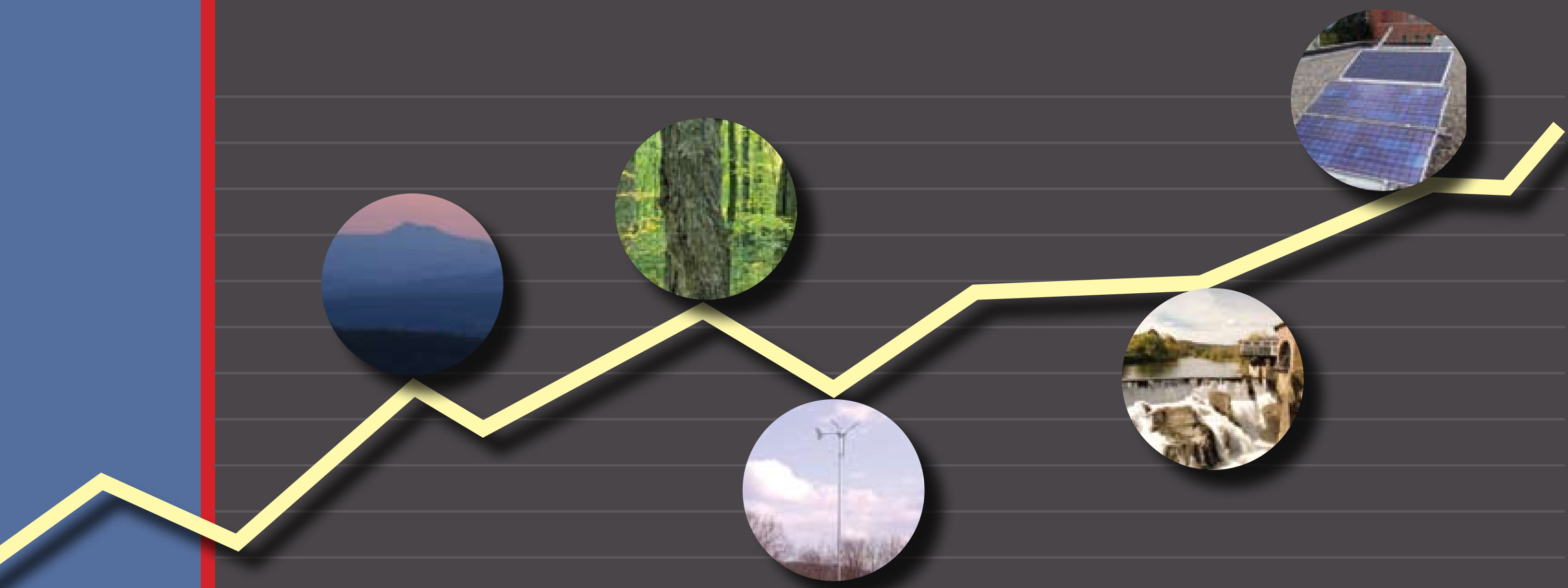
Strengthening Vermont's Energy Economy

Final Report and Recommendations of the Vermont Rural Energy Council

Vermont Council On Rural Development

August 2007



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Executive Summary

The Vermont Rural Energy Council (VREC) was developed by the Vermont Council on Rural Development (VCRD) to provide a non-partisan analysis of opportunities in rural electric generation, fuel development and energy efficiency in Vermont. VREC's findings are listed as Recommendations in Section II, at the core of this report.

VREC's review of economic opportunities included three main inputs: from leaders in the field, from fact-based research on the status of this economic sector today, and from economic modeling of sector opportunities.

Through the course of its deliberations, VREC invited leaders in all aspects of energy generation, fuel development and efficiency to provide testimony and advice to the council.

VCRD also commissioned the development of The Vermont Energy Digest to serve as a fact book for VREC's deliberations, one that provided a common set of known data on renewable energy and efficiency in Vermont today. It is important to see the Digest as the companion to the VREC final report; in the broadest sense it provides a situation analysis on renewable energy generation, fuel development and efficiency in Vermont that can provide a baseline as we look to future opportunities (available at www.vtrural.org).

VCRD commissioned Economic & Policy Resources of Vermont to build a model to evaluate the economic benefits of development in fourteen focused categories of efficiency, fuel development and electric generation (Section III of this report). The economic model developed by this process is freely available for the administration, legislature and interested parties for further use in examining alternative scenarios or to evaluate a variety of diverse assumptions over time.

The findings from this analysis are significant. The full development of just the energy sources included in the 14 technology scenarios analyzed could ultimately result in the generation of a significant portion of the State's electric power needs and create tens of thousands of Vermont jobs during their construction and development.

The model as currently developed does not compute externalities for different technologies or include values associated with carbon reductions; nor does it evaluate various development financing sources or the cost/benefits of the use of public funds to accelerate the market penetration of the listed scenarios—those economics need more work in Vermont.

Based on these inputs and on the knowledge and experience of Council members, the Vermont Rural Energy Council crafted a set of recommendations for actions that would advance rural energy generation, fuel development and efficiency in Vermont (Section II).

These recommendations include:

- Systematically Advancing a Vermont Renewable Energy Program
- Expanding Net Metering
- Adopting Clean Energy Policies
- Constructing an All Fuels Efficiency Program
- Improving Transportation Efficiency
- Targeting Economic Development Assistance
- Building a Green Investment Strategy
- Adopting Time of Use Rates for Electricity
- Beginning a Vermont Carbon Plan
- Expanding Property Tax Incentives for Renewable Development

- Expanding Property Tax Benefits for Using Less Energy
- Expanding Renewable Incentives Through the Clean Energy Fund
- Advancing Public Education on Conservation, Efficiency, and Renewables
- Expanding Workforce Education
- Supporting Research and Development
- Advancing Farm-Based Methane
- Expanding Biofuel Development and Use
- Promoting Green Building
- Improving Home Energy Efficiency
- Developing Biomass Energy
- Expanding Small Scale Hydro Power
- Modeling Community Wind Development
- Advancing Solar Thermal Systems

As VREC came to conclusions, it worked toward consensus in its recommendations. In some of the areas full consensus was not achieved, and recommendations were included based on a two-thirds vote of the Council. In some cases some VREC members felt the recommendations went too far, or not far enough. To ensure a balanced appraisal of the recommendations, members who had qualifications or disagreements with adopted recommendations have submitted their perspectives in the section entitled, "Additional Considerations and Challenges."

Vermont has a major opportunity for progress in the generation of renewable energy, the development of fuels, and the advancement of efficiency. VCRD and VREC commend all the work going forward in the state today and respectfully offer the following set of ideas, research, and recommendations to support Vermont's efforts to advance this critical economic sector for the good of all its citizens.

Introduction

Providing Vermonters with safe, reliable, affordable energy is a substantial challenge. By encouraging the innovation and creativity of energy entrepreneurs, we believe Vermont can help confront that challenge and at the same time grow a critical economic sector in Vermont. Vermont's success will require the collaboration of public and private partners. This document is a contribution to this cooperation.

Renewable electricity generation, energy efficiency and alternative fuel development offer business opportunities in Vermont that could expand the circulation of dollars in state, decrease Vermont dollars spent on energy imports and increase the overall health of the economy. In addition, Vermont has existing businesses, natural resources, and intellectual capital that can give it a market advantage in renewable energy and fuel development for in-state use and for export. With appropriate support and leadership, there are significant opportunities for increased efficiency, solar, wind, biomass, biofuel and other forms of generation to provide fuel and electricity for households and businesses in Vermont today and in the future. These businesses, and the success of this sector, can build from our Vermont traditions of innovation, resourcefulness, and respect for the natural environment, and can support the working landscape we love.

Vermont can be an incubator of ideas and a leader in the implementation of energy efficiency and the development of local energy for local use:

- Leading in the development of local electricity applications that increase the reliability and capacity of the grid, while actively lessening demand and contributing energy to it.
- Leading in the application of conservation and efficiency, including building practices that significantly reduce energy demand.
- Leading by incubating Vermont businesses that promote and provide efficiency solutions in the state, national and global marketplace.
- Leading in small-scale transportation solutions, alternative fuel development, and the sustainable use of natural resources for heating.
- Leading in energy problem solving that can help to answer environmental challenges across the globe; building the brand identity of "Vermont: advancing energy and environmental solutions."

Fossil fuels, including oil, gas, and coal, exist in finite quantity and have volatile prices and markets. Over time, the effects of diminishing supply and the political control of that supply will be felt in markets at all levels. Currently, Vermont receives about 64% of its electricity from two sources, Hydro Quebec and Vermont Yankee. With the completion of long-term Hydro Quebec contracts (2015) and re-licensing issues around Vermont Yankee (2012), Vermont can anticipate increases in the cost of electricity in the next ten years. Vermont is fortunate today to have a high proportion of renewable energy in the state's electric portfolio; that proportion, and the relatively positive carbon footprint of the state, could be adversely affected by market conditions in the future.

On the other hand, rising energy prices could positively affect the Return on Investment (ROI) of in-state sources of energy, and provide opportunities for innovative Vermont businesses. Efficiency measures and in-state energy sources could then be more cost competitive. Vermont must be prepared to adapt to this changing market, and to seize emerging opportunities to diversify its energy portfolio to include an increasing percentage of Vermont-generated renewables.

In crafting the recommendations that follow, the primary focus has been to strengthen and support renewable energy generation, conservation, and efficiency as vibrant and viable components of Vermont's economy.

Solutions to the energy challenge will come from a variety of options and perspectives. Solutions require changes in behavior, in planning, and in thinking about our resources and our responsibilities to one another. Some of the underlying suppositions contributing to these recommendations are an awareness of the value and finitude of our natural resources, a concern that some energy policies can disproportionately hurt low-income Vermonters, and the knowledge that global warming is real, and carries short and long-term threats to Vermont and the world.

If Vermont leads in energy efficiency and the innovative development of renewable local power for local use, the state can build a major competitive advantage for its businesses and communities.

Because of the complexity of energy issues, and their relationship to economic, social, and environmental policies, energy planning and decision-making in Vermont should include meaningful and effective public involvement to ensure decisions reflect consideration of all of these factors.

Vermont has a significant opportunity to advance its energy future by supporting innovations in both energy generation and efficiency. Emerging technologies in biomass, thermal, water, farm and bio-waste methane, solar, biofuels, efficiency, and small-scale and community wind projects offer opportunities for rural entrepreneurship and should be systematically promoted today as elements in Vermont's economic brand, and as strategies toward the future sustainability and prosperity of rural communities.

This report outlines ideas and recommendations we believe to be consistent with the priorities established by Governor James Douglas and the Vermont Legislature aimed at addressing climate change, lessening Vermont's carbon footprint, and setting state goals for the energy and environmental technology sector of the state economy. VREC recognizes the leadership and strong efforts already underway through the Douglas Administration, the Vermont Legislature, our Congressional Delegation, non-profit organizations, leading businesses, entrepreneurs and communities throughout the state. We hope that our recommendations will contribute to the advancement of these efforts for the benefit of all Vermonters.

VREC Origin and Goals

The Vermont Council on Rural Development (VCRD) is a non-profit organization dedicated to helping Vermonters and Vermont communities develop their capacity to create a prosperous and sustainable future through coordination, collaboration, and the effective use of public and private resources.

VCRD works with Vermont communities to identify key challenges, and has a strong history of addressing the state's significant issues through non-partisan policy councils and facilitation. Over the course of the last two years, we have learned that energy has become a paramount issue of common concern among Vermonters throughout the state. The Council's approach to the energy topic is consistent with VCRD's vision of using Vermont's technology, resources and abilities to support the rural economy, and traditional sectors of the state's economy.

In VCRD community development conversations, residents express deep and widespread concerns about global climate change, the country's (and their family's) dependence on foreign oil, the question of 'peak oil' (if not now, soon), and consequent dangers of local economic dislocation, and escalating global competition, pricing, and potential conflict. Paralleling these global and national security concerns are the questions around the future of Vermont's energy supply, re-licensing the Vermont Yankee Nuclear plant, future Hydro-Quebec contracts, and the high and volatile costs of gasoline and heating oil.

It is in this context that VCRD decided to examine Vermont's energy future and to explore ways that Vermonters might respond that would benefit Vermont businesses and communities.

In 2006, VCRD saw the opportunity to bring together leaders and experts to work systematically toward a non-partisan platform that could help Vermont move the mark in defining the state's energy future. VCRD instituted the Vermont Rural Energy Council (VREC) to unite federal, state, non-profit and industry leaders with a one-year mission to identify opportunities and propose policies, investment strategies, and practical action to expand economic development in renewable energy generation, fuel development, and energy efficiency in rural Vermont. Its central mission was to explore this question:

What combination of conservation, efficiency, in-state electric generation and alternative fuel development will effectively provide the greatest leverage to support the prosperity and sustainability of Vermont communities?

VREC explored opportunities provided by Vermont's forest, farm, solar, wind and water resources to maximize innovation and the sustainable use of Vermont's natural resources in energy generation. The Council was charged to address opportunities to expand energy efficiency and the in-state generation of electric power, and also to consider crucial areas of energy usage that have received less scrutiny and public debate: transportation, and home and commercial heating.

VREC was not designed to address the wide range of issues related to Vermont's energy policy or to develop recommendations around the future of Hydro Quebec contracts, Vermont Yankee re-licensing, or utility-scale wind projects. VCRD recognized that the state energy plan would involve a broad public process to make decisions about the state's energy portfolio within the constraints of market conditions. Instead, VREC was charged to make specific recommendations to Vermont's Governor, Legislature, Congressional Delegation, energy industry, and the general public that could lead to the expansion of public/private cooperative action and policies to support and enhance the generation of electricity, developments in alternative fuels, and greater use of efficiency measures in rural Vermont.

Goals of the Vermont Rural Energy Council

- Bring together leaders in federal, state, non-profit, private and research organizations to collaboratively develop an action plan to advance rural energy generation in Vermont.
- Expand the role of energy innovation in community and economic development in the State of Vermont.
- Identify strategic state policies and economic development tools to promote jobs and opportunities in this sector.
- Identify existing federal and state policy, technical, educational, legal, financial, and other barriers that must be overcome to grow the energy generation sector in Vermont.
- Supply research and recommendations to state, federal and private investors to assist them in making the best use of resources for the long-term growth and vitality of Vermont's energy sector.
- Create a platform of recommendations for incentives and supports for entrepreneurial activity in the rural energy sector in Vermont.
- Increase the size of the rural energy generation sector in Vermont and reduce the state's dependence on petroleum and the export of Vermont dollars for energy consumption.
- Identify what is achievable and support the advance of energy efficiency and conservation.
- Build a global competitive advantage for Vermont by supporting a culture of resourcefulness, innovation and intellectual capital around energy.
- Provide input into federal legislation, inform the Vermont congressional delegation of potential improvements to the Federal Farm Bill, and support efforts to systematically leverage resources for rural development in Vermont.

VREC Components and Methodology

From June of 2006 to July of 2007 VREC reviewed renewable energy opportunities ranging from solar and community wind to the development of alternative transportation fuels. A key starting point was the August 2006 VCRD Rural Summit on "Local Power; Energy and Economic Development in Rural Vermont." The Summit was a conference that gathered the ideas and recommendations of more than 350 entrepreneurs, community and state leaders (the final report is available at www.vtrural.org).

VREC commissioned two studies to inform its deliberations: the "Vermont Energy Digest," and "Economic Modeling of Key Energy Sector Opportunities."

The Digest, written by Brenda Hausauer, was designed to gather factual information from a wide variety of sources on existing and emerging businesses and technologies, Vermont's current status in the efficiency and renewable energy sectors, potential capacity, impediments for in-state energy generation and fuel development, and the promotion of greater conservation and efficiency. The Digest (now available at www.vtrural.org) contains chapters on: Conservation and Efficiency; Farm-Based Methane and Waste-to-Power; Transportation and Bio-Fuels: Solar Opportunities; Wind; Co-Gen and Distributed Generation; Utility Scale Biomass; Hydro, and Geothermal Technologies and current state incentives and initiatives.

The economic model is designed to test assumptions. It can be used to evaluate a variety of scenarios beyond the fourteen profiled thus far. The existing test cases can be questioned, and different assumptions about market penetration or multipliers can be evaluated. VCRD funded the model to be of on-going and flexible use in the inevitable debates ahead on the cost/benefit of a variety of potential strategies and investments.

The modeled sectors that were completed as part of the analysis commissioned to Jeff Carr and Mat Barewicz of Economic and Policy Resources, Inc. of Williston, with development assistance provided by Riley Allen and Dave Lamont, economists at the Department of Public Service, and Tom Kavet, of Kavet, Rockler & Associates, LLC, Consulting Economist to the State Legislature, and Council member.

The market potential ranges used in the analysis are based on EPR interviews with industry leaders and Council members. They represent broad estimates of potential market size, but do not take into account detailed review of project economics (cost effectiveness, possible pricing scenarios, financing options, etc.) or estimates of achievable potential based on customer preference. The model documents estimates of technical feasibility that must be evaluated with some caution and can be modified in future modeling work as market conditions evolve.

Some potential elements, like small hydro, are yet to be modeled in this system, others, like farm methane, cover only those systems in a certain size range. The model does not have a predictor to include nascent technologies like cellulosic biomass or the development of algae systems on farms. In other words, the model is not a complete and inclusive summation of all opportunities but represents a cut-away look at market potential ranges and economic benefits in certain sectors. Even so, it reveals some important conclusions.

Several of the modeled areas have small but significant returns in economic development; others, like those around residential solar, wind, and biomass, present major categorical opportunities. But the aggregate totals across all the sectors illustrate the potential for job creation and energy generation.

Even the low estimate scenario of market opportunity describes a construction and development phase representing a potential of over 10,000 short-term jobs (of one to two year duration), largely associated with construction activity. The high end estimates in the development phase suggest potential short-term employment effects that are many times these levels, with ongoing sustained annual employment gains of more than 3,000 Vermont jobs, the greater part of which are associated with commercial-scale biomass generation. Assuming the high-end estimates of generation potential could be realized, it suggests that a significant share of the state's electrical needs could be addressed through these resources. However, some caution should be exercised as the high-end estimates represent a boundary of estimated potential.

Seen as a whole the scenarios modeled describe a significant opportunity for the large-scale development and deployment of local renewable power sources in Vermont.

Recommendations from VREC

VREC recognizes and respects the efforts of the Vermont Congressional Delegation to expand national energy efforts, and the planning initiatives in Vermont today: the Governor's Commission on Climate Change, the Regional Greenhouse Gases Initiative, the Public Service Department's Mediated Modeling process, the 25 x 25 Alliance, the planning processes led by Vermont utilities, and the Public Engagement Process being developed jointly by the Administration and Legislature to inform the state energy plan. A strong grass-roots effort is also underway, and many Vermont residents are uniting to develop substantial and innovative projects at the community level. This document is designed to complement and enhance these efforts by recommending ways to stimulate economic development in the energy sector in Vermont over the next decade.

VREC supports long-term policies that will advance the in-state energy economy. In building it's recommendations, VREC looked toward a 10-year horizon. It presents its recommendations as starting points for public policy development and implementation, recognizing that cost/benefit analysis beyond the scope of the VREC process will be needed in evaluating each potential action step, and that recommendations will enter Vermont's policy arena where that level of fiscal evaluation can take place.

Realizing that Vermont will advance step-by-step and not with a one-time or final solution, VREC respectfully presents its recommendations as potential action steps for the consideration of Governor Douglas, the Legislature, and the people of the State of Vermont.

Vermont Rural Energy Council

Recommendations

Challenge: Making Energy A Priority

Progress in the development of in-state electric generation, fuel development and efficiency will require collaborative leadership by the Administration, state agencies, Legislature, business leaders, and policy makers. Vermont needs a long-term vision for energy development and conservation to guide these collaborative efforts, as well as systematic goals and implementation plans to advance them. Such leadership is needed to identify and implement economic development opportunities and system improvements, coordinate complementary initiatives to eliminate redundancies and maximize results by strengthening inter-agency cooperation.

Recommendation 1:
Vermont Renewable Energy Program

Vermont's State Energy Office in the Department of Public Service should be authorized and charged to actively promote and support renewable energy development, market Vermont as a center for innovative renewable energy businesses, and invest in renewable research and development to serve Vermont's need for a coordinative focal point of united leadership.

Vermont cannot compete with the scale and breadth of work that is advancing in California led by the California Energy Commission. But Vermont would benefit from a similar focal point to help develop targets, unite agency, non-profit, community, and private efforts, and set annual action plans to promote clean energy development.

Clean Energy Coordinating Council

The Vermont Renewable Energy Program should be established with leadership from an appointed Clean Energy Coordinating Council comprised of agency and industry representatives, energy experts, public interest groups and academicians.

The Council's primary responsibility should be to advise the Energy Office regarding the design, budgets, objectives, goals, administration and evaluation of Vermont's clean energy program.

A number of state agencies have jurisdiction over different aspects of biomass, hydro, biofuel and other potential energy development, use, and management. These agencies may have unintended overlapping and/or conflicting goals and policies and lack coordinated oversight. With its agency representatives, the Clean Energy Coordinating Council should be charged with the responsibility of assisting farm, forest, business and household scale systems through interagency regulatory processes.

With advice from the Clean Energy Coordinating Council, the Vermont State Energy Office in the Department of Public Service should set short- and long-term goals and targets for renewable energy development by sector (biofuels, solar, etc.) and review them annually.

The Clean Energy Development Fund

The Clean Energy Development Fund should advance these goals with grants, loan guarantees and loan-making authority. The Fund should develop loan guarantees, low interest loans and grants to entrepreneurs that could support the commercialization of business opportunities for biofuels, wind, solar, biomass and other renewable energy processes. It should augment its loan making capacity in partnership with the Vermont Economic Development Authority (VEDA).

The Clean Energy Development Fund should have financial capacity to stimulate Vermont research and development and project development in the renewable sector.

The Clean Energy Development Fund should be authorized to attract philanthropic, federal, state, and private sector capital toward investment in the Vermont renewable energy sector.

The Vermont State Energy Office, Clean Energy Coordinating Council and Clean Energy Development Fund should lead in the development of a statewide public information campaign (as described in Recommendation 13).

RECOMMENDATION 2:
Net Metering

To encourage local and reliable distributed generation of renewable electricity, Vermont should significantly expand net metering opportunities, increasing the net metering single project limit in phases up to 2000 kW and increasing the cap on overall net metering within a utility to 5%, allowing the Public Service Board the authority to increase this up to 10% based upon determination of public good.

Net metering allows selected renewable energy systems to operate interconnected with the grid in a bi-directional manner. This allows these systems to provide power into the grid during times when the system is producing more than the host building is consuming, and to pull power off the grid when the building is using more power than the renewable energy system is making. Net metering allows the system owner to effectively obtain the retail rate for their power production, either by using it directly or by temporarily moving it onto the utility power lines.

Net metering has been possible in Vermont for a decade. While Vermont is a leader nationally in the per capita development of net-metered electricity, so far net metering has produced capacity of only about one tenth of 1%.

Currently, Vermont limits most net metered systems to 150 kW peak output, and limits the total amount of net metering to 1% of the 1996 (or most recent year, whichever is greater) peak demand. New Jersey allows net metering up to 2,000 kW, California up to 1,000 kW, New Mexico up to 80,000 kW; Oregon is currently considering legislation to increase its limit to 2,000 kW.

Increasing the system size cap to 2,000 kW to be on par with the leading states would cause significant problems for some of Vermont's smallest utilities. In order to maintain their viability, these utilities should be granted a lower limit.

VREC recognizes that net metered power will be more costly to consumers than existing sources in the short term, but contends that investment and development by this means will advance the development of small, renewable energy systems and lead to consumer savings over time.

RECOMMENDATION 3:
Clean Energy Utility Policy

Vermont should establish new utility policies to support clean production across all energy resources; Vermont should set regulatory standards to be implemented by the Public Service Board that favor efficiency and renewable energy procurement by Vermont's utilities.

Vermont currently has the lowest carbon electric energy portfolio and the most aggressive electric efficiency programs in the nation. The State has established the SPEED program to encourage renewable energy procurement by our utilities. However, going forward, Vermont should adopt clearer guidelines in considering climate changing carbon emissions in our State's energy planning.

As part of the State's comprehensive energy plan and electric plan, the state's utilities should be directed to account for the financial risks associated with greenhouse gas emissions when evaluating new energy resource investments. Further, the PSB should establish a "Greenhouse Gas Adder" of a set dollar figure per ton of carbon dioxide to be used by utilities as an additional cost consideration in long-term planning and resource procurement.

The PSB also should institute a greenhouse gas emissions performance standard for new contracts with electricity generation facilities. The standard would require that any long-term base-load power commitments to meet Vermont's energy needs are at least as clean as a natural gas-fired plant using combined cycle turbine technology.

Finally, the PSB should adopt a "loading order" of preferred energy resources to meet the state's needs. Energy efficiency and demand /response activities should be the first steps in the loading order to satisfy the energy needs of Vermont's population.

RECOMMENDATION 4:
Heating Fuel Efficiencies

Vermont should establish an all fuels efficiency program to maximize the potential savings in heating fuels. Potential fuel efficiencies and program effects should be regularly and rigorously evaluated.

Vermont should explore funding options such as increasing the excise tax on home heating fuels. The program would invest resources in weatherization and efficiency for the multiple benefits they provide to consumers.

RECOMMENDATION 5: Transportation Efficiency

Transportation is the state's largest energy end user. A campaign to dramatically improve transportation efficiency should be implemented.

The State of Vermont Agency of Transportation should continue it work of advancing performance standards in line with California Low Emission Vehicle standards.

The Agency of Transportation should re-affirm that transportation development be managed toward specific performance standards to reduce Vehicular Miles Traveled (VMTs) and to increase public transportation ridership. The goal of increasing transportation efficiency should be equivalent to the priority of relieving transportation congestion, and in many cases, the two goals are mutually supportive.

Vehicle Retirement Programs

Several states have implemented innovative programs to retire gas guzzling, high polluting cars and replace them with newer, more efficient vehicles. Some programs are funded through registration, inspections, tire change and maintenance fees. Others provide low interest loans and loan guarantees. For more information, see the following links:
http://www.bonnieclac.org/
http://www.arb.ca.gov/msprog/avrp/avrp.htm

All AOT projects should involve cost/benefit analysis weighing conservation factors and efficiency opportunities when making investment decisions.

AOT should continue to explore rail, where possible, as a substitute for highway freight and passenger traffic. Highway dollars should be directed toward providing adequate shoulders to ensure bicycle safety.

The Agency should also support employer-led conservation and efficiency, rideshare, bicycle and other innovative transportation advances, especially employer-based incentives, by sharing models through the public education campaign (Recommendation 13).

Vermont should explore resources to fund transportation efficiencies, including the potential for a transportation fuels excise tax.

Taking the Challenge – Vermont Company Reduces Commuter Miles, Gains Governor's Wellness Award

In 2006, Stark Mountain Woodworking in New Haven Vermont issued its staff of twelve a challenge – park your car, ride a bicycle at least 650 commuter miles to work over the course of the year, and get a substantial cash bonus - $1,000. The employees responded with enthusiasm, logging over 8,000 commuter miles during the challenge. In return, participants received $500 up front to purchase a bicycle and $500 cash at the conclusion of the program. Employees who do not successfully complete the program owe the company $1per mile not ridden. Skimmer Hellier, who developed the program, says the benefits to the environment are substantial, and equally important is a workforce that feels unified around a common interest, and enjoys a higher energy and fitness level. According to Hellier, "This requires an investment up front from an employer, but the payback is tenfold – in team performance, attitude, and environmental benefits."

Help in setting up the program was provided by LocalMotion of Burlington, and local bike shops donated some safety equipment. Every employee has signed on for the second year of the program, which will provide a higher cash incentive. Heiller notes, "This could be replicated in much bigger companies for a genuine impact."

In 2007, Stark Mountain Woodworking was awarded the Governor's Gold Wellness Award.

Recommendation 6:
Targeted Economic Development Assistance

Expansion of in-state energy generation, fuel development and efficiency could serve as a key part of Vermont's green economy. With this as a priority, state economic development programs should aid entrepreneurial start-ups, support indigenous businesses, and systematically recruit new companies that create jobs in the renewable energy and efficiency sector in Vermont.

Vermont has substantial expertise and investment in brand development and promotion in tourism, foods and local products. In line with goals established by the Governor and endorsed by the Vermont Legislature, state investments are supporting the expansion of the "green business" sector in the state by attracting and recruiting environmental engineers and their firms.

The State should also incorporate efficiency and renewable energy into the "Vermont Brand" and support economic development in efficiency and renewable energy sectors through targeted recruitment, employment incentives, and market development.

Although increases in manufacturing can have exceptional economic benefits, most jobs created in renewable energy and efficiency will be in construction, installation, engineering, sales, and systems management.

Existing and potential business supports that should be particularly targeted to the in-state energy industry include:

- Targeted business subsidies for job creation in the energy sector.
- Targeted business subsidies for on-the-job training programs.
- Creation of a job training and retraining center at VTC or other technical education center to provide short-term programs to retrain Vermont workers in the skills needed for energy efficiency and renewable energy installations.
- Ensuring the availability of start-up capital through VCEDF and VEDA to provide expanded financing support for renewable energy businesses, making this support available to renewable businesses, not just manufacturers.
- Vermont should provide support and assistance to inventors and entrepreneurs who are attempting to bring technology advances from the prototype stage to commercialization. In order for investors to fund new renewable energy technology companies, the entrepreneur and his/her company must be 'investment-ready.' Business technical assistance providers should assist these start ups and thus accelerate the rate at which they become investor-ready and reach the product commercialization stage.

The Vermont Department of Economic Development should establish a priority to assist renewable energy companies in expanding and moving to Vermont.

Challenge: Financial Policy and Investments

There is not a sufficient long-term funding mechanism to facilitate the development of renewable energy systems in Vermont. Vermont needs to identify additional resources that can be brought to bear and to accelerate its ability to draw economic investors to this sector. For businesses and households, renewable energy systems can be prohibitively expensive to purchase and install, and often have long lead times for purchase due to insufficient manufacturing. Consumers also may incur tax penalties linked to home valuation changes based on installation of energy efficiencies or systems. These disincentives are significant barriers that hold back investment and negatively condition personal choices.

Recommendation 7:
Vermont Green Investment Strategy

The State Treasurer's Office should implement a new investment strategy to make prudent and competitive investments in clean energy businesses through the Clean Energy Development Fund, or other appropriate mechanisms, to secure attractive returns, while attracting private sector capital investment and growth in the clean energy sector.

Legislative statue should provide the Vermont State Treasurer with the latitude to invest in the Clean Energy Development Fund or other appropriate mechanisms in order to promote investment in innovative and profitable clean technology businesses and industries in Vermont. State investment could leverage significant and positive interest in the private sector venture capital markets.

The primary mission of these investments should be to generate attractive returns in both the short and long term, consistent with the Treasurer's obligation to invest the assets in a prudent fashion. In addition, the Fund would provide benefits by creating jobs and economic growth in clean energy and technology industries in Vermont and by promoting greater energy independence and environmental protection for the State.

Recommendation 8:
Efficiency and Household Electric Rates

To increase conservation and efficiency measures, the Public Service Board should develop an electric rate structure that phases in Time of Use Rates, based on real-time electric costs.

Time of Use Rates will require the development of "smart metering" (the ability to read and record individual household usage by time of day) and would set the cost to consumer based upon the real time-cycle costs of distributing power to customers. This system will reward with rate relief those consumers who conserve and plan for their energy usage at off peak times.

Electric consumption at certain times of day builds peak demand on the electric grid. For example, surges in the use of power required to provide air conditioning in the hottest part of a summer day, or cooking, laundry and lights on winter evenings, place the greatest demands on the capacity of the energy system. Time of Use Rates would allow electric utilities to charge the real cost for power consumption based on demands throughout the cycle of the day. These rates would encourage consumption at times of low demand, with correspondingly low rates, thereby providing incentives to households that will lessen peak demands and lessen the need for new energy production to meet peak demand times.

Recommendation 9:
Vermont Carbon Footprint

Vermont should research and prepare to institute a Carbon Plan to reduce CO2 emissions, spur the development of efficiencies, and expand renewable generation and fuel development.

VREC believes that a nation-wide system of carbon taxes is very likely and Vermont should prepare for this eventuality in the next year. Vermont should be at the forefront of the development of carbon policies nationally and should study possible scenarios for carbon taxation.

As a first short-term step, the Administration and Legislature should set requirements for the disclosure of the carbon footprint based on a standard for vehicles, buildings, appliances, and fuels. The state is joining the Climate Registry to build a database of carbon values that can serve Vermont and work as a national model.

Secondly, research and analysis should develop the platform for a fair and equitable carbon tax structure in Vermont. While this work may be superceded by federal action, it will set a direction for the state that will help prepare Vermonters and Vermont businesses.

Recommendation 10: Property Tax Incentives

Institute property tax exemptions for household and commercial energy improvements and build predictability for taxation of utility-scale developments.

To support home-based energy investments in efficiency, and in wind, solar, and other household generation, exempt household energy improvements from the property tax appraisal value of homes.

Value added to commercial buildings for qualified renewable energy systems should be subtracted from the assessed value of the building for property tax purposes. Qualified equipment includes net metered solar, wind, geothermal, solid waste, biomass and hydroelectric systems. The state should set standards for qualified projects and provide information to municipal governments and listers for their implementation.

The predictability essential for the development of new utility-scale renewable generation requires a state-set level of taxation to ensure fixed costs over the term of contracts.

Recommendation 11: Tax Incentives for Using Less Energy

Vermont should institute Business and Residential Energy Tax Credits to spur residential and business reductions in energy use. Tax breaks, including credits and deductions, for efficiency and renewable energy investments and purchases can magnify existing market incentives and help overcome short-term cost barriers. The Tax Department, Agency of Commerce, Agency of Transportation, and Public Service Department should work with stakeholders to develop tax policy proposals to provide such incentives.

Vermont could model its **Business Credit** on Oregon's Business Energy Tax Credit (BETC), which covers investments in energy conservation, recycling, renewable energy systems, or less-polluting transportation fuels. Any business may qualify, including but not limited to manufacturing plants, stores, offices, apartment buildings, farms, and transportation services. Vermont tax credits could cover costs directly related to net metered projects, including equipment costs, engineering and design fees, materials, supplies and installation costs. Loan fees and permit costs also may be claimed. Vermont should model its system of credits on the Oregon

Oregon Business Energy Tax Credit

Oregon's 35% tax credit is taken over five years: 10% the first and second years and 5% for each year thereafter. Any unused credit can be carried forward up to eight years. Those with eligible project costs of $20,000 or less may take the tax credit in one year.

Under the pass-through option, a project owner may transfer a tax credit to a pass-through partner in return for a lump-sum cash payment (the net present value of the tax credit) upon completion of the project. The pass-through option allows non-profit organizations, schools, governmental agencies, tribes, other public entities and businesses with and without tax liability to use the Business Energy Tax Credit by transferring their tax credit for an eligible project to a partner with a tax liability.

Projects that use solar, wind, hydro, geothermal, biomass, or fuel cells (renewable fuels only) to produce energy, displace energy, or reclaim energy from waste may qualify for a tax credit. Renewable resource projects must replace at least 10% of the electricity, gas or oil used. The energy can be used on site or sold.

General retrofit projects, in addition to those for lighting, and weatherization projects for rental property may be eligible for the program, as well as new construction projects, including energy efficiency and lighting. Retrofit projects must be 10% more energy efficient than existing installation; lighting retrofit must be 25% more efficient than existing lighting. For new buildings, all measures must reduce energy use by at least 10% compared to a similar building that meets the minimum requirements of the state energy code. Sustainable, high performance buildings are eligible for the tax credit. www.energy.state.or.us tax credit that also provides opportunities for non-profits, schools, and other entities without tax liability to benefit by transferring tax credits achieved through conservation or other measures to a business that does have a tax liability. The non-profit gets a cash payment and the business gets a credit.

Homeowners and renters who pay income taxes would be eligible for the **Residential Energy Tax Credit** if they purchase premium-efficiency appliances, heating and cooling systems, pellet heat systems, duct systems, geothermal space or water heating systems, solar water and space heating systems, photovoltaic and wind systems.

Recommendation 12:
Renewable Incentives

Vermont should provide consistent incentive programs to advance the deployment of renewable technologies and support the profitability of renewable energy businesses in the state. To support this effort, the state will need to build an expanded, sustainable and reliable source of financing for the Clean Energy Development Fund such as a systems benefit charge, and examine any regulatory and financing barriers that might undermine this effort.

Fifteen states have established dedicated funds, supported by system benefit charges, to provide incentives to support renewable energy project development.

Vermont should follow the model that several states have developed by providing two distinct grant programs: a "small renewables" program that provides upfront cash rebates on a first-come, first serve basis for home-owners to buy down the capital cost of smaller, residential-sized solar, hydro and wind systems, and a "large onsite renewables" program to provide grants on a competitive basis to support larger renewable projects (greater than 20 kW in capacity) to expand the production and use of distributed renewable technologies in multi-family housing developments, community-wide energy projects, and for the commercial and industrial sectors. Eligible renewable systems that could qualify for such a grant should include biogas digesters, micro-hydro, solar electric systems, commercial solar water heating systems, pellet systems, and wind projects.

To leverage private investment in these systems and to benefit more Vermonters, grants should be limited to covering 25% of the project cost. Vermont should also increase the allowable system size from 15 kW to 100 kW to match other northeast US states.

In addition, the successful Small Solar and Wind program should be continued with priority placed on new home construction and multi-family, low income housing where the economics of solar are better than in the retrofit market. Other northeast US states offer incentives that range from 30% to over 50% of system costs; Vermont currently offers approximately 20%. Increasing both the amount of funding and incentives available will drive more development in the residential net metered market. This will create more jobs and spur the development of the overall industry.

Challenge: Education, Training, and Research

We need to understand more about the challenge posed by global warming, energy issues, the crucial importance of conservation practices, and the opportunities to systematically expand energy development and efficiency. As Vermonters look to the future, they will need to address opportunities in renewable energy production, and the economic, social and environmental costs and benefits of current and alternative energy sources and technologies. At the same time, energy businesses are developing that need employees with specific technical skills, and the educational system must expand its capacity to train the energy sector workforce of the future.

Recommendation 13:
Public Education

Vermont needs to establish a public education campaign around conservation, efficiency and renewable energy. The Vermont State Energy Office and Clean Energy Coordinating Council should assemble a Collaborative Education Team including state officials and leading businesses in energy efficiency and generation to develop and implement the education campaign.

A. Working with appropriate stakeholders, the Administration should institute a statewide public education campaign to advance conservation.

The Collaborative Education Team should hire a Vermont-based public relations firm to create public service and educational announcements aimed at strongly promoting action and the benefits of conservation.

The campaign should find ways to include and engage youth in developing public service announcements and videos through a design competition at the high school level. College scholarship funds could be made available to each of the winning team members.

The campaign should celebrate Vermont values, and build from the idea of energy conservation as an economic concept – one of the rational use of resources. The campaign should be founded on the fact that conservation decisions are personal and provide practical ways that households can identify strategies, set goals, and measure the value of their choices. It should encourage consumer responsibility and emphasize choice, educating Vermonters about alternatives and best ways to save energy over time.

The campaign should highlight the leadership of communities and grassroots efforts that are taking place all over Vermont today. It should celebrate community successes from shutting down idling school buses to town-wide campaigns to replace light bulbs or expand local purchasing.

Community Action

Many Vermont residents have established or are interested in learning more about community-based energy initiatives. The Vermont Energy and Climate Action Network has published a resource, "Town Energy and Climate Action Guide", with information on how to establish community energy committees, funding sources, models and details on more than two dozen Vermont communities that have launched grass-roots projects and activities. The guide can be downloaded from the Vermont Natural Resource Council website – www.vrnc.org.

The campaign should connect to education efforts in the Agency of Transportation to address conservation and efficiency opportunities and practices in local and regional transportation.

B. Vermont should lead a "Buy Local—Produce Local" energy education campaign.

Education and outreach efforts should provide information on electric, thermal, and transportation efficiencies; educate about green building, solar, wind, geothermal, biomass and biofuels opportunities in Vermont, and promote and support community energy planning initiatives.

An educational/informational campaign should promote understanding of the merits and positive environmental impacts gained through the use of renewable energy options, provide information on best practices and products, address common misconceptions, and inspire Vermonters about the opportunities for local and household energy solutions.

C. Construct and Market the Vermont Renewable Energy Brand

In developing the brand, the direct and personal benefits (both economic and environmental) must be compelling to individual consumers and all other stakeholders, including businesses, institutions, and the government.

Recommendation 14: Workforce Education

Expand energy and efficiency workforce education offerings in Vermont to train the engineers, mechanics, architects, building designers, contractors, facilities managers, and service technicians who will develop and install the renewable energy systems and efficiency measures of the future. Support energy related curriculum development in pre-secondary education.

The renewable energy market and energy efficiency market (products and services) will not grow without a trained workforce. Education programs must be developed at various levels (high school, one and two year certificate programs, associate degree programs, bachelors degree programs, graduate degree programs) and within short- and long-term time horizons. VREC proposes that higher education institutions develop a post secondary degree and specialist licensing program in Industrial Maintenance/Energy Management Technology.

The nation has advanced recycling efforts by incorporating recycling information in elementary school science curriculum. A similar strategy could be adopted for renewable energy. Vermonters should develop elementary, middle and high school science curriculum related to renewable energy, and integrate the new curriculum in the next few school years. Vermont should also develop renewable energy teacher training and supplemental educational materials to train teachers on renewable energy.

There are many excellent models and opportunities for collaboration with existing organizations that could make development of educational programs timely and cost efficient.

Education Models and Partner Opportunities

The Maine State Energy Education Program emphasizes industrial energy efficiency and alternative energy use.

In collaboration with the Interstate Renewable Energy Council (www.irecusa.org), local renewable energy businesses, and local universities, independent colleges and technical schools could develop course offerings and degree programs for energy-specific design, manufacture, install, and service technicians and engineers. In addition to the technical aspect of the training, project feasibility analysis training would be an important part of the educational program.

Vermont's Workforce Development Council could conduct modeling of the energy sector workforce and opportunities and lead in the development of workforce education and training around on-farm energy production. Education must include environmental values, not just technical education.

In collaboration with The North American Board of Certified Energy Practitioners (www.nabcep.org), the Building Performance Institute, and other credentialing bodies, Vermont could ensure that all Vermont educational programs have the highest quality credentialing and certification so that Vermont programs become a magnet, drawing students from other states as well.

Recommendation 15: Research and Development

With leadership from the state and its congressional delegation, Vermont colleges, non-profits, and the business community should be encouraged to expand research and development toward the commercialization of biofuels, biomass, cellulosic, wind, solar, hydro and other renewable technology opportunities.

Research and Development is key to economic development. To induce it the state should create a state matching grant program for research, development and demonstration projects in biomass, biofuels, hydro, solar, and other technologies. This fund should be used to match federal dollars where possible.

Research and Development in Vermont should include evaluation of technologies that can effectively scale to Vermont, including small-scale local and distributed power opportunities.

Research and Development funding should be matched with resources that support incubator systems and entrepreneurial training to help move new ideas and invention into viable business models.

For example, state funding of research and development is a key step to develop Vermont scale, economically-viable farm methane technology applications, in particular for testing small-scale, modular-anaerobic digester technology, systems that supplement manure with forage crops and wastes, and central digesters.

Challenge: Advancing Specific Sectors

Bolstering targeted sectors can yield measurable increases in job opportunities, while responsibly maintaining Vermont's natural resources.

Recommendation 16:
Farm-Based Methane

State and federal resources in Vermont should work together to systematically expand the benefits of farm-based methane electric generation. The state should establish a Vermont goal for the development of farm methane capacity. To meet this goal, the Clean Energy Coordinating Council (including the Department of Public Service, Agency of Natural Resources and Agency of Agriculture) should develop a joint action plan.

A. Provide direct supports to expand the number of working digesters and their energy production.

Digesters provide multiple benefits to farms and to Vermont. They reduce methane released from manure, dramatically lessening the carbon footprint of dairy operations. Digesting lessens water pollution from farms and provides a responsible solution for farm wastes—especially for large farm operations. Digested matter can provide compost and bedding and with income from electric generation can support the long-term fiscal viability of farm operations. The most significant hurdle for farmers is paying the up front cost of the digester and then learning how to properly operate and maintain the system.

Vermont should develop a web-based digester cost and benefit calculator that farmers can use to determine the economic and environmental costs and benefits of using farm waste to generate renewable energy. (The calculator should include the avoided costs and environmental benefits that could be derived using solids as bedding material.)

Vermont should also provide assistance to farmers to help them secure matching grant funding through the Clean Energy Development Fund and from federal agencies for the installation and operation of renewable energy production using farm waste.

The Clean Energy Development Fund should establish a methane digester revolving loan program to help supplement the funds needed for farms to install digesters.

Federal funding should be sought to evaluate the potential for manure management centers at potential sites for regional dairy bio-digesters. This initiative would examine the technical and economic feasibility of collecting dairy waste, transporting it, digesting it to produce energy, and returning digested manure to participating farms.

B. Simplify the regulatory pathway for farm energy systems.

The Clean Energy Coordinating Council should develop an integrated and coordinated plan to create a favorable regulatory environment for farm methane development. Technical assistance should be provided to Vermont's farms with sector-specific expertise to support electricity, heat and CHP production from farm products and waste. The working group should conduct a review of state policies and regulations affecting farm methane projects, including utility interconnection requirements and fees, and the process for obtaining state certificates of public good from the Public Service Board for energy system approval. Based on this review, the working group should strive to establish clear and consistent state policies for fostering farm methane projects.

The group should disseminate informational resource material through established systems by the use of demonstrations, open houses, seminars, press releases and educational programs.

The Vermont Agency of Natural Resources should review and revise regulatory programs that may be preventing the use of wastes (food processing, whey, brewers waste, etc.) in farm-based biogas systems.

Earl Audet of the Blue Spruce Farm in Bridport, Vermont.

Recommendation 17:
Biofuel Development and Use

Vermont should build specific targets and direct resources to expand biofuel production (e.g. biodiesel, algal oil and cellulosic ethanol) and market penetration for transportation and home heating.

Biodiesel is made from renewable sources, is produced domestically, and reduces our dependence on foreign oil. It can be made from plant oils from crops such as soybeans, canola, and rapeseed; and from waste vegetable oils and animal fats. Biodiesel can be added to #2 fuel oil for heating, used in vehicles with diesel engines, or used in diesel backup generators for electric generation and can be used in most engines and boilers with few or no modifications. Pure biodiesel (B100) is blended into home heating and diesel fuel. Five percent biodiesel combined into fuel oil results in a B5 blend; ten percent in a B10 blend and so on.

State and federal resources in Vermont should work to systematically expand research and demonstration of sustainably and locally produced biofuels for local use thereby providing new forms of revenue for farms, capturing local economic multipliers, and decreasing the amount of energy used to make and transport energy to end users.

The State should provide incentives to support model private sector projects that develop biofuel feedstocks with a high energy return, such as algae and grasses, and then establish goals for the development of biofuel capacity from these and other high value feedstocks by 2017. To meet this goal, the Clean Energy Coordinating Council, the Vermont 25 x 25 Alliance, and the VT Agency of Agriculture should collaborate with the private sector to develop an action plan.

The State of Vermont has taken significant steps forward in increasing the use of biofuels and the efficiency of state vehicle fleets and should continue to "lead by example." Agencies should be systematically supported in their use of biofuels by creating a renewable fuels standard for state institutions. Moving state fleets and buildings to a B5 to B20 blend, for example, would result in a reduction of between 2,500 and 10,000 tons of carbon equivalents per year and be consistent with new and existing efforts to curb greenhouse gas emissions. A strong signal from the State can help leverage the development of Vermont's biofuels sector.

The State should proactively work to develop new market-based and value-added opportunities for a wide range of liquid biofuel feedstocks and agricultural by-products produced in the state. These biofuels and by-products include: biodiesel, biolubricants, and livestock feed from oilseed crops, algae, waste vegetable oil, and cellulosic ethanol. The Clean Energy Development Fund should allocate some of its financial resources to renewable liquid fuels to support public/private investments and pilot projects in the emerging bio-fuels sector.

The following incentives are recommended to foster greater distribution and production of biodiesel in Vermont:

- VREC proposes a rebate to heating oil dealers for each gallon of biodiesel blend sold and delivered in Vermont.
- VREC proposes a rebate for biodiesel blends used as transportation fuel in Vermont.
- VREC recommends a producer's credit for each gallon of biodiesel processed and delivered in Vermont.

Recommendation 18:
Green Building

Increase state requirements for new construction to Energy Star standards and provide incentives and permit relief for participation in the Vermont Builds Greener/ LEED for Homes, LEED or other similar programs.

Green Building Information

VT Builds Greener/LEED for Homes (VBG/LEED): Currently, the only green building rating system that exists in the state for residences. It is administered by VEIC. A rating scorecard can be found a www.bsr-vt.org.

LEED: Leadership in Energy and Environmental Design has multiple programs for commercial, neighborhood and residential applications. More information at www.usgbc.org.

VT Energy Star: Vermont's state energy efficiency program rates buildings based on a Home Energy Rating (HERS). A lower HERS rating denotes greater efficiency. See www.efficiencyvermont.com.

Green building programs deal with issues such as home size, renewable energy sources, compact development and proximity to services. Points are awarded for minimizing energy in transporting materials, use of local resources, and embodied energy. Green building includes a comprehensive look at energy resulting in structures and living patterns that use less energy.

The current statewide Energy Code for new construction does not ensure an adequate level of energy efficiency. The state should explore raising the standard for new construction to meet entry level Energy Star Requirements and implement incremental increases over the next five years in the level of energy efficiency required, as measured by the HERS (home energy rating score) index, while balancing affordability for working Vermonters.

The Vermont Builds Greener Program/LEED for Homes and similar programs encourage the use of low embodied energy in construction materials, planned neighborhood developments that allow for reduced use of fuel for transportation, and increased use of renewable technologies. These programs should receive reduced permit review and should receive credit for higher density development in that review. Within five years Vermont should explore requiring that all new buildings meet significantly advanced construction standards for efficiency, as described in VBG/LEED or other applicable standards. Lenders should receive training to become familiar with efficiency and sustainability factors, and Energy Star specifications.

The State should require that all developers of low income housing in Vermont that receive Vermont tax credits examine the use of renewable energy systems such as solar domestic hot water systems on every home.

Recommendation 19:
Home Energy Efficiency

Expand weatherization services and build incentives and supports for home energy efficiency throughout Vermont.

Vermont should establish a standardized "efficiency index" by which to measure home energy efficiency that would be used by Efficiency Vermont, the Weatherization Assistance Program, building inspectors and others, make this common set of standards available for consumers, banks, investors, and property owners. This would rationalize and consolidate existing measures and provide banks and consumers with a baseline that quantifies home efficiency.

Change the eligibility for the low-income Weatherization Assistance Program from its current standard at 60% of State Median Income to 60% of County Median Income, or the higher of the two. County criteria used for affordable housing eligibility by HUD, would allow all Weatherization Assistance Program services to participate in affordable housing programs. Allowing the higher of the two would ensure that services were available for Vermonters in lower income counties on an equitable basis.

Vermont should also increase the per-unit spending cap for the Weatherization Assistance Program to capture greater energy savings in larger, more complex homes, multi-family units and rental property.

Vermont should explore making the time-of-sale disclosure of energy performance a part of the building evaluation, rewarding compliant builders and owners in the marketplace and exposing structures that need additional work.

Vermont should update and raise efficiency standards for new heating, cooling and other major household appliances sold in the state.

Economic modeling demonstrates the significant economic benefits of replacing incandescent bulbs with Compact Florescent Light Bulbs (CFLs). Vermont should continue current substitution efforts toward a goal of the universal deployment of CFLs in Vermont households.

Recommendation 20:
Biomass Energy

A. Vermont should expand its biomass energy economy by supporting the development of regional wood fired electric plants and the development of sustainably harvested biomass and systems for home and businesses heating and cogeneration (i.e. combined heat and power).

New systems at each scale should, where possible, make use of the potential for distributed heat, so that Combined Heat and Power (CHP) opportunities are incorporated in project designs and benefits.

Vermont should develop a comprehensive state biomass plan. Led by the Agencies of Agriculture and Natural Resources and the Department of Public Service, the plan should include an inventory of biomass quantity, quality, and location, evaluate viable technologies for the Vermont context, and determine the estimated biomass net energy contribution and highest value for the available resources. Consideration should be given to biomass access, regulatory needs and compliance with water quality regulations. This plan should include careful establishment of siting criteria for power plants with respect to available zoned property located relative to strategic places along the transmission and distribution grid and relative to appropriate transportation infrastructure

Further, Vermont should create strategies to identify a developer for a regional wood fired electric plant and provide financing support or guarantees, tax credits, site plan development and regulatory assistance to encourage this development.

Vermont should stimulate demand in these markets through the purchasing power of state government and major institutions (UVM, state universities). The State could also encourage other public entities, like local government, to follow its lead.

As part of its biomass energy goal, Vermont should divert and use suitable biomass materials from municipal waste streams to boost fuel supplies.

The Clean Energy Development Fund should support bioenergy and CHP programs and projects based on the public good that thereby accrues to all Vermonters.

B. Woodmarket Management

The non-residential fuel wood market is inadequate for supplying current growth in demand. That inadequacy will become critical if growth in demand increases at rates suggested by current and proposed stimuli to increase use of wood as fuel or feedstock for more refined fuels. Vermont should invest resources, including the creation long-term contracts, in aggressively developing and managing the fuel wood supply sector.

For the foreseeable future, the non-residential fuel wood market will be dependent on the broader forest products industry for production. The vast majority of logging firms are dependent on integrated harvesting to achieve profitability. Integrated harvesting means that the widest array of products is harvested and then sold into the highest price market. In light of this market structure, it would be in the best interest of further wood energy development for the state to focus economic development resources and regulatory rationalization efforts on retaining and growing the logging and sawmill sectors regionally and in Vermont.

Vermont should invest the necessary funds to determine the stack emissions profiles for the range of wood fuels available for use including wood chips with bark on and bark off, wood and agricultural pellets, clean construction and demolition residues, and other segregated waste stream materials. Vermont should invest in development of a best available controls catalogue for the range of expected wood energy applications, especially smaller scale.

In order to improve the economy of transporting wood fuel, interstate truck weights limits should be raised to 100,000 pounds from the current 80,000 pounds. Creating reasonable rail transportation options for wood fuel would also be a valuable compliment.

In order to ensure long-term supply of wood fuel, existing harvest and ecosystem monitoring efforts should be maintained and strengthened at both the state and federal level. Those monitoring programs should be directed to provide specific reporting on the impacts, if any, of fuel wood harvesting on forest inventory and productivity.

Recommendation 21:
Small Scale Hydro-Power

Vermont should advance the development of Small Scale-Hydro Power through the investment and tax mechanisms described in this report, and by the Agency of Natural Resources easing and clarifying regulatory policy and practice.

Sites available for macro-scale hydro development in Vermont are mostly already developed. This recommendation is designed to improve the margins for smaller scale (under

5 MW) opportunities that could provide local distributed energy, and especially micro-hydro (under 100 kW) and pico-hydro (under 5 kW), typically used to supply power to a single home.

Recommendation 22:
Community Wind Development

The Clean Energy Development Fund should issue an RFP inviting Vermont communities to submit an application to work in partnership with the state to create a pilot community wind demonstration project.

Community wind projects that are developed, supported, and cooperatively owned by members of a community could fill a crucial gap in renewable energy production. A demonstration project would help reduce barriers to wind development by alleviating conflicts between local residents and developers, providing a working model of appropriate scale wind production, and generating income for the recipient community.

The Clean Energy Coordinating Council should assist by providing applicant communities with a map of land suitable for use, including appropriate state land, identifying areas with adequate wind resources and transmission capacity. The State should provide financial, contracting and regulatory assistance to support the success of this demonstration of a Vermont-scale project.

Recommendation 23:
Solar Thermal Systems

Vermont should advance the application of solar energy to heating hot water.

Vermont should provide a stronger financial incentive to install solar domestic hot water on new and existing homes. The existing federal tax credit is $2,000. Adding a state tax credit on top of the state incentive through the small solar and wind program at the Clean Energy Development Fund would provide a much stronger market signal, and make the economics strong enough to allow more Vermonters to take advantage of the programs.

In addition, Vermont should allow weatherization funds to be spent installing solar thermal systems on eligible homes.

The state should create a program of solar domestic hot water installations on state buildings to help build the market. This type of program could draw a manufacturer to Vermont.

Additional Considerations and Challenges

The recommendations in this report were derived from ideas generated in presentations and group discussion, and from the particular background, expertise and perspective of each member of VREC. In some cases, approval of the recommendations presented here was not unanimous, but was attained by a two-thirds majority vote. The economics of energy is a complex topic, and while the recommendations in this report reflect majority opinion, some members wished to offer dissenting views and concerns, or to provide additional information to be considered.

Recommendation #2: Net Metering

Some VREC members recognized potential benefits to ratepayers who invest in net-metered projects, however, they expressed concern about the possibility of cost shifts onto other ratepayers and potential problems for the electric grid.

Recommendation # 3: Clean Energy Utility Policy

In light of Vermont's relatively clean electric portfolio, some members questioned the wisdom of adding additional requirements that could affect the cost of electricity, while others questioned the legitimacy of the recommendation as an economic development tool.

Recommendation #4: Heating Fuel Efficiencies

Some members objected to the potential funding sources referred to in the recommendation, noting that they believed efficiency education, financing derived from savings, and incentives were preferable to an excise tax on home heating fuels.

Recommendation # 5: Transportation Efficiency

In considering the advance of performance standards in line with California Low Emission Vehicle Standards, the following additional information may be useful.

The Standard would require fuel providers, including producers, importers and blenders, to ensure that the mix of fuels sold in Vermont meets, on average, a declining standard for greenhouse gas emissions that result from the use of transportation fuel. The Standard would establish a "carbon content" standard for transportation fuels linked to the fuel's impact on greenhouse gas emissions. The goal would be to reduce the carbon intensity of Vermont's vehicle fuel by at least 10 percent by 2020. Lower carbon fuels that could be brought to market include biofuels, ethanol and biodiesel, hydrogen, electricity, compressed natural gas, liquefied petroleum and biogas.

Recommendation # 7: Vermont Green Investment Strategy

Caution should be used in introducing new criteria for public pension fund investments that might undermine existing returns. Some members expressed confidence that if green investments are attractive and prudent, no new direction for the State Treasurer is needed.

Recommendation # 9: Vermont Carbon Footprint

While some members thought the design or implementation of a tax regime based on carbon considerations was unlikely and ill advised as a recommendation, others expressed concern that the recommendation was too modest and designed to avoid taking real action. They asserted that rather than just studying a carbon tax, Vermont should establish a carbon tax to reduce emissions and to stimulate the use of energy efficiency and renewable fuel generation. In their thinking, the carbon tax should not represent a new tax burden, but be implemented as an alternative to offset existing property, income and other state taxes.

Recommendation #12: Renewable Incentives

While agreeing that Vermont should do all it can to examine any regulatory and financing barriers that might undermine the use of renewables in Vermont, some VREC members objected to the term "systems benefits charge," citing a lack of benefit to all users of the grid. They suggested identifying the charge as a tax that will subsidize renewable energy projects.

Recommendation # 16: Farm Based Methane

During group discussions, it was suggested by some members that the report should recommend establishment of a specific funding mechanism to assist farmers with the cost of necessary improvements to the grid system for farm-based renewable energy projects. The capacity of the local distribution system is often insufficient to accommodate generation of electricity for the grid. Utilities today charge farmers for line improvements, further increasing the upfront cost of systems such as anaerobic digesters. These members believe the state should establish a dedicated fund, based on a systems benefit charge, to assist with funding necessary distribution system upgrades. Alternatively, the Public Service Board should establish a line extension rule that provides for utility support and cost recovery for distribution systems investments necessary to support farm biogas systems.

Recommendation #18: Green Building

It was unclear to some members whether the current system for reviewing, updating and enforcing Vermont's building codes is, in fact, inadequate. Existing programs and standards for Green Building, such as Green Globes and the National Association of Homebuilders Green Building Guidelines should be recognized, and may be adequate.

Additional Considerations

Renewable Portfolio Standard

Over the course of the Energy Council's deliberations, VREC members considered the inclusion of a recommendation supporting the establishment of a Renewable Portfolio Standard in Vermont. The recommendation did not receive a two-thirds majority vote, and therefore is not included in this report. Some members, however, strongly supported an RPS and consider it a superior way to encourage renewable energy development. Members noted that an RPS is a fundamental component of an energy strategy in twenty-two states and the District of Columbia, covering 40% of the nation's electric load. They asserted that an RPS is a market-based mechanism that would enhance Vermont's energy security, support increased renewable energy production and diversity of supply, and encourage economic development. An RPS sets quantitative targets for the supply of renewable energy, but allows utilities flexibility in how to meet hose targets. Finally, although Vermont has a better carbon footprint than many other states due to current sources of electric generation, they believe it is important to look to the future. To them, an RPS can create good-paying jobs, product environmental benefits and help to position Vermont as a leader in renewable energy generation.

Biofuels

Biofuel production in areas outside of Vermont have raised concerns about destruction of tropical rainforests, the effect of rising demand for ethanol on the price and availability of food, the impact on livestock feed, and the low net energy return for corn-based ethanol. Some members want to clarify other opportunities for biofuel production in-state that they believe will offer economic advantages while allowing communities to scale projects based on local energy and agricultural needs. They hold that local production and use of biofuels eliminates the need to transport fuel over long distances, reduces greenhouse gas emissions, provides greater energy security, creates new jobs, expands the local tax base, and supports Vermont's agricultural heritage. While local ownership requires greater responsibility from communities, some members believe local ownership provides substantial returns.

Cost/Benefit Considerations

Renewable Energy is a broad canvas and many important elements are essential to the whole picture; including societal, environmental, economic, and cultural factors. The charge of VREC required members to focus on potential economic benefits of renewable energy that could be developed for Vermont. This sometimes proved challenging. Some members believed that there is a responsibility and moral imperative in making energy decisions that extend beyond the financial and that should be made more explicit in this report. Others felt that minimizing new costs burdens for Vermont businesses and taxpayers should be the primary and fundamental criteria for including recommendations.

Final Summary Report

Economic and Fiscal Impact Modeling Protocols for Selected Prototype of Renewable Energy Projects

Prepared for:

Vermont Rural Energy Council of the Vermont Council on Rural Development

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I. Introduction

a. Purpose of the Study

This study was commissioned by the Vermont Council on Rural Development to assist in the development of input-output modeling protocols regarding the economic and fiscal impacts of developing alternative renewable energy generation technologies in the state of Vermont. The specific objective of this study was to define an initial, but credible, consensus set of input-output modeling protocols to estimate the state economic and fiscal impacts associated with the development of various prototypical renewable energy projects. The overarching goal was to provide order-of-magnitude estimates of economic and fiscal impacts of representative projects in these alternative technologies to advance the level of discussion concerning their development and to encourage others to further develop these protocols to even more refined levels.

b. What Was Accomplished

During the course of the study, representative projects covering a total of 14 alternative technologies were specified and their economic and fiscal impacts on the state were modeled. These specifications used actual information provided by experts in each renewable technology area. These 14 alternatives were selected from a list of more than two dozen potential projects identified by the Council during the fall of 2006.

All input-output and fiscal impact modeling protocols developed in each technology area were reviewed by a technical team of experts with extensive experience in input-output modeling—including those with experience in the field of renewable energy projects . EPR specified the input-output and fiscal impact modeling protocols for each project type by renewable technology category. This initial specification was then reviewed and adjustments were made where indicated by the technical review team.

The project resulted in four accomplishments. First, this project resulted in the development of fully documented, initial input-output modeling protocols for each alternative technology. Secondly, the Vermont Rural Energy Council now has a set of credible impact assessments for representative projects in 12 renewable energy technologies and 2 conservation programs run by Efficiency Vermont. Third, although they may still benefit from further development, the project canvassed experts in each renewable technology area to develop initial quantification ranges of the total market potential for each technology. Fourth, with the completion of this project, the analytical ground work has been laid so that interested parties can further the development of these protocols and their resulting impact estimates. With all of these outcomes, the authors of the study hope that these results will elevate the level of public discussion surrounding renewable technologies and their economic-fiscal impact on the state of Vermont.

c. Methods of Analysis

The analytical approach employed in this study included the following steps: (1) Prioritize projects for analysis; (2) review literature on each technology and conceptualize the input-output modeling approach to be employed for each; (3) determine the economic-fiscal impact assessment parameters (e.g. 10 year impact assessment period, use of average cost approach, state economic-fiscal impacts, beginning year 2007, etc); (4) obtain data for a representative project in each selected renewable technology area identified for analysis from recognized experts in each technology, (5) review and follow-up with each expert (or experts) concerning specific information required for accurate input-output analysis; (6) specify the project inputs by technology area and review with the technical review sub-committee; (7) make adjustments to those specifications by technology area per technical review; (8) complete the input-output and fiscal impact analyses by technology area; (9) review and make adjustments based on technical sub-committee review; (10) finalize the impact assessment statements and complete a summary description of the representative project, (11) summarize the results of each representative project, and (12) develop initial estimates of market potential for the representative project technologies based on the opinions of the experts polled.

At all times, the study approached the impact assessment modeling from the standpoint of reasonableness and objectivity. This is not an advocacy analysis nor is it an assessment of the feasibility of these representative projects for project developers or users. The impact assessment analyses presented do not speculate on the source of project development funds for each technology—which depending on the project could be of significant consequence. For these economic-fiscal impact analyses, it was assumed that the business or homeowner either had the funds or had access to the funds necessary to acquire the technology, or implement the project. During the course of the study, this assumption generated a great deal of discussion. In the end, it was the opinion of the technical sub-committee that the myriad of tax credit and other financing alternatives available to those seeking to implement projects within these technology categories was too complex and too uncertain to be a part of these impact assessment analyses. However, any discussions using the data and information from this study for specific policy development purposes should consider the ramifications of this underlying assumption. A second area of the study that generated a considerable amount of discussion concerned the study's initial, order-of-magnitude estimates of the statewide market potential for the representative projects in each technology area. These estimates are just that—initial estimates of market potential for the specific representative projects. As with any assessment project of this kind, the opinion of the experts varied, and in most cases were simply experience-based estimates, each with their own set of assumptions and sometimes with some degree of advocacy for the representative project or technology that was modeled in this study. For this reason, market potential ranges were employed in the analysis, with a low and high estimate for each.

The third area in the analytical decision making process that deserves mention is the input-output model (REMI) that was employed in these impact assessment analyses. With any economic input-output assessment study, there was a wide range of input-output models that could be employed. The alternatives reviewed for this study included the full range of input-output models ranging from static (IMPLAN) to dynamic (REMI, REDYN, or other off-the–shelf models) as well as the idea of a "custom-built" input-output model. In this case, the technical sub-committee decided to employ the REMI model (obtained through the Vermont Department of Public Service). The REMI model is a conjoined, macro/input-output model that is capable of dynamic (versus static) simulations. Since the REMI model was available at no incremental license cost and is widely accepted within Vermont for development review, regulatory impact assessment, and other impact measuring purposes for in and out of state governments, it was selected for this study. Custom models and other input-output models that required additional licensing fees were determined to be cost prohibitive. The study's sponsors and the investigators would also like to express their appreciation to the Vermont Economic Progress Council for allowing the use of the fiscal impact component of the Council's fiscal cost-benefit model for this study.

Fourth, this study did not attempt to quantify or monetize the benefits or costs of externalities associated with the representative projects in each technology area. Externalities would include impacts such as pollution, carbon emissions, sustainability, and aesthetics. To some, quantifying and measuring these externalities are the most compelling reason for undertaking these projects. The decision to not attempt to quantify energy externalities in this study was made for budgetary reasons. However, this is an area ripe for further analysis when the budgetary resources are found to further develop this important effort.

II. Overview of Key Findings

- With the exception of the two conservation programs modeled, most of the state economic-fiscal benefits from the projects studied were derived from the initial investment and construction necessary to put the representative projects associated with these technologies in place.
    - In terms of net Vermont employment impacts, the period of initial investment and related construction activity is the largest source of economic-fiscal benefit, with the greatest economic impact occurring in the early years of the 10 year assessment period.
    - Out-year impacts from most of these projects after construction and installation are positive, but individually do not generate vast numbers of new job opportunities—even for local wood consuming technologies.
- The economic impacts of any project are augmented significantly by the manufacturing of project components within the State's boundaries. Whether through direct or indirect support, the State's ability to develop such industries strengthens the local economy through additional jobs as well as by diminishing the economic leakages associated with energy project investment.
- The market potential for the different programs modeled varies significantly from program to program. Programs involving households have the potential to be replicated many more times than those involving businesses. However, efficiency programs for commercial establishments and schools should not be discounted because they may have the largest potential for cost savings to their hosts.
- Although many individual energy sources analyzed herein do not generate large numbers of jobs and/or energy production, in aggregate these technologies can have a substantial economic impact. For example, just considering those sources included in 12 of the 14 technologies analyzed (excluding residential solar and solar hot water), and the lowest estimates of market potential provided, nearly 6,000 net new Vermont jobs could be added over a 10 year period as these technologies are developed and built. Job impacts are concentrated during the initial years of the impact assessment period when project construction impacts occur, and these estimates assume that all of the market potential would be developed within the next 10 years. When market potential estimates for residential solar and solar hot water are added to the these job impacts, an additional 5,500 direct and indirect jobs over ten years could be created if an additional 5% of the state's 307,345 housing units were fitted with this technology. Together the identified projects, excluding residential solar and solar hot water, could represent a significant portion of the state's electric power needs per year—with wind energy and the biomass generating plant making the largest contributions. Just what share of the state's total energy needs that could be collectively accounted for by development of these technologies depends on the capacity factor that resource was able to operate at in a given year. For all of the technologies assessed, this capacity factor will vary. Adding residential solar and solar hot water to the mix would increase the energy displacement-savings of these technologies significantly higher. However, it will likely take more than 10 years to place this technology in up to 230,000 (or 75%) of the State's housing units.

- The impacts associated with renewable technologies are a result of the increased economic activity associated with the development, construction, operation and cost savings (e.g. energy) to Vermont residents associated with the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. These impacts are displayed as the incremental change in employment, personal income, and revenue to the state. These impacts reflect the interrelated direct and indirect effects on economic activity impacted by the program.

The summary results of each modeled technology are presented in the following matrix. This matrix is intended to summarize the results of the modeling for each technology area using the representative projects, and present the likely impacts of these representative projects in areas such as energy savings, jobs per $1,000 invested, employment impacts over several periods, and energy production. Lastly, the matrix presents order of magnitude ranges of the state market potential of the representative projects in each technology area. The reader is cautioned that these reflect only educated guesses by the experts in each technology area specifically for the model project. There may be other differently scaled projects in each of the technology areas that would have significant market potential not included in the matrix (e.g. differently scaled methane projects for a smaller herd size than the 500 to 1,000 head project technology evaluated in this study), as well as many other technologies not analyzed within the confines of this project (such as mini and micro hydro-electric projects, and various other solar technologies). The reader is advised to make observations that reflect that understanding when using the information and data contained in this study.

In light of the cooperative nature of this study, the information and data presented here is in the public domain. Users of these data and information are asked to provide appropriate attribution to the study authors and contributors when references are made.

Summary Matrix of Renewable Energy Project Impacts

	Farm Methane Project	Commercial CFL Promotion	Residential CFL Promotion	Residential Solar Hot Water	Residential Solar
Development Costs (000s) [1]	$450.0	$0.0	$0.0	$1.0	$0.3
% of Expenditure in VT	4%	100%	100%	100%	100%
Construction Costs (000s) [1]	$1,133.3	$0.0	$0.0	$3.2	$3.9
% of Expenditure in VT	100%	0%	0%	100%	100%
Machinery and Equipment Costs (000s) [1]	$270.0	$0.0	$0.0	$4.4	$38.2
% of Expenditure in VT	0%	0%	0%	42%	0%
Total Capital Expenditures (000s) [1]	$1,853.3	$0.0	$0.0	$8.5	$42.4
% of Expenditure in VT	62%			70%	10%
Total Employment Effect - Construction & Development [5]	19	2	62	77	281
Total Employment Effect - Ongoing [5]	4	3	17	1	1
10 Year Cumulative State Subsidy (000s)	$0.0	$280.5	$5,906.3	$1,000.0	$8,750.0
10 Year Cumulative Federal Subsidies (000s)	$463.3	$0.0	$0.0	$2,000.0	$2,000.0
10 Year Cumulative Fiscal Cost/Benefit (000s)- With State Subsidies	$30.6	$210.0	-$8,525.0	-$821.2	-$8,104.4
10 Year Cumulative Fiscal Cost/Benefit (000s)- Without State Subsidies	$30.6	$42.2	$1,975.0	$178.8	$645.6
Annual Avoided Energy Cost (000s)	$351.7	$565.5	$4,095	$260.9	$0.5
10 Year Cumulative Avoided Energy Cost (000s)	$4,068.8	$5,654.7	$40,949	$2,609.1	$4,932.0
Annual Energy Generation (KWH)	1,238,095	3,730,650	27,852,694	2,450	5,100
Annual Energy Generation (Million BTUs)	NA	NA	NA	219.0	NA
Jobs Per $100 Thousand Dollars Invested - Year 1	1.0	0.8	1.1	0.9	0.7
Market Potential (For Specific Project Technology) [3]	15-20 sites	+10%-10%	+10%-10%	% Housing Stock	% Housing Stock
Low	15	90%	90%	10%	10%
High	20	110%	110%	75%	75%
Market Potential - Total Capital Expenditure					
Low (000s)	$27,800.0	$0.0	$0.0	$130,621.6	$651,571.4
High (000s)	$37,066.7	$0.0	$0.0	$1,828,702.8	$9,121,999.6
Total Potential Energy Generation (KWHs or BTUs)					
Low	18,571,429	3,357,585	25,067,424	37,649,763	78,372,975
High	24,761,905	4,103,715	30,637,963	527,096,675	1,097,221,650
Total Average MW Effect (Electric Generation Only)					
Low	2,120	383	2,862	4,298	8,947
High	2,827	468	3,497	60,171	125,254
Total Potential Vermont Job Impact - Construction & Development					
Low [4]	279	2	56	1,188	4,314
High [4]	372	2	69	16,627	60,395
Total Potential Vermont Job Impact - Ongoing					
Low [4]	61	3	15	15	20
High [4]	81	4	19	208	279

NA means "Not Applicable." [1] Project costs are per project. [2] Italicized values in the employment rows denote year 2 employment. [3] Estimates of market potential do not include all technologies available by type of project. They also are neutral regarding the non-technical feasibility of developing such projects in Vermont. These estimates are based on the knowledge/experience base of the experts contacted for the specific project type assessed in this study as of the date of the study. Market potential for solar hot water and residential solar conservatively assume 5% existing stock (approximately 15,000 units) installation, which is removed from future market potential.

Commercial Solar: 250 kW	Commercial Solar: 1000 kW	School Wood Chip: Small Scale	School Wood Chip: Medium Scale	School Wood Chip: Large Scale	1 MW Wood Fueled Industrial Co-Generation	25 MW Wood Fueled Generation Facility	50 MW Large Scale Wind Turbine Project	225 kW Wind Turbine	SELECTED TOTALS
$20.0 100%	$40.0 100%	$20.0 100%	$42.0 100%	$104.0 100%	NA	$6,000.0 100%	$1,500.0 100%	$167.3 100%	
$300.8 30%	$1,119.4 75%	$10.0 100%	$195.0 100%	$600.0 100%	$400.0 73%	$11,000.0 100%	$21,000.0 100%	$265.0 100%	
$1,136.7 0%	$4,230.6 0%	$140.5 0%	$169.0 0%	$470.0 0%	$1,275.0 50%	$49,000.0 0%	$70,000.0 0%	$150.0 25%	
$1,457.5 8%	$5,390.0 16%	$170.5 18%	$406.0 58%	$1,174.0 60%	$1,675.0 55%	$66,000.0 26%	$92,500.0 23%	$582.3 81%	
32	106	3	7	19	15	150	316	7	
0	1	0	0	1	5	322	17	0	
$227.1	$834.4	$153.5	$365.4	$1,056.6	NA	NA	$0.0	$12.0	
$2.0 -$181.4 $37.3	$2.0 -$659.6 $144.2	$0.0 -$51.4 $96.0	$0.0 -$49.6 $301.4	$0.0 -$209.3 $823.9	NA $269.2 $269.2	NA NA $8,605.9	$2,014.8 $1,395.8 $1,395.8	$9.1 $6.0 $18.0	
$23.1	$106.2	$10.7	$36.8	$100.0	$654.8	$16,844.9	$7,271.5	$53.3	
$260.1	$1,063.8	$112.7	$361.4	$983.8	$6,817.8	$106,793.3	$69,888.9	$314.5	
275,000	1,100,000	NA	NA	NA	8,059,200	186,150,000	100,740,000	453,330	
NA	NA	1,360.0	3,401.0	9,845.0	8059.2	NA	NA	NA	
2.2	2.0	2.0	1.8	1.7	0.9	0.2	0.3	1.2	
Sites 50 150	10-15 sites 10 15	35 1 35	100 1 100	15 1 15	25-30 sites 25 30	3 - 7 3 7	10-12 sites 10 12	200 sites 1 200	
$72,875.0 $218,625.0	$53,900.0 $80,850.0	$170.5 $5,967.5	$406.0 $40,600.0	$1,174.0 $17,610.0	$41,875.0 $50,250.0	$198,000.0 $462,000.0	$925,000.0 $1,110,000.0	$582.3 $116,450.0	$2,103,976 $13,090,122
13,750,000 41,250,000	11,000,000 16,500,000	1,360 47,600	3,401 340,100	9,845 147,675	(KWH Only) 201,480,000 241,776,000	558,450,000 1,303,050,000	1,007,400,000 1,208,880,000	453,330 90,666,000	(KWH Only) 1,955,552,505 4,585,943,908
1,570 4,709	1,256 1,884	NA NA	NA NA	NA NA	23,000 27,600	63,750 148,750	115,000 138,000	52 10,350	223,237 523,510
1,608 4,825	1,059 1,588	3 118	7 717	19 292	373 448	450 1,051	3,164 3,796	7 1,408	11,342 91,708
9 26	10 15	0 7	0 47	1 20	136 163	966 2,254	169 203	0 44	1,391 3,368

[4] Impacts are 10 year impacts based on total market potential or the activity estimated. For CFLs, estimates of market potential reflect a bandwidth around the annual activity estimates for each technology. For solar hot water, the estimates reflect all market potential activty occurring within the 10 year impact assessment period. This is not likely to actually occur since there were 307,345 housing units in Vermont in 2005, but this level of actiovty is assumed for comparability-consistency purposes.

[5] In this row, solar hot water and residential solar job impacts are expressed per 1,000 installations. Total potential job impacts expressed below and other total impacts are not per 1,000 installations but reflect estimates of total market potential.

PROTOTYPE FARM METHANE DIGESTER PROJECT

Impact Assessment Period: 10 Years

Project Description:
This project is based on existing Cow Power projects in place on several farms around the state in partnership with Central Vermont Public Service Corporation. The inputs modeled include development and construction costs that were estimated to be typical for a farm methane digester project currently in operation in Vermont. There is the potential to complete between 15-20 of these projects in Vermont for operations with herd size of 500 or more head. As the technology improves, it may be possible in the future to build digesters on farms with fewer than the 500 cows (or to link several smaller farms) typically required to make these projects economically viable.

Modeling Inputs ($ Nominal)
Total Development Costs (000s) $450.0
Total Construction Costs (000s). $1,133.3
Total Equipment Costs (000s) $270.0

Project Summary Data:
Dollar Amount of New Investment in
Vermont ($000s) $1,853.3
Estimate of Annual Operations Cost Savings
Attributable to the Project ($000s). $351.7

Fiscal Impact Summary Results:
Total Employment Effect in Year 1 (Direct and Indirect) [1] 19
Total Employment Effect in Year 5 (Direct and Indirect) [1] 4
Total Employment Effect in Year 10 (Direct and Indirect) [1] 4

Total Change in Personal Income in Year 1 ($000s). $524.5
Total Change in Personal Income in Year 5 ($000s). $139.2
Total Change in Personal Income in Year 10 ($000s). $183.1

Total Present Value Change in State
Revenue Benefits ($000s). $221.5
Total Present Value Change in State Costs ($000s) . . . . . -$190.9
Total Present Value Net Change in State
Fiscal Benefit ($000s) $30.6

Present Value Factor: 4.1%

Average Annual Amount of Electricity
Saved/Replaced (kWh). 1,238,095

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
While it is certain that these projects will reduce carbon emissions and lower the costs of doing business for possibly financially distressed farmers it is not in the scope of this project to predict those cost savings. The total employment impact of the project is estimated to be 19 direct and indirect jobs in year #1 and 4 jobs, composed exclusively of indirect jobs by year #5 continuing through year #10. Indirect jobs are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $0.2 million change in personal income in year #10 is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $1.9 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. methane digester and related equipment) and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $0.031 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. In terms of market potential, it is estimated there are 15-20 additional viable sites statewide.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of 4 full-time/part-time jobs, a total of $0.2 million disposable income, and a positive, cumulative state fiscal impact of $0.031 million fiscal benefit through impact year #10. This program will create a positive benefit to the state net of positive externalities such as reduced carbon emissions and greater energy independence.

Notes on Assumptions:

[1] Operational costs of the project are accounted for by the direct employment impact.

[2] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

COMMERCIAL COMPACT FLUORESCENT LIGHT BULB PROGRAM

Impact Assessment Period: 10 Years

Project Description:

The EVT Retail Products effort is the principal activity through which EVT promotes the stocking, promotion and sale of ENERGY STAR CFLs. It accomplishes this by partnering with a variety of retail venues throughout Vermont. The Retail Products effort targets both residential and small commercial customers (making purchases of less than 100 CFLs) that may benefit from the use of CFLs. Approximately 87% of CFLs purchased through the program are bought by residential customers and 13% by commercial customers. This impact analysis deals with the estimated annual level of activity for the commercial portion of the EVT program. This analysis assumes the replacement of 6,500 bulbs in impact year #1, 7,500 bulbs in impact year #2, and 10,000 bulbs per year in impact year #3 and thereafter.

The EVT C&I promotion of CFLs is for larger commercial and industrial customers purchasing large quantities (greater than 100 CFLs at one time). EVT executes this promotion by custom screening the lighting application and/or replacement for cost effectiveness, and then rebating the customer an incentive of approximately $1.50 per CFL if the installation and/or replacement are determined to be cost effective.

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	2
Total Employment Effect in Year 5 (Direct and Indirect) [1]	4
Total Employment Effect in Year 10 (Direct and Indirect) [1]	3
Total Change in Personal Income in Year 1 ($000s)	$78.2
Total Change in Personal Income in Year 5 ($000s)	$207.9
Total Change in Personal Income in Year 10 ($000s)	$248.0
Total Present Value Change in State Revenue Benefits ($000s)	$210.0
Total Present Value Change in State Costs ($000s)	-$400.8
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$190.8
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced Kwh	3,730,650

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:

This scenario is intended to be an example of a commercial energy conservation program. The impacts associated with this Compact Fluorescent Light bulb replacement are a result of the increased economic activity associated with the state government spending to promote the project and the cost savings to Vermont businesses associated with the CFL bulb replacement. They do not reflect the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. The impacts are displayed as the incremental change in employment, personal income, and revenue to the state. These impacts reflect the interrelated direct and indirect effects on economic activity impacted by the program.

The total direct and indirect employment impact of the project is 2 indirect jobs in impact year #1, 4 indirect jobs in impact year #5, and 3 indirect jobs in impact year #10. All of these jobs are considered indirect jobs as there is no direct spending on any facilities or employment in Vermont. Indirect jobs are jobs that are created by the spending on goods and services related to this energy conservation effort. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $0.2 million change in personal income is created by both the wages paid to the indirect employees and the increased disposable income created by the electricity cost savings of the program participants. The net fiscal impact of -$0.2 million to the State of Vermont is the difference between the rebates and tax incentives provided by the program and the increased tax revenue created as the result of the increased economic activity associated with the annual activity of the program.

These economic impacts represent a net benefit to the State of Vermont of 3 jobs, $0.2 disposable income and -$0.2 million fiscal cost to the state in year #10. This program has unspecified, positive externalities such as reduced carbon emissions and greater energy independence. This is an area ripe for further study using the input-output modeling protocols for this program developed during the course of this project. At this time, the estimated bandwidth for statewide low and high market potential reflect a plus or minus 10% level of activity difference relative to EVT program estimates over the next 10 years.

Notes on Assumptions:

[1] Includes income offsets to account for the tax effort associated with state program expenditures.

RESIDENTIAL COMPACT FLUORESCENT LIGHT BULB PROJECT

Impact Assessment Period: 10 Years

Project Description:
The EVT Retail Products effort is the principal activity through which EVT promotes the stocking, promotion and sale of ENERGY STAR CFLs. It accomplishes this by partnering with a variety of retail venues throughout Vermont. The Retail Products effort targets both residential and small commercial customers (making purchases of less than 100 CFLs) that may benefit from the use of CFLs. Approximately 87% of CFLs purchased through the program are bought by residential customers and 13% by commercial customers. This analysis assumes the replacement of 437,500 bulbs in impact year #1, 500,000 bulbs in impact years #2 through 4, 400,000 bulbs in impact years #5 and #6, and 300,000 bulbs per year in impact years #7 through #10. At 40 bulbs per housing unit, this corresponds to 10,900 housing units impacted in impact year #1, 12,500 housing units impacted in impact years #2 through #4, 10,000 housing units impacted in impact years #5 and #6, and 7,500 housing units impacted in impact years #8 through #10.

There are two principal incentive approaches used to promote these products at reduced cost to consumers. The first involves the use of instant coupons that consumers redeem at the check-out to receive a discount on CFLs. The current coupon discount is $1.50 per CFL package. The other incentive approach in the program is through negotiated markdowns with retailers or buy downs with manufacturers. The discount for these activities varies by lamp type and for some lamp types by wattage. Reimbursement is based on the provision of shipping data. There are no manufacturers of either CFLs or incandescent lamps in VT.

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	62
Total Employment Effect in Year 5 (Direct and Indirect) [1]	34
Total Employment Effect in Year 10 (Direct and Indirect) [1]	17
Total Change in Personal Income in Year 1 ($000s)	$6,853.0
Total Change in Personal Income in Year 5 ($000s)	$7,282.0
Total Change in Personal Income in Year 10 ($000s)	$5,699.0
Total Present Value Change in State Revenue Benefits ($000s)	$5,429.0
Total Present Value Change in State Costs ($000s)	-$8,525.0
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$3,095.1
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced Kwh	27,852,694

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts associated with the prototypical Compact Fluorescent Light bulb project are a result of the increased economic activity associated with the state government spending to promote the project and the cost savings to Vermont residents associated with the project. They do not reflect the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. The impacts are displayed as the incremental change in employment, personal income, and net revenue (above fiscal costs) to the state. These impacts are all interrelated. They are all a combination of the direct effects of the impacts modeled and the indirect effects of the economic activity which are the result of program activity.

The total employment impact of the program is 62 indirect jobs in impact year #1, 34 indirect jobs in impact year #5, 17 net new indirect jobs in impact year #10. All of these jobs are considered indirect jobs as there is no direct spending on any facilities or employment in Vermont. Indirect jobs are jobs that are created by the spending on goods and services related to this energy conservation effort. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $5.7 million change in personal income is created by both the wages paid to the indirect employees and the increased disposable income created by the electricity cost savings of the program participants. The net fiscal impact of -$3.1 million to the State of Vermont is the difference between the rebates and tax incentives provided by the program and the net tax revenue (defined as net of total state costs) associated with the incremental economic activity resulting from the program.

These economic impacts represent a net benefit to the state of 17 jobs, $5.7 disposable income, and -$3.1 fiscal benefit to the state though impact year #10. This program will create a negative fiscal benefit to the state separate and apart of any positive externalities such as reduced carbon emissions and reduced fossil fuel dependence. This is an area ripe for further study using the input-output modeling protocols for this program developed during the course of this project. At this time, the bandwidth for low and high statewide market potential reflect a plus or minus 10% level of activity difference relative to EVT program estimates over the next 10 years.

Notes on Assumptions:

[1] Includes income offsets to account for the tax effort associated with state program expenditures.

Prototype Residential Solar Hot Water Project

Impact Assessment Period: 10 Years

Project Description:

This project consists of residential solar arrays used for preheating water for hot water heaters for 1000 residential homes. The total market potential for this technology ranges between 10% and 75% of the housing units in Vermont.

Modeling Inputs ($ Nominal)

Total Development Costs (000s) $1.0
Total Construction Costs (000s). $3.2
Total Equipment Costs (000s) $4.4

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s) $8.5
Estimate of Annual Operations Cost Savings
Attributable to the Project ($000s). $236.6

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1] . . . 77
Total Employment Effect in Year 5 (Direct and Indirect) [1] 0
Total Employment Effect in Year 10 (Direct and Indirect) [1] . . . 1

Total Change in Personal Income in Year 1 ($000s). . . . $3,054.0
Total Employment Effect in Year 5
(Direct and Indirect) [1] $383.4
Total Employment Effect in Year 10
(Direct and Indirect) [1] $404.4

Total Present Value Change in
State Revenue Benefits ($000s) $628.6
Total Present Value Change in State Costs ($000s). . . . . -$1,449.8
Total Present Value Net Change in
State Fiscal Benefit ($000s) . . . . -$821.2

Present Value Factor. 4.1%

Average Annual Amount of Electricity
Saved/Replaced (kWh) 2,450,000

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:

The employment impact of this project is uneven, showing an increase of 77 in year #1, 0 job impact in year #5 followed by a gain of one job in year #10. The $0.4 million change in personal income is created in year #10 by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $8.5 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of -$0.8 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. No assumption is made in the impact modeling concerning the source of the initial investment by the homeowner needed to complete a project using this technology in a residential setting. There is a wide range of possibilities related to new construction or retro-fit projects.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $0.9 million in personal income, and a negative, cumulative state fiscal impact of $8.1 million through impact year #10. This program will create positive, but as yet unspecified, externalities such as reduced carbon emissions and greater energy independence. Based on information provided by experts with this technology, it is estimated that the market potential for this technology is between 10% and 75% of the total housing stock in the State. Because there are no estimates of total existing installed sites, we conservatively estimated that 5% of the existing stock (about 15,000 houses) already have such installations and deducted this from future market potential calculations.

Notes on Assumptions:

[1] Presently the energy production of these types of projects in not large enough to qualify for standard renewable energy credits.

[2] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[3] Currently there are manufacturers of equipment associated with this project and companies who install the projects located in Vermont.

[4] Analysis assumes no substitution effect in the household budget due to the financial commitment associated with this project

Prototype Small Residential Solar Project

Impact Assessment Period: 10 Years

Project Description:
This project consists of 5 kW residential solar arrays without a battery backup which is net metered for 1000 residential homes. The total market potential for this technology ranges between 10% and 75% of the housing units in Vermont.

Modeling Inputs ($ Nominal)

Total Development Costs (000s) $0.3
Total Construction Costs (000s). $3.9
Total Equipment Costs (000s) $38.2

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s) $42.4
Estimate of Annual Operations Cost Savings
Attributable to the Project ($000s). $478.8

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1] . . 281
Total Employment Effect in Year 5 (Direct and Indirect) [1] . . . -4
Total Employment Effect in Year 10 (Direct and Indirect) [1] . . . 1
Total Change in Personal Income in Year 1 ($000s). . . . $12,650.0
Total Change in Personal Income in Year 5 ($000s). $799.2
Total Change in Personal Income in Year 10 ($000s). $850.2

Total Present Value Change in
State Revenue Benefits ($000s) 2,184.8
Total Present Value Change in State Costs ($000s). . . . -$10,289.2
Total Present Value Net Change in
State Fiscal Benefit ($000s) . . . . -$8,104.4

Present Value Factor. 4.1%

Average Annual Amount of Electricity
Saved/Replaced (kWh) 5,100

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The employment impact of this project also is uneven, showing an increase of 281 in year #1, a loss of 4 jobs in year #5 followed by a gain of 3 jobs in year #10. The loss of jobs is likely linked to the equilibrium aspects of the input-output model used (REMI) following the large employment effect created by the large amount of construction spending during the first year of the project.

The $0.9 million change in personal income is created in year #10 by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $42.4 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of -$8.1 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. No assumption is made in the impact modeling concerning the source of the sizable initial investment by the homeowner needed to complete a project using this technology in a residential setting. There is a wide range of possibilities related to new construction or retrofit projects.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $0.9 million in personal income, and a negative, cumulative state fiscal impact of $8.1 million through impact year #10. This program will create positive, but as yet unspecified, externalities such as reduced carbon emissions and greater energy independence. Based on information provided by experts with this technology, it is estimated that the market potential for this technology is between 10% and 75% of the total housing stock in the State. Because there are no estimates of total existing installed sites, we conservatively estimated that 5% of the existing stock (about 15,000 houses) already have such installations and deducted this from future market potential calculations.

Notes on Assumptions:

[1] Presently the energy production of these types of projects in not large enough to qualify for standard renewable energy credits.

[2] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[3] Currently there are no manufacturers of equipment associated with this project located in Vermont but there are companies who install the projects.

[4] Analysis assumes no substitution effect in the household budget due to the financial commitment associated with this project

PROTOTYPE 250kW COMMERCIAL SOLAR PROJECT

Impact Assessment Period: 10 Years

Project Description:
This project consists of a 250 kW solar array which is net metered supplying energy to a hypothetical commercial building.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$20.0
Total Construction Costs (000s)	$300.8
Total Equipment Costs (000s)	$1,136.7

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$1,457.5
Estimate of Annual Operations Cost Savings Attributable to the Project ($000s)	$25,819.4

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	32
Total Employment Effect in Year 5 (Direct and Indirect) [1]	0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	0
Total Change in Personal Income in Year 1 ($000s)	$1,205.0
Total Employment Effect in Year 5 (Direct and Indirect) [1]	$40.1
Total Employment Effect in Year 10 (Direct and Indirect) [1]	$26.7
Total Present Value Change in State Revenue Benefits ($000s)	$184.2
Total Present Value Change in State Costs ($000s)	-$365.6
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$181.4
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	275,000

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The construction spending generated by this project is expected to generate 35 jobs in the first year of the project. The $0.04 million change in year #10 in personal income is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $1.46 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. solar panels and related equipment) and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $0.18 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. This impact assessment analysis is neutral with respect to the source of the initial investment funds to develop this project.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $0.04 million in personal income, and a negative, cumulative state fiscal impact of -$0.2 million fiscal benefit through impact year #10. This program will create positive externalities such as reduced carbon emissions and greater energy independence. Based on information provided by experts with this technology, it is estimated that the market potential for this technology is between 50 and 150 sites statewide.

Notes on Assumptions:

[1] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[2] Currently there are no manufacturers associated with the equipment for this technology in Vermont but there are companies who install the projects.

[3] Analysis assumes no substitution effect of capital expenditure associated with this project versus any other project available to a commercial establishment.

Prototype 1000kW Commercial Solar Project

Impact Assessment Period: 10 Years

Project Description:
This project consists of a 1000 kW solar array which will supply energy for a hypothetical commercial building.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$40.0
Total Construction Costs (000s)	$1,119.4
Total Equipment Costs (000s)	$4,230.6

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$5,390.0
Estimate of Annual Operations Cost Savings Attributable to the Project ($000s)	$103.3

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	106
Total Employment Effect in Year 5 (Direct and Indirect) [1]	0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	1
Total Change in Personal Income in Year 1 ($000s)	$3,979.0
Total Change in Personal Income in Year 5 ($000s)	$148.8
Total Change in Personal Income in Year 10 ($000s)	$106.8
Total Present Value Change in State Revenue Benefits ($000s)	$625.9
Total Present Value Change in State Costs ($000s)	-$1,285.5
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$659.6
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	1,100,000

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The construction spending on the project is expected to create 106 jobs in year 1. The total employment impact of the project is estimated to be 1 indirect job in year #10. Indirect jobs are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $0.1 million change in personal income in year #10 is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (e.g. reduced expenditures) on electricity by program participants. The change in capital investment of $4.2 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. solar panels and related equipment) and the direct expenditure for materials related to the equipment's installation. No assumption is made about the origin of those investment funds. The net fiscal impact of -$0.7 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $0.1 million in personal income, and a negative, cumulative state fiscal impact of -$0.7 million fiscal benefit through impact year #10. This program will create positive externalities such as reduced carbon emissions and greater energy independence. Based on information provided by experts with this technology, it is estimated that the market potential for this technology is between 10 and 15 sites statewide.

Notes on Assumptions:

[1] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[2] Currently there are no equipment manufacturers associated with this project's technology located in Vermont but there are companies who install this technology within the state.

[3] This impact assessment analysis assumes no substitution effect of capital expenditure associated with this project versus any other project available to a commercial establishment.

Small Scale School Wood Chip Heating Facility

Impact Assessment Period: 10 Years

Project Description:
This project consists of the installation of a wood pellet boiler heating system in a small, existing public school, with approximately 25,000 square feet, including vendor equipment and pre-fab, free-standing pellet silo. No building construction is necessary. The project will replace existing no. 2 fuel oil use with wood pellet fuel. Experts in this technology estimate this project could be replicated at approximately 35 sites around the state.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$20.0
Total Construction Costs (000s)	$10.0
Total Equipment Costs (000s)	$140.5
Total Capital Expenditures	$170.5
Average Annual Financing Costs	$7.5

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	3
Total Employment Effect in Year 5 (Direct and Indirect) [1]	0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	0
Total Change in Personal Income in Year 1 ($000s)	$143.1
Total Change in Personal Income in Year 5 ($000s)	$13.4
Total Change in Personal Income in Year 10 ($000s)	$15.3
Total Present Value Change in State Revenue Benefits ($000s)	$113.6
Total Present Value Change in State Costs ($000s)	-$165.0
Total Present Value Net Change in State Fiscal Benefit ($000s)	$51.4
Present Value Factor	4.1%
Average Annual Cost of Fuel Oil Saved (kWh)	$10,700

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The job impact created by these types of projects will be concentrated during the construction period of the project during which 3 jobs will be created in year 2. After the construction period, each individual project does not result in enough economic activity (e.g. use enough wood) to create permanent job opportunities in timber harvesting--although full development of 35 projects will likely have some permanent and quantifiable job impact in the logging-transport sector.

The $0.02 million change in personal income is created by both the wages paid to the direct indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $0.2 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of -$0.05 thousand to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project.

In summary, the economic impacts associated with this proto-type project include a total of $0.02 million in personal income, and a negative, cumulative state fiscal impact of -$0.05 thousand fiscal benefit through impact year #10. This program will create positive externalities such as replacing a non-renewable resource with one that is carbon neutral and greater energy independence. It is estimated by technology experts that this technology could be employed at approximately 35 sites statewide.

Notes on Assumptions:

[1] All fiscal estimates are net of state subsidy.

[2] Estimates do not include carbon emissions reductions.

Medium Scale School Wood Chip Heating Facility

Impact Assessment Period: 10 Years

Project Description:
This project consists of the installation of a "semi-automated" woodchip heating system in a smaller, existing public school, with approximately 50,000 square feet of space. The project includes impacts associated with vendor equipment and building construction for boiler room space and slab-on-grade woodchip storage. This project will replace existing no. 2 fuel oil use with woodchip fuel. It is estimated by technology experts that this technology could be installed at roughly 100 locations statewide.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$42.0
Total Construction Costs (000s)	$195.0
Total Equipment Costs (000s)	$169.0
Total Capital Expenditures	$406.0
Average Annual Financing Costs	$18.8

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	7
Total Employment Effect in Year 5 (Direct and Indirect) [1]	0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	0
Total Change in Personal Income in Year 1 ($000s)	$289.9
Total Change in Personal Income in Year 5 ($000s)	$30.5
Total Change in Personal Income in Year 10 ($000s)	$30.5
Total Present Value Change in State Revenue Benefits ($000s)	$340.6
Total Present Value Change in State Costs ($000s)	-$390.2
Total Present Value Net Change in State Fiscal Benefit ($000s)	$49.6
Present Value Factor	4.1%
Average Annual Cost of Fuel Oil Saved (kWh)	$36,800

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts of a medium scale school wood chip heating facility project are the result of the increased economic activity associated with the development, construction, operation, and cost savings to Vermont residents associated with the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions using this carbon-neutral technology. While it is certain that these projects will reduce carbon emissions, estimating that impact is subject to further research and is beyond the scope of this project. The impacts are displayed as the incremental change in employment, personal income, capital investment, and revenue to the state. These impacts are all interrelated. They are all a combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the program.

The job impact created by this type of project is concentrated during the construction period of the project resulting in 7 jobs in year 2. After the construction period, there is not sufficient demand for wood products to result in an additional significant permanent employment impact in any of the remaining impact years. However, it is expected that the development of 100 of these projects could result in additional permanent full-time and part-time jobs related to wood product harvesting in the state in the logging-transport sector.

The $0.04 million change in personal income is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $0.4 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of -$0.05 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. The project is net of the significant level of state subsidy payments that are offered to undertake these heat source conversion projects.

In summary, the economic impacts associated with this proto-type project include a net benefit to the a total of $0.03 million in personal income, and a negative, cumulative state fiscal impact of -$0.05 thousand fiscal benefit through impact year #10. This program will create positive externalities such as replacing a non-renewable resource from a predominantly foreign source with one that is more carbon neutral and greater energy independence.

Notes on Assumptions:
[1] All fiscal estimates are net of state subsidy.

[2] Estimates do not include carbon emissions reductions.

LARGE SCALE SCHOOL WOOD CHIP HEATING FACILITY

Impact Assessment Period: 10 Years

Project Description:
This project consists of the installation and operation of a "fully-automated" woodchip heating system in a large, existing public school, with approximately 200,000 square feet of space. It includes vendor equipment and building construction for boiler room equipment and wood fuel bin. The goal of this project is to replace existing imported no. 2 fuel oil with renewable woodchip fuel. It is estimated that this technology could be implemented at approximately 15 sites statewide.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$104.0
Total Construction Costs (000s)	$600.0
Total Equipment Costs (000s)	$470.0
Total Capital Expenditures	$1,174.0
Average Annual Financing Costs	$53.2
Average Annual Wood Chip Costs	$44.0

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	19
Total Employment Effect in Year 5 (Direct and Indirect) [1]	1
Total Employment Effect in Year 10 (Direct and Indirect) [1]	1
Total Change in Personal Income in Year 1 ($000s)	$774.4
Total Change in Personal Income in Year 5 ($000s)	$82.0
Total Change in Personal Income in Year 10 ($000s)	$87.7
Total Present Value Change in State Revenue Benefits ($000s)	$928.6
Total Present Value Change in State Costs ($000s)	-$1,137.9
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$209.3
Present Value Factor	4.1%
Average Annual Cost of Fuel Oil Saved (kWh)	$100,000

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts of a large scale school wood chip heating facility project are the result of the increased economic activity associated with the development, construction, operation, and cost savings to Vermont residents associated with the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. While it is certain that these projects will reduce carbon emissions, developing such estimates is beyond the scope of this project. The impacts are displayed as the incremental change in employment, personal income, capital investment, and revenue to the state. These impacts reflect an interrelated combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the program.

The total employment impact of the project is estimated to be 19 direct and indirect jobs in year #1 associated with the construction expenditures on the project and 1 indirect job in both impact years #5 and #10. Indirect jobs are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont. With a statewide potential of 15 sites statewide, the total job impact would increase proportionally.

The $0.1 million change in personal income is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by program participants. The change in capital investment of $1.2 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of -$0.2 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. The project is net of the significant level of state subsidy payments that are offered to undertake these heat source conversion projects–calculated as 90% of the initial project cost. In this case the assumed State subsidy totals $1.057 million.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of 1 full-time/part-time jobs, a total of $0.1 million personal income, and cumulative state fiscal impact of -$0.2 million fiscal benefit through impact year #10, assuming a State subsidy of just over $1 million for this size project. This program will create a positive benefit to the state net of positive externalities such as replacing a non- renewable resource with one that is carbon neutral and greater energy independence.

Notes on Assumptions:

[1] All fiscal estimates are net of state subsidy.

[2] Estimates do not include carbon emissions reductions.

Industrial Pellet-Fired Co-Generation Facility

Impact Assessment Period: 10 Years

Project Description:
This project is a collaborative effort between Vermont Electric Cooperative and Canadian companies, Enerkem, Sealaner Waterworks and Stanstead called Renewable Energy of North America or REDONA. The project as specified produces heat and electricity using wood pellets. The electricity will be sold to the utility and the heat will be used by the industrial host facility. The state currently has some manufacturing capacity for production of the generation units. This is factored into the economic impact modeling protocol to account for this "local" capacity.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$400.0
Total Construction Costs (000s)	$1,275.5
Total Equipment Costs (000s)	$1,675.5

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$1,675.5
Estimate of Annual Operations Cost Savings Attributable to the Project ($000s)	$251.9

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	15
Total Employment Effect in Year 5 (Direct and Indirect) [1]	6
Total Employment Effect in Year 10 (Direct and Indirect) [1]	5
Total Change in Personal Income in Year 1 ($000s)	$484.5
Total Change in Personal Income in Year 5 ($000s)	$288.0
Total Change in Personal Income in Year 10 ($000s)	$339.5
Total Present Value Change in State Revenue Benefits ($000s)	$499.7
Total Present Value Change in State Costs ($000s)	-$230.6
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$269.2
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	8,059,200
Average Annual Amount of Heat Savings (Millions btu)	8,059.2

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts created by the industrial co-generation project are a result of the increased economic activity associated with the construction, operation and cost savings to Vermont residents. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. The impacts are displayed as the incremental change in employment, personal income, capital investment and revenue to the state. These impacts are all interrelated. They are all a combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the illustrative renewable project.

The construction and manufacturing impact created by the project is expected to be 15 jobs in year #1. The total employment impact of the project is estimated to be 6 jobs in impact year #5, composed of direct and indirect jobs, a total of a 5 job impact in impact year #10. Indirect jobs are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $0.3 million change in personal income is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (reduced expenditures) on electricity by the project's developer. The change in capital investment of $1.7 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. wood chip burner and related equipment) and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $0.3 million to the state is the net difference between the total direct and indirect state government costs associated with the development of the project and the state revenues resulting from the incremental economic activity associated with the development and operation of this renewable project technology. At this point, the impact assessment analysis assumes the initial investment funds are incremental to the Vermont economy, and that the business case regarding the internal rate of return on this project to the investing company is satisfactory enough to result in more than $1.7 million in project investment.

In summary, the economic impacts associated with this project include a net benefit to the state of 5 full-time/part-time jobs, a total of $0.3 million personal income, and a positive, cumulative state fiscal impact of $0.3 million fiscal benefit through impact year #10. This program will create a benefit to the state net of positive externalities such as reduced carbon emissions and greater energy independence. It is estimated that the statewide market potential of this technology varies between 25 and 30 sites at this time.

Notes on Assumptions:

[1] Operational costs of the project are accounted for by the energy output generated.

[2] The growth rate used to escalate the value of the energy production, heat savings and RECs is based on the energy price forecast as published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

25 MW WOOD FIRED POWER GENERATION PLANT

Impact Assessment Period: 10 Years

Project Description:

This project consists of a 25 MW wood fired power plant which will generate commercial energy to be consumed in the state of Vermont as well as supplied back to the Northeast Energy Market grid (ISO New England). This project may be replicated around the state between 3 and 7 times.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$6,000.0
Total Construction Costs (000s)	$11,000.0
Total Equipment Costs (000s)	$49,000.0

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$66,000.0
Estimate of Annual Value of Energy Generated by the Project:	$14,971.4

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	150
Total Employment Effect in Year 5 (Direct and Indirect) [1]	425
Total Employment Effect in Year 10 (Direct and Indirect) [1]	322
Total Change in Personal Income in Year 1 ($000s)	$5,751.0
Total Change in Personal Income in Year 5 ($000s)	$19,820.0
Total Change in Personal Income in Year 10 ($000s)	$21,270.0
Total Present Value Change in State Revenue Benefits ($000s)	$15,619.2
Total Present Value Change in State Costs ($000s)	-$7,013.3
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$8,605.9
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	186,150

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:

The impacts associated with the prototypical 25MW wood generating project are a result of the increased economic activity associated with the development, construction, and operation of the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions using a carbon-neutral fuel source. The impacts are displayed as the incremental change in employment, personal income, capital investment, and revenue to the state. These impacts reflect the interrelated combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the project as specified.

The employment effect is comprised in two segments, the development and construction period that will occur during the first 3 years of the project, and the following operational phase of the proto-typical project. Employment in the second year of the project including both direct and indirect jobs is expected to equal 150 net new jobs. Employment in year #5 is expected to be 425 jobs and employment in year #10 is expected to equal 322 direct and indirect jobs. Direct jobs are those that are created at the facility itself and in supplying the raw fuel product. Indirect jobs are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $5.8 million change in personal income in year #2 is created by both the wages paid to the direct and indirect employees created by the development and construction of the facility. The $19.8 and $21.3 million change in personal income in years #5 and #10, respectively, are the result of economic activity associated with operating and fueling the facility. The change in capital investment of $66.0 million is the estimated direct investment in the proposed project's machinery and equipment and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $8.6 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project.

In summary, the economic impacts associated with this proto-type project include a year #10 employment impact of 322 jobs, a net benefit to the state of a total of $21.3 million in personal income, and a positive, cumulative state fiscal impact of $8.6 million fiscal benefit through impact year #10. This program will create a benefit to the state net of positive externalities such as reduced carbon emissions and greater energy independence. At this time, the best informed estimate of the total market potential of this scale and type of project is for between 3 and 7 total sites.

Notes on Assumptions:

[1] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

LARGE SCALE WIND PROJECT

Impact Assessment Period: 10 Years

Project Description:
This project consists of twenty 2.5 MW wind turbines (or 50 MW of capacity) which will generate commercial energy to be consumed in both the state of Vermont as well as for the Northeast Energy Market area (ISO New England) as a whole. The project as specified also includes significant land lease payments to land owners, increased local and state taxes paid, which the former was utilized in this analysis as a reduction in local property tax burdens (and therefore an increase in household disposable income) over the 10 year impact assessment period.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$1,500.0
Total Construction Costs (000s)	$21,000.0
Total Equipment Costs (000s)	$70,000.0

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$92,500.0
Estimate of Annual Value of Energy Generated by the Project:	$7,271.5

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	316
Total Employment Effect in Year 5 (Direct and Indirect) [1]	17
Total Employment Effect in Year 10 (Direct and Indirect) [1]	17
Total Change in Personal Income in Year 1 ($000s)	$10,850.0
Total Employment Effect in Year 5 (Direct and Indirect) [1]	$2,447.0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	$2,502.0
Total Present Value Change in State Revenue Benefits ($000s)	$3,295.5
Total Present Value Change in State Costs ($000s)	-$1,899.7
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$1,395.8
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	100,740,000

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts associated with the prototypical large scale wind turbine project are a result of the increased economic activity associated with the development, construction and operations associated with the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions related to the energy generated and sold in Vermont or New England. The impacts are displayed as the incremental change in employment, personal income, capital investment, and revenue to the state. These impacts are interrelated, and include a combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the program.

The employment effect is comprised of direct and indirect impacts associated with the construction and the ongoing operation of the facility. The construction impact in year #1 equates to 316 jobs. The ongoing operation of the facility (starting in year #2) will generate 17 total jobs. Of the 17 total jobs, 6 are estimated to be direct employees related to operation of the facility with the balance equal to indirect and induced effects. Indirect and induced jobs are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

The $2.5 million change in personal income in year #10 is created by both the wages paid to the direct and indirect employees and the increased disposable income created by land lease payments and reduced local taxes due to the presence of the facility. The change in capital investment of $92.5 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. wind towers and related equipment) and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $1.4 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $2.5 million in personal income, and a positive, cumulative state fiscal benefit of $1.4 million through impact year #10. This program will create a positive benefit to the state net of positive externalities such as reduced carbon emissions and greater energy independence. At this point, the best informed estimate indicates that the total market potential is for up to ten commercial wind projects of this scale statewide in Vermont.

Notes on Assumptions:

[1] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[2] Very little of the manufactures associated with this project are located in Vermont.

Prototype 225kW Wind Project

Impact Assessment Period: 10 Years

Project Description:
This renewable project consists of a 225 kW wind turbine which would supply energy to homes on a neighborhood scale. According to the experts contacted, it is estimated that this technology could be replicated approximately 200 times statewide.

Modeling Inputs ($ Nominal)

Total Development Costs (000s)	$167.3
Total Construction Costs (000s)	$265.0
Total Equipment Costs (000s)	$150.0

Project Summary Data:

Dollar Amount of New Investment in Vermont ($000s)	$582.3
Estimate of Annual Value of Energy Generated by the Project:	$32.7

Fiscal Impact Summary Results:

Total Employment Effect in Year 1 (Direct and Indirect) [1]	7
Total Employment Effect in Year 5 (Direct and Indirect) [1]	0
Total Employment Effect in Year 10 (Direct and Indirect) [1]	0
Total Change in Personal Income in Year 1 ($000s)	$236.5
Total Employment Effect in Year 5 (Direct and Indirect) [1]	$22.9
Total Employment Effect in Year 10 (Direct and Indirect) [1]	$22.9
Total Present Value Change in State Revenue Benefits ($000s)	$54.8
Total Present Value Change in State Costs ($000s)	-$48.8
Total Present Value Net Change in State Fiscal Benefit ($000s)	-$6.0
Present Value Factor	4.1%
Average Annual Amount of Electricity Saved/Replaced (kWh)	453,330

Note: [1] Employment effects include both full-time and part-time jobs.

Summary of Results:
The impacts associated with the prototypical 225kW wind turbine project are a result of the increased economic activity associated with the development, construction, operation, and cost savings to Vermont residents associated with the project. They do not include estimates of the impacts of positive or negative externalities such as the benefits of reducing carbon emissions. The impacts are displayed as the incremental change in employment, personal income, capital investment, and revenue to the state. These impacts are all interrelated. They are all a combination of the direct effects of the impacts modeled and the indirect effects of the economic activity created by the above-described project and its determinants.

The only employment effect is expected to be a result of the direct and indirect effects of the construction of the facility of 7 jobs in impact year #1. It is estimated there would be no incremental job impact in impact years #5 and #10. Indirect jobs in year #1 are jobs that are created by the spending on goods and services that are the result of developing, building, and operating the project. Indirect jobs also include jobs created by the new workers spending their salaries on goods and services in Vermont.

It is estimated that there will be a $0.01 million change in personal income in year #10. This impact is created by both the wages paid to the direct and indirect employees and the increased disposable income created by prospective savings (e.g. reduced expenditures) on electricity by households connected to the system. The change in capital investment of $0.6 million is the estimated direct investment in the proposed project's machinery and equipment (e.g. solar panels and related equipment) and the direct expenditure for materials related to the equipment's installation. The net fiscal impact of $0.02 million to the state is the net difference between the total direct and indirect state government costs associated with the project and the State revenues resulting from the incremental economic activity associated with the project. The impact assessment analysis makes no assumption about off-setting activity regarding the source of the nearly $0.6 million in initial investment funds needed to develop and construct the proposed project.

In summary, the economic impacts associated with this prototype project include a net benefit to the state of a total of $0.02 million in personal income, and a positive, cumulative state fiscal impact of $0.01 million fiscal benefit through impact year #10. This program will create a positive benefit to the state net of positive externalities such as reduced carbon emissions and greater energy independence. It is estimated that this technology has the potential for installation in approximately 200 sites statewide.

Notes on Assumptions:

[1] The energy price forecast employed in calculating cost savings is published in the Vermont Department of Public Service in its "Vermont Electric Energy Efficiency Potential Study" published in January 2007.

[2] Currently some of the manufactures associated with this project are located in Vermont.

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