy.

Highlight: Renewable Energy and the Agricultural Sector

Our renewable energy strategy will create new opportunities for and invite significant contributions from Vermont's agricultural sector. Our farmers have been in the business of harvesting renewable energy and turning it into food and other useful products for centuries. In the 21st century, they will have the chance to expand this traditional business model while diversifying their income, mitigating their environmental footprint, and producing renewable fuels and electricity for themselves and their communities. The plan outlines a variety of strategies designed to utilize farm infrastructure, energy sources, and working landscapes.

On the renewable electricity front, the farm energy strategy should focus on expansion of Vermont's already significant use of bio-digesters, which create energy through the production and burning of methane gases. Integrating other energy amendments, such as food wastes, on-farm crop wastes, and bio substrates from other manufacturing processes, would amplify the production and efficiency of this technology. With proper management and further investments, this technology may be able to generate up to 30 megawatts of renewable base load power by 2025. In addition, Vermont's working farm landscapes offer hillsides, open land between productive fields, and structures for solar and wind electric generation. The east-west orientation of many farm buildings and their ample roof and wall space allow for deployment of solar panels. The barriers are funding and operations – many farm owners would require access to capital to deploy such projects and are agricultural, not energy, experts. Thus, a key to our farm energy future will be encouraging third-party developers to own and operate such systems, while farms reap the benefits of the lease arrangements and energy production.

Critical to the utilization of small-scale distributed generation is the ability to connect to the grid at a reasonable cost. This cost can be prohibitive to farms with open land and plenty of renewable energy opportunities but no robust connection to the lines needed to service and distribute the power. Because of the multiple benefits of on-farm energy, both monetary and intangible, consideration must be given to sharing the cost of connecting working farms to the grid. In addition, expanding an on-farm clean energy program as a part of the Standard Offer, if appropriately constructed and sized, would stimulate a more rapid and profitable deployment of energy technologies on farms in Vermont.

Heating and transportation fuels both may also benefit from renewable farm energy projects. Liquid biofuels are an opportunity for agriculture in Vermont, especially on-farm biodiesel. Biodiesel production and on-farm use generate many benefits to the farm, including fuel and feed cost reductions, while helping society to reduce its reliance on traditional fossil fuels.

Emerging technologies may accelerate the curve of renewable fuel progress in the future. Algae, which can be produced on-farm using any number of on-farm wastes as feedstock, is a promising source of biodiesel. Once algae are crushed and the liquid component are turned into biodiesel, the solids can be used as a feed or compost input. Vermont also has the ability to grow grass very well in our temperate climate, with good soils and ample rainfall. While grass is not yet a widely used energy source, it is a very efficient solar collector that can be used as a compressed dry product heating fuel or processed into ethanol and burned as a liquid fuel. Both algae and grass energy technologies have been demonstrated to work, but have yet to be widely developed on a commercial scale in the United States. With a focused effort on research and development, both of these approaches offer great potential for Vermont farmers in the 21st century renewable energy economy.



Transforming Transportation, Fostering Smart Land Use

Vermonters use a great deal of energy—and spend a great deal of money—moving from home to work, shopping, and other activities. Our transportation needs are directly linked to and impacted by our land use decisions—where we live, work, and use services. How and where we build and where we site energy projects also impact our energy use and the character of our landscape.

Transportation represents a significant portion of our energy usage and GHG emissions, because virtually all of our transportation is powered by gasoline and diesel fuel. *See Vol. 2, Sec. 9.* The vehicles, fuels, infrastructure, and patterns of living and working that developed around the automobile in the last century must evolve if we are to improve our energy security and independence in this century. In order to move Vermont toward 90% renewable energy at mid-century, we must make significant changes in the types of fuels our vehicles use and in the infrastructure that we rely upon to move around.

In planning for our energy future, it is critical that we include a vision for sustainable development in our communities. To be successful we must balance development needs with the impact on natural resources and the environment, to build strong, healthy communities that last. Fortunately, the state has a longstanding goal of encouraging concentrated mixed development in and near our downtowns and villages, while protecting natural resources and working landscapes outside of those areas. This traditional land use pattern supports a variety of public interests beyond efficient transportation and reduce energy usage, including reduced development pressures on agricultural and natural lands, increased housing options, continued use of our historic resources, active community centers, and a strong Vermont brand. By continuing to encourage locally based, small-scale growth tied to developed town centers, we can limit impact on our natural resources and achieve integrated and holistic energy planning through land use choices.

Two Major Strategic Goals for Transportation and Land Use

A major transformation of the state's transportation system, along with focused progress on compact land use development, is needed to achieve the plan's goal of 90% renewable energy by 2050.

To achieve the transformation in **transportation** we envision we must:

- Reduce petroleum consumption and accelerate the switch to cleaner fuels, and PEVs and
- Reshape our transportation system with better, more efficient programs and infrastructure.

To leverage our **land use** decisions to achieve our energy goals we must:

- Enhance Vermont's traditional towns and village character while increasing the resiliency and energy efficiency of our built environment and
- Preserve Vermont's scenic beauty and character while thoughtfully siting energy projects to increase our energy security and diversity.

Among the many strategies and measurable goals detailed in the plan regarding both transportation and land use, here are a few highlighted priorities:

Highlight: Electric Vehicle Adoption

A lynchpin of the plan is the expected move toward vehicle electrification nationwide. We are only at the beginning of this transformation; while we cannot predict its precise outcome, we must set a course that will allow Vermont to take full advantage of its development. The current, business-as-usual projections for electric vehicles and plug-in hybrids are modest. If present trends continue unchanged, preliminary projections made by ANR indicate that by 2030 there would be only 10,000 battery-electric and plug-in hybrid vehicles here, representing roughly 2% of all light-duty vehicles registered in Vermont. This is nowhere near the pace that we expect if the nation embraces PEV technology; nor is it a pace that will be sufficient if we wish to virtually eliminate our reliance on petroleum in transportation by mid-century for the passenger fleet. The plan sets forth steps to drive infrastructure for PEV here and regionally, and to study the myriad regulatory, funding, and other changes that may be required to accommodate robust PEV adoption in Vermont.



Regulatory Policies and Structures

We must continue policies and standards that raise fuel efficiencies and reduce emissions in vehicles, by supporting low- and zero-emission vehicle programs and working to establish a low-carbon fuel standard with 11 northeastern states. This could reduce gasoline consumption by as much as 30 percent and spur job growth over the 10-year life of the program, according to a recent economic analysis by the Northeast States for Coordinated Air Use Management. In addition, we must accelerate the adoption of electric, hybrid, and alternative-fueled vehicles by first determining a combined average fuel economy for the Vermont-registered vehicle fleet and then setting a goal to meet the national CAFE standards, or improve upon our current average by 5%—whichever is greater—by 2025.

We must also improve interagency coordination, and support regional and town planning efforts, in recognition of the close connection between statewide transportation planning and local land use decisions. State agencies must work in sync with regional planning commissions and municipalities to create mixed-use, compact development and a more energy-efficient transportation system, responsive to all modes of transportation.

- To that end, we must commit to triple the number of spaces in the state park-and-ride program to 3,426 by 2030, and work with regional planning and municipal leaders to create a network of park-and-ride locations on municipal, collector, and arterial routes to complement state facilities that are located primarily on the interstates.

In conjunction with increased rideshare infrastructure, we must set and measure progress toward targets for reductions in single-occupancy vehicle (SOV) commute trips.

- The plan recommends steps to reduce SOV commute trips—which presently account for approximately 75% of all commute trips—by 20% in 20 years.

For land use, we must ensure state programs recognize and encourage compact development patterns by strengthening the state designation programs to ensure consistency, efficiency, and improved function to encourage new growth in and around our town centers. We must align state policies across agencies and departments to support thoughtful and resilient growth in our downtowns and villages.

- The Agency of Commerce and Community Development (ACCD) is leading an effort to review designation programs and propose improvements and revisions in 2012. Its success will be shown in increased participation in designation programs, leading to growth in our downtowns and villages.

- The state also must work with regional planning commissions and town energy committees to help ensure comprehensive, robust, and detailed energy and development plans that express local preferences for transportation energy reduction, for development of homes and businesses, for protection of working land and open spaces, and for siting of energy projects.

Innovation and Expertise

The State can, right now, use its fleet to demonstrate the use of compressed natural gas and other emerging fuel technologies, including PEV, to meet the state's GHG reduction goals per executive order #14-03. In addition, we need technical innovations in the private sector to foster fuel switching (e.g., batteries, smart grid storage), new technologies (e.g., fast charge), and clean vehicle infrastructure (charging stations and alternative fuel pumps). To assist innovation in land use and transportation planning, VTrans and ACCD must develop specific training programs and conduct workshops to implement Complete Streets and ensure Transit Oriented Design, in partnership with the American Institute of Architects Vermont, the Vermont League of Cities and Towns, the American Association of Retired Persons Vermont, and others. Finally, in order to broaden transportation options and economic growth associated with it, the state must continue to support freight and passenger rail initiatives that dovetail with northeast and Canadian rail initiatives.

Finance and Funding

The largest funding challenge in transportation arises from the expected shift away from petroleum transportation fuels and SOV trips. While we make progress on our goals of reducing petroleum usage and increasing shared transportation, we must also recognize the effect that progress will have on the way we fund transportation services. The current gas tax construct must shift over time—toward vehicle miles traveled fees, other demand-based fees, or fees based upon the alternative fuels utilized—in order to maintain our roads and infrastructure. This will require funding innovations, supportive regulatory policies, and significant public engagement—and we do not have the answers now regarding what funding system will best suit Vermont as the 21st century transportation system takes hold. These same transportation challenges exist at the federal level and in other states, and we expect solutions will emerge as electric vehicles and more efficient vehicles and fuels gain ground. However, in the next decade, Vermont must be a leader on this issue, proactively studying and then addressing the funding dilemma caused by the planned reduction in use of petroleum-based fuels for transportation.

For land use, as a part of ACCD's state designation program review, it will review state agency programs and funding sources that are linked, or could be linked, to state designation programs—including wastewater, water supply, transportation, municipal planning grants, and other infrastructure programs—to better support growth in smart growth locations rather than outside designated areas.

Outreach and Education

VTrans, ACCD, and other relevant agencies will continue partnerships with employers, energy committees, and grassroots groups to promote and increase participation in existing initiatives, including Go Vermont programs, regional transit routes, and CarShare Vermont, and will encourage private sector innovations to obtain greater adoption of alternatives to SOV commuting. We also must increase awareness and emphasis on smart growth principles, land use and transportation goals, and the tools to implement these goals. ACCD is planning to conduct statewide workshops on policies and tools that support sustainable, resilient, and compact development.

There are many other strategies, coupled with specific goals and action steps, discussed in the plan regarding both transportation and land use. If we are to achieve our goals, we must create transportation systems and support communities that allow Vermonters to embrace other means of transportation—rideshare, transit, walking, biking—while creating an infrastructure and public policies that support alternative fuels and emerging, more efficient, and renewably fueled vehicle technologies such as hybrid and electric-powered options. Meeting the challenge will also be dependent on private sector innovation to provide critical technological breakthroughs in transportation—the state cannot drive this change alone. And our federal government will have to commit to maintaining aggressive federal fuel economy requirements and to establishing a clean fuel program, while consumers do their part by embracing new technology and increasing the rate of adoption. Meanwhile, we must support energy-smart land use decisions while addressing flood resiliency and aging infrastructure. Though the task is large, the rewards if we succeed will be healthier, more connected communities; money saved at the pump; and greater energy security and independence for all Vermonters.

Implementation

As outlined in the plan, there is much to be done. While by statute the Department of Public Service is charged with statewide energy planning, our planning process has amply demonstrated the need to engage a wider group of state leaders, including agencies and departments that oversee critical energy sectors, to ensure that implementation is well coordinated, thoughtful, and robust. To help that process, Governor Shumlin has asked the Climate Cabinet formed by Executive Order 05-11 to accept authority for ensuring necessary executive branch action to support, implement, and monitor the progress of the recommendations in this Plan.

By taking on this task, the Climate Cabinet will specifically enhance its existing mission regarding climate change to embrace the intersection between the environment, energy and Vermont's economy. The Department of Public Service has committed to continuing robust support for the plan, helping to monitor progress and recalibrate recommendations in light of changing circumstances, and updating the key recommendations of the plan itself more frequently. Other agencies and departments as tasked by the Climate Cabinet, including ANR, VTrans, and ACCD, Agency of Agriculture, and Department of Human Services, among others, will also assist in monitoring both public and private sector actions that affect our energy future, so that the plan can be responsive to change.

The Legislature, of course, plays the key role in reviewing the plan's recommendations and determining whether to implement those that require legislative change. Key legislative committees, including the House Energy and Natural Resources and Commerce Committees and the Senate Natural Resources, Economic Development, and Finance Committees, among others, will undertake review of the plan's recommendation in the coming sessions.

Finally, the Climate Cabinet is reviewing public and stakeholder implementation models right now, as the final plan is released, and is committed to helping support a framework for encouraging citizens, institutions, organizations, and businesses to take a systematic approach to energy policy progress and to move Vermont toward our renewable energy goals. State government cannot and should not do it alone.

Vermonters will judge the efficacy of the plan's recommendations and must help with its implementation. Many of the actions suggested in the plan are capable of progress without any further state government initiative. Ultimately, all Vermonters will help determine the success of the plan, its recommendations, and Vermont's energy future.

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